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FOURTH WORKSHOP ON THREE DIMENSIONAL MODELLING OF SEISMIC WAVES GENERATION. PROPAGATION AND THEIR INVERSION

28 September - 9 October 1998

The ISC (International Seismological Centre) and the Earthquake Location Problem

presented by:

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These are preliminary lecture notes, intended only for distribution to participants.

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INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS, TRIESTE, ITALY

FOURTH WORKSHOP ON THREE-DIMENSIONAL MODELLING OF SEISMIC WAVES GENERATION, PROPAGATION AND THEIR INVERSION

(1998 September 28th – October 9th)

LECTURE ON 1998 OCTOBER 5TH – AFTERNOON

The ISC (International Seismological Centre) and the earthquake location problem

Speaker: Anthony A Hughes

Introduction

The International Seismological Centre (ISC) is the international organisation charged with the task of systematically collecting earthquake information, both instrumental and macroseismic, and providing definitive locations and magnitudes of events world-wide on a monthly basis approximately two to three years after their occurrence. The ISC was established in 1964 and has accumulated and analysed more than thirty years of earthquake data. This lecture, given by the former Director of ISC, will give a history of the beginning and establishment in the United Kingdom of the international service to collect and reduce earthquake data, its evolution into the International Seismological Summary (ISS) in 1918 and the International Seismological Centre (ISC) in 1964. The evolvement of the ISC's administration and funding structure will be described and the current operational state will be explained. The remainder of the lecture will be devoted to the procedures used by the ISC to assemble and analyse the instrumental and macroseismic data leading to the definitive locations and magnitudes of earthquakes and explosions as found in the Bulletin of the ISC and its CD-ROMs. Problems in the systematic location of earthquakes will be highlighted as well as shortcomings with the observational data. Uses made of the ISC database will be described, with suggestions for further refinements of the data and the outcome.

History of the International Seismological Summary 1918 - 63

International Seismological Centre 1964 - 97

Professor John Milne d. 1913

- Involvement in Japan in all areas of seismological investigations
- Instrumental development
- Earthquake engineering
- Data acquisition
- Assembly and publication in the UK of earthquake locations and observations

Professor H H Turner (ISS, 1918-1931)

- Astronomer and Seismologist at Oxford University
- Established the ISS in 1918 to collect, reduce and publish seismological data available
- Contributed to enhanced timing services
- Developed the Turner-Zöppritz Travel Time Tables
- Deduced depth of occurrence of earthquakes was significant

Professor H Jeffreys (ISS, 1938-1952)

- Applied Mathematician, Astronomer, Seismologist at Cambridge University
- Maintained the ISS from Turner's death until after World War II
- Main achievements were the development of the Jeffreys-Bullen Travel Time tables and their adoption by the ISS along with other data reduction procedures

Dr R Stoneley (ISS, 1952-1960)

- Applied Mathematician and Seismologist at Cambridge University
- Maintained ISS under great difficulty from lack of money and enormous increase in data becoming available
- Organised a brief unsuccessful attempt to use a computer for data reduction

Dr P L Willmore (ISS, 1960-1963, ISC 1964-1970)

- Seismologist from Cambridge University
- Developed standard seismographs
- Introduced computer processing at ISS and ISC
- Oversaw the establishment of the ISC in Edinburgh, UK

Dr E P Arnold (ISC, 1970-1977)

- Seismologist from Cambridge University and trained in the United States
- Re-organised the computer-based data collection system
- Refined the data analysis system using a high-level compiler for the editing instructions
- Introduced computer photo-typesetting for printing
- Stabilised the computing system and reduced the backlog of data from four years to two years in arrears

Mr A A Hughes (ISC, 1977-1997)

- Seismologist with ISS and ISC
- Oversaw the acquisition of two in-house computing systems
- Contributed to the reduction of 38 years of seismic data (1958-1996)
- Introduced the whole of the ISC database on six CD-ROMs
- Established a headquarters building for ISC in the UK

Structure and Funding of ISC

The ISC was formed in 1964 in Edinburgh, UK under the direction of Dr Willmore following the traditions of the ISS, to take advantage of the new computing technology as well as new developments in communications and printing. Initially four institutes in four countries funded the organisation. In 1970 the ISC was re-organised as an international non-governmental organisation under its own statutes under UK law with Dr Arnold as director. The result was that over thirty institutes quickly provided more funding to allow development and a reduction in a backlog of data. The current structure is:-

- International Governing Council (GC) – represents each funding agency – determines funding – adopts policy and appoints ISC Director – meets every other year – currently 54 agencies in 45 countries
- Executive Committee of Governing Council – meets annually – oversees operation and development of services - implements GC policies and the budgets – comprises of three GC delegates and special scientific and financial advisers
- Executive Director – in charge of all operations, personnel, finance and the UK headquarter building at Thatcham, UK
- Deputy Director – undertakes the responsibilities of the Director in his absence

ANALYSIS PROCEDURE AT THE ISC

Data Collection

The input data used in the preparation of the Bulletin of the ISC and for the location of events are:-

a) Station observations of phase onset times with the observers identification with particular values from certain phases of periods and amplitudes for the determination of magnitudes

b) Hypocentral determinations by agencies and stations world-wide giving locations, origin times, magnitudes and particular details such as method of determination

c) Macroseismic information about events. This is generally textural data giving indications on the type of shock and details of any associated phenomena e.g. volcanism, surface deformation, felt intensity or damage. These data have an association time to allow computer grouping with hypocentral solutions

The principle methods used by ISC in collection of data are:-

a) e-mail. The largest volume of data is collected over the INTERNET either by direct transmission to ISC or by ISC interrogating and extracting data from agency computers. Used mostly for hypocentral data and station readings

b) Magnetic tape (rapidly disappearing, being replaced by e-mail). Half-inch magnetic data tape has been the medium used most extensively over the lifetime of the ISC, to transfer large volumes of data to and from ISC. The majority of the data were station readings and hypocentres.

c) Diskettes and CD-ROMs. Diskettes are used frequently for small volumes of data being sent to and retransmitted from the ISC. They are particularly appropriate for readings from single stations or small networks. For larger volumes of data

certain agencies have adopted the use of Compact Disks for the transmission of data to ISC.

d) Station or Agency Bulletins. These are used to report unformatted data such as macroseismic information. They have the drawback that any data used from them at ISC have to be keyed but they can provide unformatted information which can help in the association of data into discreet events and with location procedures.

The data are checked for formal errors such as unknown station and agency codes, illegal onset or origin times, abnormal amplitudes and periods. Data may have to be reformatted into formats acceptable to ISC.

All data are entered into a disk/tape system on the computer. Data are held in monthly packets in order of station and agency code and are backed up on magnetic tape monthly. Advantages and shortcomings of the system will be discussed.

Data Analysis

The analysis of the station readings, hypocentral data and macroseismic information is described under four procedures.

1) **Group.** This procedure associates multiple determinations of events together with observations from stations and any macroseismic reports. Difficulties and failures of this procedure will be highlighted.

2) **Revise.** Using P-wave onset times, hypocentres are derived or agency hypocentres revised leading to the definitive ISC solutions. A classical weighted least squares solution is derived with the application of the Jeffreys-Bullen Travel Time tables. Certain options are adopted to restrain the value for depth of focus

when hypocentre solutions go unstable. Successive revision passes of the data are made, editing the hypocentres solutions and observations to provide the most reliable ISC hypocentre solutions and data sets for the earthquakes and explosions. A detailed description of the editing procedure and the high-level editing language will be given.

3) **Identification or Phase Identification.** Using the ISC hypocentral solutions or the best agency determinations, the station phase data are re-examined and compared with the phase arrival times according to the Jeffreys-Bullen model. Comparison with observers' identification of supplementary phases is made and reidentification is attempted with a view to maximising the number of identifications of phases observed at each station.

4) **Print and Output.** The fourth procedure in the analysis primarily allows the hypocentral and station data to be printed in a form that can be examined by a seismologist. Intermediate determinations in the iterative revisions are given with explanations of problems and failures in the hypocentral determinations. In addition, magnitudes are computed and seismic and geographic region numbers and names are allotted to each event.

Output of the Data

When a monthly period of earthquakes and explosion data with their station observations and associated macroseismic information are considered ready for publishing, and no further editing is required, an output procedure is executed creating:-

a) An archive file in a standard ISC format. This file is made available on magnetic tape and annually on CD-ROM.

b) The whole file is typeset into the *Bulletin of the ISC* and listed on a laser printer. This master copy is used for the bi-monthly version of the *Bulletin* to be printed.

c) Subsets of hypocentral and macroseismic data are created. These subsets are used in Catalogue of Earthquakes files made available on magnetic tape and CD-ROM. Six-monthly subsets comprise an issue of the *Regional Catalogue of Earthquakes* which gives the hypocentral data by order of magnitude of events for major earthquakes and by geographic and seismic regions. This publication is also mastered on a laser printer and then published.

For the period 1965-95, the ISC assembled a Bibliography of Seismology containing titles and references in papers, books and journals on seismology, earthquake engineering and seismic surveying. Each record in the Bibliography gives the title of the article, three principle authors, a journal reference and up to four key-words to specify the seismological subjects considered. Further information is given such as language used and cross-references. This was published as a bi-annual publication and the whole file is available on CD-ROM.

Uses of the Data

a) **Seismicity studies.** The largest use of ISC data is with the hypocentral data in the Catalogue files to indicate the occurrence of events over a particular period of time and in a particular area. The hypocentres in the Catalogue are the starting point of many seismicity studies which then go on to improve the locations and magnitudes given by ISC and integrate further data and local information which was not available to ISC.

b) **Structure studies.** The station observations found in the ISC Bulletins are being used for local earth structure studies and global tomographic studies. Care has to be taken with the quality of hypocentres, location of the stations provided in the ISC datasets and that residuals are based on the Jeffreys-Bullen model.

c) **Earthquake mechanism studies.** Data from many of the major earthquakes are used as initial information on the location and station readings for fault plane solutions. Again care is required with the hypocentral data and the station readings which frequently require reappraisal.

Shortcomings and inadequacy of the data

Poor or false hypocentral solutions stem from inadequate station readings and mis-editing. Misassociation of station readings leads to bogus locations. Hypocentral solutions may be sensitive to a single station reading. Depth of focus is the most difficult parameter in the hypocentral solution to determine and is easily unstable due to inadequate data or poor distribution by distance or azimuth. Occasionally multiple determinations of a hypocentre are so far apart that computer analysis gives two events. These "split" events are carefully sought by the ISC editors.

Further refinements

Certain agencies have taken the hypocentres and station readings for events in particular regions from the ISC data base and revised these events using more modern earth models and revision techniques. Closer attention is given to depth determination. These revised files are made available on occasions from the authors and may help with further structure studies.

APPENDICES

1. List of Governing Council Agencies
2. Introduction to Bulletin of ISC
3. Sample Content of Bulletin
4. Introduction to Regional Catalogue of Earthquakes
5. Sample content of the Regional Catalogue of Earthquakes
6. Sample content of Bibliography of Seismology

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All data, including phase data for events below magnitude 5.0, are available on an annual CD-ROM and in a computer readable form

A complete list of seismological observatories and agencies can be found in the January-June edition of the *Regional Catalogue of Earthquakes*

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INTRODUCTION

Content of the Bulletin

The following is a very brief précis of the procedures, both computational and otherwise, which are used to produce the *Bulletin*.

Both preliminary estimates of earthquake foci and observational data are collected in computer-readable form on such media as magnetic tapes, punched cards and punched paper tape as well as in the form of coded data sheets and station bulletins, the latter being converted into computer-readable form at the Centre. These data are entered into a combination disc-magnetic tape storage system as soon as possible after receipt. When a month's data are to be processed, the relevant estimates and observations are arranged in chronological order and the revision process begins.

All stations and agencies have been instructed to give their observational times and the times of epicentral estimates in Universal Coordinated Time *uncorrected* for either the effects of small movements of the Earth relative to the axes of rotation or seasonal variations. The times listed can therefore be assumed to be UTC.

Those epicentral estimates whose positions are the same within one degree in both latitude and longitude and whose times of origin are the same within 60 seconds are considered to be estimates of the same event and henceforward treated as such. Once all of the preliminary estimates have been identified, then all of the observations (an observation being defined as all the data reported by a given observatory concerning a single event) which follow the earliest estimate by 40 minutes are considered individually to determine whether or not each should be associated with the event. A *preliminary* association is made if:

1. the first longitudinal arrival is identified as a crustal phase, i.e. Pg, P* or Pn, the station is within 15° of the epicentre and the absolute value of the residual against the given phase is less than 70 seconds or failing that,
2. the otherwise unspecified first longitudinal arrival (abbreviated to 'P/PKP') has a residual of less than 70 seconds against the P, PKP (DEF, BC or AB branches, according to Shimshoni (1967)) or failing that,
3. P/PKP has a residual of less than 70 seconds against P diffracted around the core boundary or failing that,
4. in the absence of P/PKP, the first transverse arrival is identified as a crustal phase (Sg, S* or Sn), the station is within 15° of the epicentre and the residual is less than 70 seconds or failing that,
5. in the absence of P/PKP, the otherwise unspecified first transverse arrival ('S/SKS') has a residual of less than 70 seconds against the S or SKS (AC and DF branches) tables.

Each of the above possibilities is considered in turn and is given a priority in the above order. Where it is possible to associate an observation with more than one event, the association which results in a higher priority level or has a smaller residual at the same priority level would be the one taken. It must be noted here that the associations referred to above are only provisional and that at later stages in the procedure they are refined by both automatic and manual means.

A revision of the focal parameters is then attempted using a program based on the Method of Uniform Reduction, a variant of the Method of Least Squares (Jeffreys 1961) where each equation of condition is weighted with w_i

$$w_i^{-1} = 1 + \mu \exp\{h^2(\xi_i - \alpha)^2\}, \qquad (1)$$

where $h^2 = \dfrac{1}{2\sigma^2}$

and $\alpha = \sum_1^n w_i\xi_i \Big/ \sum_1^n w_i.$

and μ and σ are approximated by inspecting the frequency distribution of residuals (Buland, 1986). The computation then proceeds as in the case of a classic Least Squares solution. All computations of focal parameters are based on the *Seismological Tables* by Jeffreys and Bullen (1940) and only P, Pg, P* and Pn observations are included. Calculated travel-times used to compute residuals are corrected for the earth's ellipticity using the method suggested by Gutenberg and Richter (1933) and developed by Jeffreys and Bullen (Bullen 1937). The correction is of the form:

$$\delta t = f(\Delta)(h + H)$$

where h and H are the heights of the station and epicentre above the mean sphere and $f(\Delta)$ is as given on page 50 of the 1967 edition of the *Seismological Tables*.

During this revision procedure the tentative associations referred to above are refined. In general, observations whose residuals have an absolute value between 20 and 50 seconds are returned to the unassociated data stream; duplicate readings are eliminated, preference being given to those observations received directly from the stations themselves and those which are marked as final readings; and all observations and epicentral estimates are examined in detail by a seismologist for evidence that can alter the association. Once a final set of associations has been arrived at, the revised estimate is re-calculated with only those data.

If the P-data have not been sufficient to determine depth of focus, or if the apparent value is negative, the final revision is carried out with the depth fixed from other evidence or held at an arbitary value, commonly at the base of the crust. If the depth is obtained from pP-P intervals, at least three consistent observations are required. An estimate of the 90% confidence interval (introduced in 1986 Bulletin) is *always* calculated for each of the focal parameters which has been revised. Depth of focus is expressed in kilometres from the surface.

Calculation of unified magnitudes, M_b, given in this *Bulletin*, follows the procedure outlined by Gutenberg and Richter (1956) for P waves of period ≤ 3 seconds. If Q is the depth-distance factor and q_i is $\log_{10}$ (amplitude in nanometres/period in seconds) for the ith station, then for *n* observations

$$M_b = n^{-1} \sum_1^n [Q(\Delta_i, h) + q_i] - 3 \qquad (2)$$

assuming the amplitude is observed on a short-period vertical instrument. Station corrections are ignored as are observations at distances less than 21° or more than 100°. An average unified magnitude is calculated and printed in the epicentre line. If this is derived from three or more stations, the magnitude is printed in **bold**.

Where amplitudes and periods are given for surface waves in the 10 – 60 second range, a surface-wave magnitude, Ms, is calculated for that observation by employing the 'Prague formula' (Vanek *et al.* 1962).

$$M_s = \log_{10}\left(\frac{A}{T}\right)_{max} + 1.66 \log \Delta + 3.3$$

where A is the vertical or resultant horizontal amplitude, T is the mean period and Δ is the epicentral distance in degrees. Ms is calculated only for events at depths 60 km or less in the distance range 5° – 160°. An average Ms is calculated from observations reported from stations in the distance range 20° – 160°. The value is printed in **bold** if three or more observations are used.

All phases except the longitudinal first-motion are then compared with the seismological tables by a logical process which associates each supplementary phase with the most plausible branch of the travel-time curves (Arnold *et al.* 1968), provided the residual is less than 7.5 seconds. This process is carried out only for observations where the epicentral distance is greater than 25° and then only on epicentres which have been successfully revised by the procedures described above. Details of the phases which can be identified are given in the first section of the list on the inside back cover of this *Bulletin*.

If the revision process has been deemed successful, the revised estimate of epicentral position etc. will be adopted and all residuals will be calculated against these focal parameters. However, if the revision process is unsuccessful, one of the preliminary estimates is selected for adoption and the distances and residuals are re-calculated against that estimate. For each adopted epicentre a geographical region corresponding to that given by Flinn and Engdahl (1965) and Flinn, Engdahl and Hill (1974) is found.

After station readings have been associated with epicentral estimates supplied by other agencies, the residue of unassociated data is subjected to a search to find associations that lead to new events. The computer program used is similar to that developed for the US National Earthquake Information Service (Engdahl and Gunst, 1966). These new events are characterised by their listing under an ISC epicentral estimate only. Some of these events may have arisen from chance misassociation. It is essential that before any tectonic or seismological significance be attached to unusual earthquakes, the readings on which the events are based should be carefully examined and the reliability of the determinations assessed. This procedure began in the *Bulletin* for 1974 January.

It should be noted that the names used to classify seismic and geographic regions are meant to be only a guide to their location and in no way to be taken to imply recognition of sovereignity or an official view of the ISC on any political matter. The boundaries of these regions follow integral degree lines of latitude and longitude and this system of division leads, on occasion, to discrepancies with state or national frontiers.

Layout of the Bulletin

The earthquakes and explosions are listed in chronological order of the adopted estimate for each and the data relating to each event can comprise three kinds of information. The first is a summary of all previous estimates by the various reporting agencies; the second shows the focal parameters that have been found by the ISC during the revision process; and the third is the observations associated with the event listed in order of epicentral distance.

Epicentral Estimates All epicentral estimates except for the adopted one are printed in *italic* type and are listed in chronological order. The adopted estimate is always printed last, mainly in **bold** type. Each epicentre line can consist of twelve pieces of information set in 'phrases' and separated by commas. All but the first three of these phrases begin with a symbol or group of symbols which indicate what sort of information the phrase contains and also include an indication as to the units of measurement and, if given, either estimates of the 90% confidence intervals or number of observations on which these measurements are based. These phrases are listed in the following order:

1. Agency code.
2. Time of origin beginning with the day of the month (the year and month is always printed at the head of the middle column of each page). The estimate of the 90% confidence interval in time of origin, if given, is also listed.
3. Geographical position of the epicentre with estimates of the 90% confidence intervals, if reported.
4. Depth of focus prefaced by 'h'.
5. Depth of focus from any other source, e.g. from pP–P observations in which case it will be suffixed by the expression ':pP–P'. If this phrase is enclosed in parentheses, the residuals which follow are calculated using the depth given in (4) above.
6. Total number of observations prefaced by 'n'.
7. The standard deviation of one observation prefaced by 'σ' along with the number of observations contributing to that determination.
8. Body-wave magnitude, prefaced by 'Mb', together with the number of observations contributing to the measurement.
9. The surface-wave magnitude prefaced by 'Ms', together with the number of observations contributing to the measurement.
10. The total number of compressions and dilatations reported (usually pertains only to ISC epicentres).
11. Comments.
12. Geographical region (adopted estimate only).

In all epicentre lines the units are expressed as superscript letters or characters and if the number is a decimal fraction then the superscript letters or characters will be centred over the decimal points. Conventions concerning units can be found on the inside front cover. All estimates of the 90% confidence intervals are preceded by the plus-minus (±) sign and the number of observations on which a calculation is based is always preceded by a solidus (/).

Observational Data All associated observational data follow the epicentral information in distance order and are printed one phase per line. In the first line of any observation, the station code and name, the epicentral distance and the azimuth are printed in **bold** type. Next are printed the direction of first motion and the character of the pulse, that is, *e* for emergent, *i* for impulsive and the identification of the first phase, the time of the observation and, if applicable, the residual against the operator's identification. If this phase has contributed to the adopted solution, the identification, time and residual will all be printed in **bold** type, otherwise in roman type. Specifically P, Pg, P* and Pn phases will appear in **bold**, core and shear phases in roman. It should be noted at this point that, even if the residual for a particular P-observation is large enough to make the weight in (1) above effectively zero, that identification, time and residual will still be printed in **bold** type.

All succeeding lines in the same observation will be printed in roman type with the station code and name repeated below those in the first line, followed by the identification given by the phase identification program as described above, the character of the onset and identification given by the station, the observational time, the residual against the identification given by the ISC and finally that against the identification given by the station.

When a phase is identified by a station as S/SKS, the residual will be calculated against the most appropriate phase and branch and the operator's identification listed as either S/(SKS) to indicate that the residual is taken against S, or (S)/SKS when taken against SKS.

If only one phase is reported and either log(A/T) is reported or an amplitude and period are given, a value for log(A/T) will be printed in the space usually devoted to the residual against the ISC identification and will be printed in *italics* and parentheses to indicate that it does not normally belong in that particular column. Note that all observational information relating to the dynamic characteristics of the signal, such as amplitude, period, log(A/T), character of onset, etc., are always printed in *italics*. If, however, more than one phase is reported in a particular observation and if either the dynamic characteristics of the signal or comments are reported, they will be printed in the space usually reserved for a repetition of the station name. The dynamic characteristics will be enclosed in square brackets to indicate that they refer to another phase and comments will be enclosed in ordinary brackets to indicate that they are given by the station not the ISC. If amplitude and period are given separately they will be printed in *italics*, amplitude being given first, followed by period, each with an appropriate set of units. If only log(A/T) is reported, the value to tenths of units will be preceded by the symbols 'lgA/T'. In either case this will be followed by either a magnitude, which will be preceded by either Mb or Ms, or an indication as to which phase in this observation these readings refer. In the latter case the reference is shown by a colon (:) followed by a number which indicates the line number within that observation that these data refer to.

In the case of surface-waves where no observational time is reported, signal amplitude and period are printed followed by either the component on which the observation was made or the resultant surface-wave magnitude preceded by 'Ms'. These observations are printed three to a line.

If, for some reason, a phase is reported in such a way that it cannot be recognised as one of those in the list of phases on the inside back cover, it will be printed in SMALL CAPITALS in the column headed 'Operator Identification' and will be enclosed in single quotation marks.

Examples The following examples illustrate the layout. The list of epicentral estimates should be interpreted as follows:

1971 Jul

JMA 01ᵈ 19ʰ 01ᵐ 17ˢ2± 1ˢ3. 43.°03± .°07N × 146° 63± .°10E. h40ᵏᵐ
JMA M4·5
JMA I–I J Nemuro
NEIC 01ᵈ 19ʰ 01ᵐ 18ˢ3. 43°2N × 146° 5E. h56ᵏᵐ, Mb4 7/7. Felt
NEIC Felt on Hokkaido
SKL 01ᵈ 19ʰ 01ᵐ 19ˢ. 43° 1N × 146° 6E. h50ᵏᵐ. Type A
ISC 01ᵈ 19ʰ 01ᵐ 17ˢ0± 0ˢ44. 43°04N ± °035 × 146.66E ± °052
h50ᵏᵐ ± 4·0ᵏᵐ, n54, σ1ˢ19/52, Mb4·6/9
5C–2D, Kurile Islands

The first estimate is from the Japanese Meteorological Agency and is given as 1971 July 01 days 19 hours 01 minutes 17·2 seconds plus or minus 1·3 seconds with an epicentre at 43·03 degrees plus or minus 0·07 degrees North by 146.63 degrees plus or minus 0.10 degrees East. Depth of focus is shown as 40 kilometres and an unspecified magnitude of 4·5 is given on the second line which is identified again by the code JMA. The third line contains a JMA comment which was received from a source different from the first and second lines. It, of course, means that the intensity was I on the Japanese scale at Nemuro. The fourth line is an estimate by the United States National Earthquake Information Centre. The time of origin, latitude and longitude are expressed in a manner similar to that of the JMA estimate but this time without standard errors. Depth of focus was at 56 kilometres but this time Mb is given as 4·7 on seven observations along with the comment that the earthquake was felt. This same agency, however, in a different report states that the earthquake was felt on Hokkaido. The sixth line is an epicentral estimate of the same event by the Sakhalin Island network. The time of origin, latitude and longitude and depth of focus are similar to the NEIC one, but the comment is given that the quality of this epicentre is 'Type A'. This can be explained by referring to the entry under the code SKL in the list of epicentral reporting agencies given in the *Regional Catalogue of Earthquakes* for 1970 January to June. The seventh, eighth and ninth lines, because they are printed mainly in **bold**, give the adopted epicentre calculated by the ISC. The first of these lines, except for the typeface is similar to the JMA line giving time of origin, latitude and longitude of the epicentre along with errors. The second line gives the depth of focus in kilometres. Because no indication is given as to what this depth was derived from, it should be assumed to be derived only from P-observations. The next five phases indicate the following: (1) a total of 54 observations was reported; (2) the standard deviation of one observation is 1·19 seconds calculated from 52 observations; (3) body-wave magnitude is 4·6 on nine observations; (4) a total of 5 compressions and 2 dilatations was reported; and finally (5) the earthquake took place in the Kurile Islands.

The following is a typical observation:

SHI	**Shīrāz**	**82·55**	**301**	**αP**	**01 28 26·2**		**−0.5**
SHI	Shirāz	pP	*e*		01 29 02	+2	
SHI	Shirāz	S	*i*		01 38 28·0	−4	

SHI is the international three-letter code; the station name being Shīrāz. The observatory was 82·55 degrees from the epicentre; its epicentral azimuth was 301 degrees measured from the North to East. The alpha (α) indicates that a compression was read on both the short- and long-period seismographs and that the phase was identified as P. The observational time was 01 hours 28 minutes 26·2 seconds and the residual against the P-tables was −0.5 seconds. On the second line the station code and name are repeated and an emergent phase was reported at 01 hours 29 minutes 02 seconds which was identified by the ISC as pP, the residual being +2 seconds. The third line indicates that an impulsive phase was observed at 01 hours 38 minutes 28·0 seconds which the ISC identified as S with a residual of −4 seconds. No amplitude and period information is given for this observation.

In the following observation the first line is similar to the example above except that the P-phase is listed as impulsive and no direction of first motion information is given.

COL	**College Outpost 83.25**	**11**	***iP***	**05 22 08·7**		**+0·4**
COL	*[22nm 0ˢ9 Mb4·9]*pP		*e*	05 22 49	0	

The second line shows in addition to an unidentified emergent phase which has been re-identified as pP, the amplitude, period and resulting magnitude for the P-phase in the first line, the amplitude being 22 nanometres, the period 0·9 seconds, the body-wave magnitude 4·9. Because the magnitude is given as Mb, it could be associated only with the P phase. On the other hand, in the following observation:

UBO	**Uinta Basin Ar 116.96**	**48**	***iPKP***	**01 34 48·2**		**+2·0**
UBO	*[24nm, 0ˢ 7:1]*	SKP_2	*e*	01 38 10	+2	

the amplitude and period information is simply referenced to line 1 of

observation since Mb is not calculated beyond 100 degrees. Be-
se only one phase is reported in the following observation:

UBO Uinta Basin Ar 82·11 44 ↑P 05 22 04·8 (-2) +1·8

log(A/T) is printed in parentheses after the time of observation even though
plitude and period were reported separately; this has had to be done for
sons of economy. The observation:

QUE Quetta 55·32 298 ↑P 05 44 02·8 +1·0
QUE [5·0μm. 20° Z, Ms5·6] 05 51 46 +4 +4
QUE [4·3μm-22° N, 2·7μm. 20° E. Ms5·6]

trates the reporting of amplitude and period for all three components of
ace-waves where no observational times are given. The observations de-
d from the vertical, North-South and East-West components are identified
such by ":Z", ":N" and ":E" followed by the resulting surface-wave magnitude.
lly, in the observation:

ASP Alice Springs 26·33 128 ↑P 08 15 35·1 −0·8
ASP [lg° / r 1·7, Mb4·9] sS eS 08 20 27 −7 +26

station reported log(A/T) rather than amplitude and period separately.
tation comments are illustrated by the following observation:

MIT Mito 0·47 293 ↓ ↑P 18 28 56·6 −0.2
MIT {I - II JMA} S/(SKS) 18 29 05 -2

he comment in curly brackets indicates the intensity was II on the
anese intensity scale in or near the region of the station.

ncies reporting Epicentral Estimates and Seismological
ervatory Locations

st of all agencies and persons who have reported epicentral esti-
es to the ISC, along with the codes used to identify them and a list of
mological observatories with their geographical locations can be
nd in the *Regional Catalogue of Earthquakes* for 1983 July to De-
mber. In future issues of the *Bulletin* agencies and locations and
es of any stations not previously listed will be published.

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INTRODUCTION

ntenu du Bulletin

lous donnons ci-après une brève description de la procédure utilisée
production du *Bulletin*, sous l'aspect calcul comme sous les autres
ects.

out comme les déterminations préliminaires de foyers, les données
bservations nous parviennent aussi bien sous des formes directe-
nt accessibles aux ordinateurs: bandes magnétiques, cartes per-
es, ruban perforé, que sous la forme de feuilles de données codées
le bulletins de stations, ces derniers étant convertis à un format
le par la machine, à l'intérieur du Centre. A leur réception, ces
nées sont introduites aussitôt que possible, dans une mémoire à
ques et à bandes magnétiques. Lorsqu'on doit traiter les données
tives à un mois, les déterminations préliminaires et les observations
espondantes sont rangées par ordre chronologique et le processus
évision est initialisé.

outes les stations et agences ont reçu l'ordre d'utiliser pour leurs
ervations et pour leurs estimations d'épicentres le Temps Universel
rdonné (TUC ou UTC) *en excluant* les corrections dues soit aux
ts mouvements de la Terre par rapport à ses axes de rotation, soit
variations saisonnières. Les heures indiquées peuvent donc être
es comme heures TUC.

es déterminations préliminaires dont les positions sont identiques à
rès en latitude aussi bien qu'en longitude et dont les heures origines
t identiques à 60 sec. près sont considérées comme relatives au
me événement et sont donc traitées ensemble. Une fois identifiées
les déterminations préliminaires, on teste individuellement les
ervations qui suivent à moins de 40 mn l'estimation la moins tardive
ure origine, dans le but de déterminer si elles doivent être associées
événement (on définit une observation comme l'ensemble des don-
rapportées par un observatoire donné relatives à un événement
cis). On établira une association *préliminaire* si:

la première arrivée longitudinale est identifiée comme une phase de croûte, c'est-à dire Pg, P* ou Pn, la station étant à moins de 15° de l'épicentre et la valeur absolue du résidu par rapport à cette phase étant inférieur à 70 sec., ou sinon,

si la première arrivée longitudinale non identifiée plus précisément (que nous désignerons par «P/PKP») possède un résidu inférieur à 70 sec. par rapport aux tables de P, PKP (branches DEF, BC, ou AB, selon Shimshoni (1967)) ou sinon,

si P/PKP a un résidu de moins de 70 sec. par rapport au P diffracté par la frontière du noyau, ou sinon,

en l'absence de P/PKP, si la première arrivée transversale est identifiée comme une phase de croûte (Sg, S* ou Sn), la station étant à moins de 15° de l'épicentre et le résidu inférieur à 70 sec., ou sinon,

en l'absence de P/PKP, si la première arrivée transversale, non identifiée plus précisément (désignée par «S/SKS») possède un résidu inférieur à 70 sec. par rapport aux tables des S ou SKS (branches AC et DF).

Chacune des éventualités ci-dessus est examinée à tour de rôle dans l'ordre de priorité indiqué. Lorsqu'il est possible d'associer une observation à plus d'un événement, l'association qui correspond à la plus forte priorité (le cas échéant à l'intérieur d'un même niveau de priorité celle qui donne le plus faible résidu) sera choisie. On doit, à ce stade, préciser que les associations en question ne sont que préliminaires et que par la suite, elles sont améliorées de façons automatique et manuelle.

On passe alors à une révision des paramètres du foyer, en utilisant un programme basé sur la Méthode de Réduction Uniforme qui est une variante de celle des Moindres Carrés (Jeffreys, 1961) où chaque équation de condition est pondérée par un coefficient w_i tel que:

$$w_i^{-1} = 1 + \mu \exp\{h^2(\xi_i - \alpha)^2\}, \qquad (1)$$

où $$h^2 = \frac{1}{2\sigma^2}$$

et $$\alpha = \sum_1^n w_i \xi_i \Big/ \sum_1^n w_i,$$

et μ et σ se déterminent approximativement en étudiant la distribution en fréquence des résidus (Buland, 1986). Le calcul se poursuit alors de la même façon que dans le cas d'une solution classique par moindres carrés. Tous les calculs de paramètres au foyer sont basées sur les *Tables Sismiques* de Jeffreys et Bullen (1940) et on n'utilise que les relevés de P, Pg, P* et Pn. Les temps de parcours théoriques utilisés pour déterminer les résidus subissent une correction d'ellipticité, par la méthode suggéréé par Gutenberg et Richter (1933) et développée par Jeffreys et Bullen (Bullen, 1937). La correction est de la forme:

$$\delta t = f(\Delta)(h + H)$$

où h et H sont les hauteurs de la station et de l'épicentre au-dessus de la sphère moyenne, les valeurs de $f(\Delta)$ étant données page 50 de l'édition 1967 des *Tables Sismiques*.

Durant ce processus de révision, les identifications préliminaires mentionnés ci-dessus sont améliorées. En règle générale, les observations dont les résidus sont en valeur absolue compris entre 20 et 50 sec. sont renvoyées dans la banque de données non-identifiées; les relevés doubles sont éliminés en ne gardant que ceux qui sont reçus directement par les stations et ceux qui sont labellés «définitifs»; toutes les observations et les épicentres estimés sont examinés en détail par un sismologue pour vérifier que rien ne s'oppose à leur association. Une fois obtenu un ensemble définitif d'associations, l'épicentre révisé se recalcule à l'aide de ces seules données.

Dans le cas où les données d'ondes P n'ont pas permis de déterminer la profondeur du foyer, ou si la valeur trouvée est negative, la révision définitive a lieu ce paramètre étant fixé, soit à partir d'autres données, soit en lui attribuant une valeur arbitraire (en général à la base de la

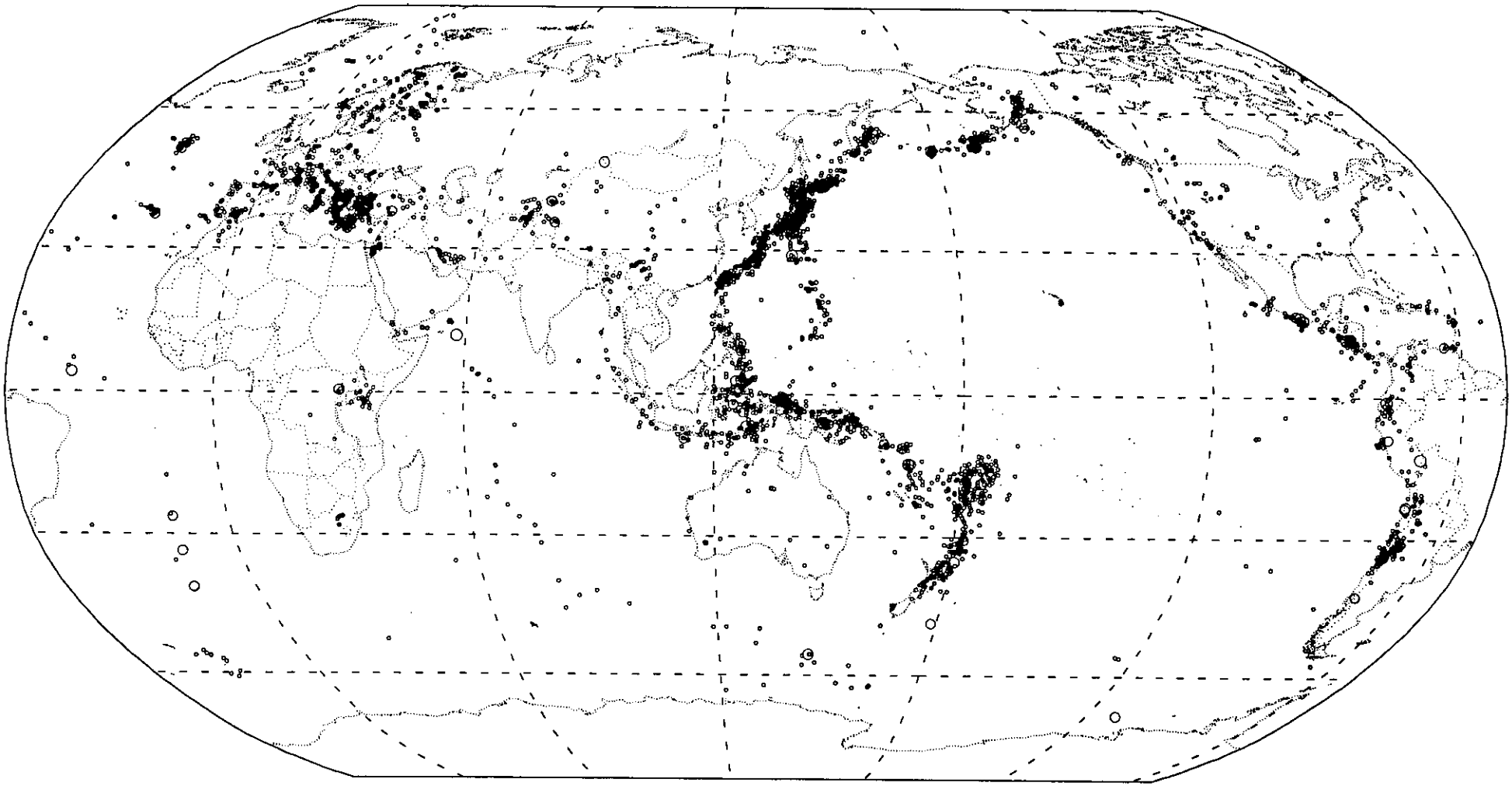
BJI 05d 14h 52m 26s2, 24°11N×122°36E, h16km, Mb5.8, Ms6.8
TAP 05d 14h 52m 27s1, 23°93N×122°36E, h6km, ML6.4
TAP Felt I=IV J, Taipei, III Hwalien, Hsinchu, II Chengkung, Sun Moon Lake, Chiayi, Lanyu
JMA 05d 14h 52m 27s8±0s4, 24°20N±°03×122°03E±°03, h55km±4km, M6.4
JMA Felt I=III J Yonaguni Jima, II Yonaguni Jima 2, Irimote Jima, Ishigaki Jima
NEIC 05d 14h 52m 28s6, 24°09N×122°22E, h30km, σ1s00, Mb6.1/99, Ms6.4/39, Mw6.3(GS), Me6.0(GS)
NEIC Radiated energy from the P-wave first-motion solution: 1.9±0.2×10^{13}Nm/14
NEIC Mw 6.3 (HRV). Ms 5.9 (BRK). Felt strongly at Taipei. Felt in many parts of Taiwan.
NEIC Broadband fault plane solution: P waves. NP1:φ=294°, δ22°, λ152°. NP2:φ=50°, δ80°, λ70°. Principal axes: T Plg51°, Azm298°; P Plg32° Azm157°. Depth from synthetics of broadband displacement seismograms.
NEIC Moment tensor solution: s32, scale 10^{18}Nm; Mrr1.55; Mθθ-0.92; Mφφ-0.63; Mrθ2.15; Mrφ2.31; Mθφ-0.78. Depth 21km; Principal axes: T 3.52,Plg58°,Azm310°; N 0.00, Plg3°,Azm44°; P -3.52,Plg32°,Azm136°. Best double couple: Mo3.5×10^{18}Nm; NP1:φ=237°,δ13°,λ103°. NP2:φ=44°, δ77°,λ87°.
MOS 05d 14h 52m 29s4, 24°17N×122°24E, h33km, Mb6.6/12, Ms6.6/25
HRVD 05d 14h 52m 31s6±0s1, 23°94N±°01×122°08E±°01, h24km, Centroid moment tensor solution. Data used: GSN; LP body waves: s57,c142; Mantle waves: s44,c73; Half duration: 3s9. Moment tensor: Scale 10^{18}Nm; Mrr1.54±.02; Mθθ-2.25±.02; Mφφ0.72±.02; Mrθ2.81±.05; Mrφ1.09±.04; Mθφ-0.02±.02. Principal Axes: T 3.37,Plg57°,Azm321°; N 0.44,Plg14°,Azm74°; P -3.81,Plg29°,Azm172°. Best double couple: Mo3.6×10^{18}Nm, NP1:φ=296°,δ21°,λ134°. NP2:φ=70°, δ75°,λ75°.
EIDC 05d 14h 52m 31s7, 24°15N×122°24E, h43km, Mb5.2/29, Ms6.5/7
HKC 05d 14h 52m 32s3, 24°8N×122°3E, Felt I=II–III MM Hong Kong. Macroseismic epicentre
ISC 05d 14h 52m 30s0±0s31, 24°08N±°020×122°27E±°018, h42km±2.8km, (h44km±1.7km:pP-P), n740, σ1s13/674, Mb6.0/155, Ms6.5/64, 182C-39D, Taiwan region

Code	Station Name	Δ°	Z°	ISC	Op	h m s		Residuals ISC	Op
HWA	Hwalien	0.61	260		/P	14 52 41.3			-1.1
JYJ	Yonaguni Jima 2	0.72	59		dP	14 52 44.6			+0.8
JYJ	[I=II JMA]				S	14 52 55.1			-1
ILA	Ilan	0.83	325		P	14 52 46.9			+1.6
TAP	Taipei	1.18	324		eP	14 52 52.8			+2.5
SMLT	Sun Moon Lake	1.27	261		d/P	14 52 52.0			+0.4
CHKT	Chengkung	1.28	220		P	14 52 50.0			-1.8
CHKT	Chengkung				S	14 53 05.0			-4
ANP	Anpu	1.29	328		eP	14 52 54.0			+2.1
YUS	Yü-Shan	1.34	244		c/P	14 52 52.9			+0.2
YUS	Yü-Shan				S	14 53 09.7			0
HSN	Hsinchu	1.38	301		eP	14 52 55.2			+1.9
IRI	Irimote Jima	1.39	77		dP	14 52 54.3			+0.9
HATJ	Hateruma Jima	1.41	91		dP	14 52 54.7			+1.0
HATJ	Hateruma Jima				S	14 53 15.9			+4
TCU	Taichung	1.45	273		d/P	14 52 56.3			+2.0
ALS	Alishan	1.45	247		eP	14 52 55.0			+0.7
TTN	Taitung	1.68	218		eP	14 52 56.5			-0.9
TTN	Taitung				S	14 53 17.4			-1
ISI	Ishigaki Jima	1.75	81		eP	14 53 00			+1.5
CHY	Chiayi	1.78	251		eP	14 52 59.4			+0.4
LAY	Lanyu	2.14	198		eP	14 53 01.5			-2.5
LAY	Lanyu				S	14 53 26.7			-3
TAI	Tainan	2.19	241		eP	14 53 07.3			+2.6
KAU	Kaohsiung	2.35	230		eP	14 53 08.5			+1.5
HEN	Hengchun	2.50	215		cP	14 53 08.5			-0.7
PNG	Penghu	2.54	259		dP	14 53 09.9			+0.2
PNG	Penghu				S	14 53 41.7			+2
JJT	Tamagu	5.39	66		P	14 53 52.3			+2.2
JIH	Iheya	5.93	59		P	14 53 56.0			+0.5
JOW	Kunigami	6.08	62		cP	14 53 58.0			-1.7
SSE	Sheshan	7.05	352		P	14 54 10.6			-2.7
SSE	[.73μm,0s8:1]				S	14 55 24.0			-9
SSE	[78.3μm,12s0:N,35.3μm,10s0:E,Ms5.6]								
JTK	Tokunoshima	7.06	57		(S)	14 55 41.2			
HKC	Hong Kong	7.65	258		eP	14 54 19			-2.7
HKC	Hong Kong				S	14 55 40.9			-7
BAG	Baguio City	7.80	192		eP	14 54 20.0	(2.8)		-3.7
JAM	Amami Oshima	7.87	55		(S)	14 55 56.2			
GZH	Guangzhou	8.24	265		/P	14 54 27.0			-2.9
GZH	[1.4μm,1s2:1]								
JMZ	Minamidaito 2	8.31	76		P	14 54 25.6			-5.2
OCP	Quezon City	9.46	187		P	14 54 56.0			+9.3
JKC	Kuchinoerabu	9.49	46		P	14 54 52.4			+5.3
WHN	Wuhan	9.53	314		P	14 54 45.0			-2.8
WHN	[27.5μm,14s0:N]				S	14 56 35.0			0
JSJ	Shimokoshiki	10.03	39		P	14 54 58.8			+4.2
JFU	Fukue Jima 2	10.27	32		P	14 55 01.4			+3.6
JSU	Suzuyama	10.35	43		P	14 55 03.3			+4.3
KAGJ	Kagoshima 2	10.41	45		P	14 54 57.8			-2.0
NGSJ	Nagasaki 2	10.79	36		P	14 55 07.7			+2.7
JZO	Okuchi	10.88	41		P	14 55 04.9			-1.3
JUH	Ureshino	11.23	35		P	14 55 16.0			+5.1
JTA	Tamana	11.44	38		P	14 55 18.7			+4.9
JII	Iki	11.67	32		P	14 55 21.0			+4.1
JNU	Nakatsue	11.76	38		P	14 55 25.4			+7.4
IZU2	Izuhara 2	11.81	30		P	14 55 22.5			+3.7
JTU	Tsushima	12.12	29		P	14 55 25.9			+3.0
JFA	Akaike	12.15	36		P	14 55 26.3			+3.0
OIT2	Oita 2	12.20	39		P	14 55 29.7			+5.8
JUS	Usuki	12.22	41		P	14 55 29.8			+5.5
JKI	Kunimi	12.52	38		P	14 55 34.6			+6.3
QIZ	Qiongzhong	12.60	249		P	14 55 29.7			+0.3
QIZ	[84.0μm,17s0:N,				S	14 57 43.1			-6
QIZ	23.0μm,18s0:E,Ms5.8]								
JTY	Toyota	12.72	35		P	14 55 31.9			+1.0
JTO	Tosashimizu	12.73	44		P	14 55 26.5			-4.6
TIA	Tai'an	12.88	341		eP	14 55 31.8			-1.2
TIA	[.30μm,1s4:1]				sP	14 55 43.0			-4
TIA	[400μm,14s:N]				S	14 58 00.0			+4
JNA	Nagahama	13.00	41		P	14 55 41.2			+6.5
JKD	Kudamatsu	13.00	38		P	14 55 42.0			+7.3
JKU	Kubokawa	13.19	43		P	14 55 33.0			-4.2
JHM	Kurahashi	13.44	39		P	14 55 41.4			+1.0
JMD	Masuda	13.44	36		P	14 55 44.3			+3.9
JET	Tanbara	13.50	42		P	14 55 37.2			-4.0
SHK	Shiraki	13.81	39		P	14 55 45.3			+0.1
SHK	[5nm,0s33:1]				Sn	14 58 14.0			
INCN	Inchŏn	13.87	15		↑eP	14 55 45.6	(3.0)		-0.4
MRT2	Murotomisaki 2	13.94	46		P	14 55 41.5			-5.4
JMN	Monobe	13.98	44		P	14 55 42.6			-4.0
JJG	Jouge	14.16	40		P	14 55 44.8			-5.1
GYA	Guiyang	14.31	283		/P	14 55 51.0			-0.9
GYA	[.17μm,1s0:1]				PPP	14 56 15.0			
GYA	[62.2μm,15s0:N,				S	14 58 40.0			+10
GYA	43.1μm,15s0:E,				sS	14 58 47.0			
GYA	Ms5.9]				'LQ1'	15 00 18.0			
GYA	[10.7μm,16s0:Z,				'LQ2'	15 00 42.0			
GYA	Ms5.0]								
JAI	Aioi	14.39	45		P	14 55 51.1			-1.8
DL2	Dalian	14.79	358		/P	14 56 00.0			+1.9
DL2	[44μm,1s0:1]				S	14 58 48.0			+7
DL2	[97.8μm,12s0:N,64.2μm,12s0:E,Ms6.2][86.6μm,20s0:Z,								
DL2	Ms5.9]								
JAD	Aida	14.97	41		P	14 55 54.4			-6.0
XAN	Xi'an	15.30	313		P	14 56 04.0			-0.7
XAN	[3.0μm,10s0:N]				sP	14 56 16.2			-3
XAN	[18.0μm,9s0:E]				S	14 58 54.0			+1
XAN	Xi'an				sS	14 59 05.0			
XAN	Xi'an				SS	14 59 11.0			-1
TIY	Taiyuan	15.98	331		↓P	14 56 14.4			+1.0
TIY	[60nm,0s9:1][44.8μm,10s0:E][79.0μm,17s0:N]								
JIE	Ise	16.24	48		P	14 56 18.1			+1.4
JAA	Atsumi	16.67	48		P	14 56 21.0			-1.2
BJI	Beijing	16.72	344		aP	14 56 24.5			+1.8
BJI	[1.3μm,2s5:1]				esP	14 56 37.0			0
BJI	[99.2μm,12s0:N]				eS	14 59 33.0			+7
BJI	Beijing				eSS	14 59 50.0			+3
JGM	Miyama	17.04	44		P	14 56 27.8			+1.1
JAO	Obara	17.12	46		P	14 56 31.3			+3.5
DAV	Davao City (W)	17.19	169		P	14 56 30.0			+1.1
DAV	[22nm,0s33:1]				Sn	14 59 44.4			
JGF	Kuroka	17.39	45		P	14 56 34.0			+2.9
JNY	Yasuok	17.57	47		P	14 56 30.2			-3.3
SHZ3	Shizuoka 3	17.64	48		P	14 56 36.8			+2.5
SNY	Shenyang	17.73	3		P	14 56 36.0			+0.6
SNY	[.29μm,1s5:1]				pP	14 56 42.2			-2
SNY	[55.0μm,14s0:Z,				sP	14 56 47.0			-3
SNY	Ms6.0]				PP	14 56 50.0			-1
SNY	Shenyang				PPP	14 56 57.4			
SNY	Shenyang				S	14 59 52.0			+3
SNY	Shenyang				sS	14 59 57.0			
CD2	Chengdu	17.76	297		P	14 56 35.0			-0.8
CD2	[1.7μm,1s4:1]				S	14 59 50.0			0
KMI	Kunming	17.79	277		/P	14 56 36.0			-0.2
KMI	[.26μm,1s8:1]				sP	14 56 50.0			-1
KMI	[47.6μm,11s0:E]				PPP	14 56 59.0			
KMI	Kunming				/S	14 59 58.0			+5
JIZS	Izushimoda	17.91	50		P	14 56 38.1			+0.4
JNT	Takato	18.06	46		P	14 56 39.6			+0.1
JYN	Shimob	18.11	47		P	14 56 41.6			+1.4
KTJJ	Kamata 2	18.15	50		P	14 56 40.1			-0.6
CBIJ	Chichi Jima	18.21	76		P	14 56 42.9			+1.4
OGS	Ogasawara	18.23	76		P	14 56 41.3			-0.4
OGS	[11nm,0s33:1]				Sn	15 00 03.9			
JIM	O shima 2	18.29	51		P	14 56 41.9			-0.5
JNG	Naakai	18.35	44		P	14 56 47.7			+4.5
JOD	Odawara	18.35	49		P	14 56 45.5			+2.3
MAT	Matsushiro	18.50	44		eP	14 56 41.0			-4.0
MAT	[23nm,1s0:1]				eS	15 00 07.0			0
MAT	[33μm,20s:Z,Ms5.6]								
MAJO	Matsushiro	18.51	44		↑/P	14 56 41.8	(2.3)		-3.2
MJAR	Matsushiro Array	18.51	44		P	14 56 43.6	(.7)		-1.4
JRY	Ryōgami san	18.64	47		P	14 56 45.3			-1.4
JHU	Hannō	18.81	48		P	14 56 46.9			-1.7
HHC	Hu-ho-hao-te	18.97	334		P	14 56 51.6			+1.0
HHC	[3.1μm,1s6:1]				PP	14 57 10.0			+2
HHC	[43.6μm,14s0:N,				S	15 00 26.0			+9
HHC	38.3μm,14s0:E,Ms6.0][72.4μm,24s0:Z,Ms5.9]								
BSO4	Boso 4	19.08	51		P	14 56 52.5			+0.8
BSO3	Boso 3	19.11	52		P	14 57 00.4			+8.2
JAG	Ashikaga	19.24	46		P	14 56 50.1			-3.5
TSK	Tsukuba	19.56	48		P	14 56 55.0			-2.1
TSK	[4nm,0s33:1]				Sn	15 00 35.8			
UTS	Utsunomiya	19.59	47		P	14 56 56.1			-1.3
CN2	Changchun	19.84	7		↑P	14 56 58.8			-1.3
CN2	[.63μm,1s0:1]				esP	14 57 11.0			-5
CN2	[67.0μm,13s0:N,				eS	15 00 33.0			-3
CN2	20.0μm,13s0:E,Ms6.2]								
JSB	Shiboa	19.86	46		P	14 56 56.8			-1.6
LZH	Lanzhou	19.89	311		↑/P	14 57 01.7			+1.0
LZH	[5.6μm,1s8:1]				sP	14 57 13.0			-3
LZH	[93.7μm,12s0:N]				PP	14 57 22.0			+2
LZH	Lanzhou				S	15 00 38.0			+1
LZH	Lanzhou				sS	15 00 52.0			
LZH	Lanzhou				SS	15 01 06.0			0
JHO	Hitachi	20.09	47		P	14 56 57.2			-5.6
TSM	Tawau	20.15	192		↑eP	14 57 02.5			-1.1
JFT	Otama	20.45	45		(S)	15 00 53.3			
JMM	Marumori	20.95	45		P	14 57 09.5			-2.2
JMM	Marumori				(S)	15 01 01.3			+3
MDJ	Mudanjiang	21.34	14		eP	14 57 14.0			-1.6
MDJ	[73nm,1s0,Mb5.0]				S	15 01 00.0			-5
MDJ	[42.2μm,12s0:N,54.9μm,12s0:E,Ms6.3][43.5μm,24s0:Z,								
MDJ	Ms5.8]								
JRG	Rokugo	21.78	41		P	14 57 17.0			-3.0
JOM	Ohasama	22.22	42		P	14 57 20.2			-4.2
JOM	Ohasama				(S)	15 01 24.9			+3
CHTO	Chiang Mai	22.32	261		↑/P	14 57 26.6	(2.4)		+1.1
NST	Nakhon Sawan	22.41	252		eP	14 57 28			+1.6
CMAR	Chiang Mai Array	22.43	260		P	14 57 27.5			+0.9
CMAR	Chiang Mai Array				PcP	15 01 22.0			0
CMAR	Chiang Mai Array				S	15 01 40.1			+21
MIYJ	Miyako 2	22.61	42		(S)	15 01 28.0			
JTH	Tanohata	22.66	42		(S)	15 01 34.7			
JYM	Yakumo	23.44	35		P	14 57 34.3			-2.0
HAKJ	Hakodate 2	23.46	37		P	14 57 34.6			-1.9
JKB	Kayabe	23.64	37		P	14 57 35.0			-3.2
JSH	Shimam	23.64	34		P	14 57 36.6			-1.7
PJG	Potts Junction	23.77	112		eP	14 57 34			-5.7
GUMO	Guam (SRO)	23.77	112		P	14 57 38.4			-1.3
GUMO	[.51μm,1s4,Mb5.8][26μm,21s:Z,Ms5.7]								
GUA	Guam	23.83	112		P	14 57 38.0			-2.3
GUA	[1.7μm,1s3,Mb6.3]				e	14 57 41.2			
JNB	Noboribetsu	24.04	36		P	14 57 39.3			-2.8
NNT	Nongplab	24.21	246		eP	14 57 43			-1.0
GTA	Gaotai	24.36	314		/P	14 57 46.0			+0.7
GTA	[.92μm,1s5,Mb6.0][2.0μm,12s0:E][35.0μm,12s0:Z,Ms6.1]								
JEW	Eniwo	24.52	36		P	14 57 45.1			-1.7
JBT	Biratori	24.72	37		P	14 57 48.3			-0.4
URA3	Urakawa 3	24.81	38		P	14 57 48.2			-1.4
JEM	Erimo	24.92	39		P	14 57 48.0			-2.7
JHR	Hokuryū	25.29	34		P	14 57 52.7			-1.4
JFR	Furan	25.35	36		P	14 57 52.4			-2.3
JAB	Ashibetsu	25.38	35		P	14 57 52.3			-2.7
JCH	Chūrui	25.42	38		P	14 57 52.7			-2.7
JSS	Shosan	25.83	33		P	14 57 58.8			-0.4
JOB	Onbets	25.87	38		P	14 57 59.7			+0.1
JKK	Kamikawa	25.93	36		P	14 57 57.9			-2.2
ASAJ	Asahikawa	26.00	35		P	14 57 56.4			-2.4
JAR	Ashorobuto	26.09	37		P	14 57 59.8			-1.8
JMP	Maruseppu	26.33	36		P	14 57 59.6			-4.2
JAK	Akkeshi	26.42	39		P	14 58 03.2			-1.5
ABJ2	Abashiri 2	26.50	37		P	14 58 04.5			-0.9
JSE	Soyaas	26.59	33		P	14 58 04.9			-1.3
ULN	Ulaanbaatar	26.64	337		P	14 58 06.0			-0.6
ULN	[23nm,0s80,Mb4.8]			pP	pP	14 58 17.6		0	0
ULN	Ulaanbaatar			ScP	ScP	15 05 07.1		+2	+2
JRA	Rausu	27.25	38		P	14 58 10.6			-1.7
YSS	Yuzh-Sakhalinsk	28.11	31		ueP	14 58 17.0			-3.0
YSS	[60nm,1s0,Mb5.2]			pP	e	14 58 28.8		-2	
YSS	[64μm,15s:Z,			PP	e	14 59 07.8		-3	
YSS	Ms6.3]			PPP	e	14 59 17.4		-6	
YSS	[60μm,14s:E]								
LSA	Lhasa	28.26	288		P	14 58 23.0			+1.5
LSA	[.21μm,1s0,Mb5.7]			pP	pP	14 58 31.0		-2	-2
LSA	[80.5μm,37s0:E]								
KGM	Kluang	28.59	223		eP	14 58 24.5			-0.1
CIT	Chita	28.65	349		eP	14 58 23			-1.8
KLM	Kuala Lumpur	28.84	227		eP	14 58 27.0			+0.1
MKS	Makassar	29.25	186		↑eP	14 58 29.0			-1.5
ZAK	Zakamensk	30.11	335		↑/P	14 58 36.0			-1.8
ZAK	Zakamensk			S	eS	15 03 34.0		+2	+2
TPI	Tanjungpandan	30.23	210		eP	14 58 39.5			+0.2
TPI	Tanjungpandan				e	15 01 00.0			
TAPN	Taplejung	31.24	283		P	14 58 48.8			+0.7
IRK	Irkutsk	31.31	339		↑eP	14 58 46.8			-1.6
IRK	[1.0μm,1s8,Mb6.4]			PP	e	14 59 47.0		-6	
IRK	[308μm,14s:Z,			S	eS	15 03 45.0		-6	-6
IRK	Ms7.1][155μm,14s:N,95μm,14s:E,Ms6.9]								
ODAN	Odare -	31.55	283		P	14 58 50.8			+0.2
JIRN	Jiri	32.58	284		P	14 59 00.1			+0.3
GUN	Gumba	32.85	285		P	14 59 02.5			+0.4
KHKI	Kahang-Kahang	32.90	192		↓eP	14 59 03.0			+0.3
KHKI	Kahang-Kahang				e	15 03 29.0			
TRT	Tretes	32.96	198		↑eP	14 59 05			+1.8
PKI	Pulchoki	33.28	284		P	14 59 05.5	(2.7)		-0.3
KKN	Kakani	33.39	284		P	14 59 06.7			0.0
DMN	Daman	33.55	284		P	14 59 07.9			-0.2
GKN	Gorkhā	33.95	285		P	14 59 11.1			-0.4
BOD	Bodaibo	34.23	352		eP	14 59 10.6	(2.1)		-3.1
WMQ	Ürümqi	34.44	313		↑P	14 59 16.0			+0.3
WMQ	[2.4μm,2s0,Mb6.8]			pP	pP	14 59 20.4		-7	-7
WMQ	[46.6μm,12s0:N,			PP	PP	15 00 27.0		-5	-5
WMQ	43.6μm,12s0:E,			PPP	PPP	15 00 45.1		-5	-5
WMQ	Ms6.6]			PcP	PcP	15 01 49.2		-1	-1
WMQ	[93.9μm,20s0:Z,			S	S	15 04 39.0		-1	-1
WMQ	Ms6.5]			PcS	ScP	15 05 36.4		0	+5
WMQ	Ürümqi				PcS	15 05 38.5			+2
DANN	Dangaing	34.71	285		P	14 59 18.2			+0.1
KOLN	Koldanda	34.87	284		P	14 59 19.6			+0.1
PYUN	Pluthān	35.40	285		P	14 59 23.3			-0.7
PDY	Peleduy	36.16	352		P	14 59 28.3			-1.8
PDY	[61nm,1s50,Mb5.3]			pP	pP	14 59 40.9		-1	-1
PDY	Peleduy			PcP	PcP	15 01 55.8		0	0
PDY	Peleduy			ScP	ScP	15 05 38.0		+1	+1
SKR	Severo-Kuril'sk	37.24	36		eP	14 59 32.0			-7.3
SKR	Severo-Kuril'sk				eS	15 05 10.0			-13
YAK	Yakutsk	38.25	6		↑/P	14 59 44.8			-2.8
YAK	[.47μm,1s8,Mb5.9]			PP	e	15 01 14		-5	
YAK	[46μm,24s:Z,			PPP	ePPP	15 01 35.0		-7	-7
YAK	Ms6.2]			PcP	/	15 02 00		-2	
YAK	[30μm,18s:N,			ScP	/S	15 05 46		+1	+8
YAK	57μm,17s:E,Ms6.5]			SS	/SS	15 08 11		-7	-7
YAK	Yakutsk			ScS	/	15 09 52		-1	
PET	Petropavlovsk	39.83	34		/P	15 00 00.0			-0.9
PET	[.28μm,1s5,Mb5.8]			PP	e	15 01 44.0		+7	
PET	[44μm,18s:Z,			PcP	ePPP	15 02 10		+3	+8
PET	Ms6.3]			S	eS	15 06 04		+2	+2
PET	[34μm,17s:N,55μm,18s:E,Ms6.5]								
KNA	Kununurra	40.09	170		↑P	15 00 02.0			-1.4
NDI	New Delhi	40.44	287		↓/P	15 00 04.8			-1.3
NDI	[.57μm,1s5,Mb6.1]			PP	ePP	15 01 44.0		0	0
MA2	Magadan	40.71	22		↑P	15 00 06.1			-1.9
ZAL	Zalesovo	40.87	327		P	15 00 08.2			-1.3
ZAL	[89nm,0s95,Mb5.4]			PcP	PcP	15 02 10.0		0	0
ZAL	Zalesovo			ScP	ScP	15 05 56.8		+2	+2
ZAL	Zalesovo				LR	15 18 30.2			
PMG	Port Moresby	41.22	141		↓P	15 00 13.0			+0.3
HYB	Hyderabad	41.29	269		/P	15 00 14.0			+0.8
HYB	[.18μm,1s4,Mb5.5]			eP	esP	15 00 29.5		-1	-1
HYB	Hyderabad					15 01 20.0			
HYB	Hyderabad			PP	ePP	15 01 50.0		-2	-2
HYB	Hyderabad			PcP	ePcP	15 02 11.0		-1	-1
HYB	Hyderabad			PcS	ePcS	15 06 02.0		-1	-1
HYB	Hyderabad			S	eS	15 06 26.0		+1	+1
HYB	Hyderabad				eSS	15 09 34.0			+10
HYB	Hyderabad			ScS	eScS	15 10 13.0		+1	+1
AAA	Alma-Ata	41.71	309		/P	15 00 18.0			+1.6
AAA	[48μm,15s:Z,			PP	e	15 02 00.0		+3	
AAA	Ms6.5]			PcP	ePPP	15 02 14.0		+1	-14
AAA	[39μm,15s:N,37μm,15s:E,Ms6.5]								
KSH	Kashi	41.82	303		P	15 00 21.0			+3.6
KSH	[.51μm,1s0,Mb6.1]			sP	sP	15 00 33.5		-1	-1
KSH	[52.5μm,15s0:N,			PP	PP	15 02 00.0		+2	+2
KSH	34.2μm,14s0:E,			PcP	PPP	15 02 20.0		+6	9
KSH	Ms6.6]			PcS	ScP	15 06 05.0		+1	+6
KSH	[79.6μm,20s0:Z,			S	S	15 06 30.5		-2	-2
KSH	Ms6.6]			sS	sS	15 06 51.0		0	0
KSH	Kashi			SS	eSS	15 09 30.0		-3	-3
FRU	Bishkek	43.30	308		/P	15 00 30.6			+1.1
FRU	[1.1μm,2s0,Mb6.2]			PP	/	15 02 14.0		+1	
FRU	[120μm,17s:N,				eS	15 07 03.0			+9
FRU	124μm,17s:E,			ScS	eSS	15 10 24.0		0	+24
FRU	Ms7.0]								
MBL	Marble Bar	45.03	183		↑/P	15 00 42.8	(1.9)		-1.1
POO	Poona	45.27	273		↑/P	15 00 44.0	(1.6)		-1.7
WRAB	Tennant Creek	45.31	164		↓/P	15 00 44.9	(2.3)		-0.9
WRA	Warramunga Ar.	45.31	164		P	15 00 44.7			-1.3
WRA	[21nm,0s70,Mb5.1]			PcP	PcP	15 02 26.2		0	0
WRA	Warramunga Ar.			S	S	15 07 26.6		+3	+3
WB2	Warramunga Ar.	45.32	164		↑/P	15 00 45.6	(2.2)		-0.4
GIRL	Giralia	46.83	189		eP	15 00 59.6	(1.6)		+1.7
QIS	Mount Isa	47.47	158		↓/P	15 01 03.0	(2.4)		0.0
BRVK	Borovoye	48.45	321		↑/P	15 01 09.5			-0.6
BRVK	[84μm,16s:Z,Ms6.8][26μm,16s:N,49μm,16s:E,Ms6.6]								
ASPA	Alice Springs	48.79	166		↑/P	15 01 13.0			-0.2
ASPA	[.18μm,0s9,Mb6.1]			S	eS	15 08 19.1		+7	+7
ASPA	Alice Springs				eScS	15 11 15.5			+16
ASAR	Alice Springs Ar.	48.79	166		P	15 01 12.5			-0.7
ASAR	[46nm,0s80,Mb5.6]			PcP	PcP	15 02 38.5		0	0
ASAR	Alice Springs Ar.			ScP	ScP	15 06 29.1		+1	+1
ASAR	Alice Springs Ar.			S	S	15 08 13.1		+1	+1
QUE	Quetta	49.21	290		eP	15 01 17.0			+0.7
QUE	Quetta				eS	15 08 04.0			-14
HNR	Honiara	49.64	128		(P)	15 01 18.3	(2.7)		-1.5
NRI	Noril'sk	49.67	345		P	15 01 14.8			-4.6
NRI	[6nm,0s50,Mb4.8]			ScP	ScP	15 06 31.2		0	0
NRI	Noril'sk				LR	15 24 32.6			
CTAO	Charters Towers	49.74	150		eP	15 01 21.0	(2.0)		+0.6
CTA	Charters Towers	49.74	150		↓P	15 01 21.1			+0.6
WARB	Warburton	50.15	175		P	15 01 22.3			-1.3
WARB	[78nm,0s80,Mb5.8]			pP	pP	15 01 34.9		0	0
WARB	Warburton			S	S	15 08 27.1		-4	-4
MEEK	Meekatharra	50.55	184		eP	15 01 24.4	(2.6)		-2.2
MRWA	Morawa	53.34	187		eP	15 01 45.0	(1.5)		-2.5
ADK	Adak	53.65	42		eP	15 01 48.4	(2.1)		-1.1
BAL	Balildu	54.64	186		eP	15 01 55.0	(1.5)		-2.1
SVE	Sverdlovsk	54.71	324		↑/P	15 01 56.5			-0.7
SVE	[97μm,17s:Z,			S	eS	15 09 37.0		+4	+4
SVE	Ms6.9]			SS	eSS	15 13 17.0		+2	+2
SVE	[33μm,17s:N,60μm,17s:E,Ms6.8]								
MAIO	Mashhad (SRO)	54.78	298		↑/P	15 01 58.5			+0.5
WOOL	Woolibar	54.84	181		P	15 01 56.6			-2.0
WOOL	[13nm,0s80,Mb5.0]				S	15 09 27.1			-8
KLB	Kellerberrin	55.53	185		eP	15 02 01.5			-2.0
ARU	Arti	55.78	323		↑P	15 02 03.4			-1.6
ARU	Arti			pP	esP	15 02 17.0		0	-5
ARU	Arti			S	eS	15 09 48.0		+1	+1
RMQ	Roma	56.42	151		↑/P	15 02 10.1	(1.9)		+0.1
NWAO	Narrogin (SRO)	56.89	185		eP	15 02 10.2	(1.6)		-3.1
KAT	Kizyl-Arvat	57.02	302		/P	15 02 15.0			+0.9
KAT	[32μm,14s:Z,			PPP	PPP	15 05 45		+2	+2
KAT	Ms6.6]			S	/S	15 10 11		+7	+7
RKG	Rocky Gully	58.54	185		↓/P	15 02 24.0			-0.8
STKA	Stephens Creek	58.63	181		P	15 02 24.5			-1.0
STKA	[35nm,0s60,Mb5.6]			S	S	15 10 24.1		-1	-1
STKA	Stephens Creek				'PKP2AB'	15 32 23.3			
ADE	Adelaide	60.76	165		↓/P	15 02 40.0			-0.1
ARMA	Armidale	61.07	151		↓/P	15 02 41.7	(1.9)		-0.6
BKM	Butte a Kiehm	61.11	128		cP	15 02 52.5			+9.9
TEH	Tehrān	61.35	299		↑/P	15 02 45.0			+1.0
SHI	Shirāz	61.63	292		c/P	15 02 45.0			-1.0
NOUC	Port Laguerre	62.77	134		↑/P	15 02 54.1			+0.4
DZM	Mont Dzumac	62.84	133		cP	15 02 55.0			+0.8
NOU	Nouméa	63.01	134		cP	15 02 54.1			-1.3
YOU	Young	63.12	156		↑/P	15 02 56.1	(1.9)		+0.2
MAK	Makhachkala	63.18	308		/P	15 02 56.0			-0.2
MAK	[38μm,16s:Z,			PcP	/	15 03 30.0		-3	
MAK	Ms6.7]			PP	e	15 05 20		+3	
MAK	[11μm,16s:N,			S	/S	15 11 27		+4	+4
MAK	48μm,16s:E,Ms6.8]			ScS	e	15 12 46		+4	
BWA	Boorowa	63.27	156		eP	15 02 58.0			+1.1
BWA	Boorowa			pP	/	15 03 02.2		-7	
BWA	Boorowa			sP	/pP	15 03 10.9		-3	+2

Code	Station	Δ	Az	Id	Phase	Time	Mag	Res 1	Res 2
SDN	Sand Point	63.36	39		eP	15 02 55.0	(2.0)		−2.1
RIV	Riverview	63.81	153		eP	15 03 05.1			+4.6
RIV	Riverview				/S	15 11 41.0			+10
CAN	Canberra	64.28	156		eP	15 03 04.5			+1.0
CAN	Canberra				/	15 03 07.9			
CAN	Canberra			pP	/pP	15 03 16.6		+1	+1
DHR	Dhahran	64.49	289		eP	15 03 07.0			+2.0
DHR	Dhahran			S	/S	15 11 39.0		−1	−1
BRW	Barrow	64.52	21		eP	15 03 04			−0.4
TAB	Tabriz	64.89	302		c/P	15 03 08.2			+0.8
KER	Bakhtaran	65.07	298		eP	15 03 08.0			−0.6
TTA	Tatalina	65.10	30		↑eP	15 03 08.1	(1.6)		−0.1
TOO	Toolangi	65.10	160		↓/P	15 03 09.0	(2.1)		+0.2
TI2	Tbilisi 2	65.36	306		P	15 03 08.8			−1.5
TI2	Tbilisi 2			sP	ePcP	15 03 33.0		+6	−9
TI2	Tbilisi 2			PP	ePP	15 05 38.0		+2	+2
TI2	Tbilisi 2				ePPP	15 07 54.0			+43
TI2	Tbilisi 2			S	/S	15 11 54.8		+5	+5
TI2	Tbilisi 2			PS	/PS	15 12 15.0		−1	−1
TI2	Tbilisi 2				ePPS	15 12 40.0			+14
TI2	Tbilisi 2			SS	eSS	15 16 10.0		+5	+5
TI2	Tbilisi 2				eSS	15 19 13.0			
TI2	Tbilisi 2					15 29 26.0			
SVW	Sparrevohn	65.44	32		eP	15 03 10.3	(2.0)		−0.2
ZEI	Tsey	65.78	308		↑P	15 03 13.0			0.0
ZEI	Tsey			pP	/sP	15 03 26.0		+1	−4
ZEI	Tsey			S	/S	15 11 59.0		+4	+4
IMA	Indian Mountain	65.85	26		↑eP	15 03 12.9	(2.5)		−0.2
PYA	Pyatigorsk	66.14	309		α/P	15 03 14.2			−1.1
PYA	[39μm,18s:Z,			sP	e	15 03 32.0		0	
PYA	Ms6.7]			PP	/	15 05 43		0	
PYA	[50μm,18s:N]			S	/S	15 12 04		+5	+5
PYA	Pyatigorsk			SPP	/PS	15 12 31		0	+4
PYA	Pyatigorsk			ScS	/PPS	15 13 02		−2	+25
KBZ	Khabaz	66.31	309		P	15 03 16.3			−0.1
KBZ	[17nm,0s75,Mb5.2]			S	S	15 12 01.2		0	0
KBZ	Khabaz			P'P'	'PKP2BC'	15 31 50.6		+2	
KIV	Kislovodsk	66.42	309		↑/P	15 03 17.1	(3.0)		+0.1
LVZ	Lovozero	67.05	336		eP	15 03 20.7			+0.1
LVZ	Lovozero			PcP	e	15 03 48.8		0	
LVZ	Lovozero			PP	e	15 05 48.0		−2	
LVZ	Lovozero			sS	(PS)	15 12 26.9		−3	−11
LVZ	Lovozero			SS	(SS)	15 16 24.4		−6	−6
LVZ	Lovozero			SSS	(SSS)	15 19 20.5		−7	−7
CP2	Crater Peak Two	67.05	32		eP	15 03 20.8			+0.1
CRP	Crater Peak	67.09	32		eP	15 03 20.5			−0.3
KDC	Kodiak Island	67.47	35		↑eP	15 03 22.2	(2.5)		−1.2
MOS	Moscow	67.49	322		↑/P	15 03 22			−1.5
MOS	[58μm,17s:Z,			PPP	PPP	15 07 28		−3	−3
MOS	Ms6.9]				eS	15 12 25			+10
PWA	Palmer West	68.11	31		P	15 03 26.5			−0.8
SLKM	Skilak Lake	68.15	32		eP	15 03 25			−2.6
OBN	Obninsk	68.16	322		↑P	15 03 27.2			−0.6
OBN	Obninsk			S	/S	15 12 24.0		+1	+1
FBA	Fairbanks	68.44	27		eP	15 03 27.8	(2.3)		−1.5
COL	College Outpost	68.44	27		eP	15 03 28.6	(1.8)		−0.7
PMR	Palmer	68.47	31		↑eP	15 03 28.3	(2.3)		−1.2
SOC	Sochi	68.60	309		α/P	15 03 30.0			−0.7
SOC	[2.4μm,2s5,Mb6.7]			PcP	e	15 03 56		0	
SOC	[42μm,18s:Z,			S	eS	15 12 28		−1	−1
SOC	Ms6.7]			ScS	e	15 13 29		+6	
SOC	[42μm,17s:N,			SS	eSS	15 17 01		+6	+6
SOC	36μm,17s:E,Ms6.9]								
MJMA	Al Majma'ah	68.80	290		↑/P	15 03 31.6			−0.6
NPO	Eielson Array	68.85	27		P	15 03 30.5			−1.4
NPO	Eielson Array			P'P'	PKP2	15 31 45.5		+2	
TOA	Tolsona	69.73	30		eP	15 03 37.9	(2.4)		+0.6
SPITS	Spitsbergen Ar.	69.79	348		P	15 03 36.0			−1.5
SPITS	Spitsbergen Ar.			pP	pP	15 03 51.4		+2	+2
ANN	Anapa	69.98	311		α/P	15 03 38.0			−1.1
ANN	[.60μm,1s4,Mb6.3]			PP	e	15 06 14.0		−2	
ANN	[17μm,17s:Z,			ScP	ePPP	15 08 00.0		−1	+4
ANN	Ms6.3]			S	/S	15 12 47		+2	+2
ANN	[13μm,17s:N,			SP	e	15 13 18		+6	
ANN	18μm,17s:E,Ms6.5]			PS	ePS	15 13 22		+5	+5
ANN	Anapa			SPP	ePPS	15 13 26		+1	−5
ARCES	ARCESS Array	70.00	338		P	15 03 38.2			−0.7
ARCES	ARCESS Array				LR	15 39 06.4			
QASM	Qassim	70.24	290		↑eP	15 03 40.5			−0.5
KBS	Kingsbay	70.33	349		↑/P	15 03 39.5			−1.2
KBS	[.17μm,1s3:2]					15 03 43.6			
KBS	Kingsbay			PP	ePP	15 06 15.2		−3	−3
KBS	Kingsbay			S	eS	15 12 50.6		+2	+2
KBS	Kingsbay				eL	15 38 43.4			
PUL	Pulkovo	70.47	328		↑/P	15 03 41.0			−0.9
PUL	[1.0μm,1s8,Mb6.5]			PP	e	15 06 14		−6	
PUL	[110μm,17s:Z,			PPP	ePPP	15 07 58		−2	−2
PUL	Ms7.2]			S	eS	15 12 48		−2	−2
PUL	[47μm,17s:N,			SPP	e	15 13 28		−4	
PUL	90μm,20s:E,Ms7.1]			ScS	e	15 13 45		+7	
TAU	Tasmania Univ.	70.55	161		eP	15 03 43.7	(2.5)		+1.1
MYA	Malataya	70.87	304		/P	15 03 46.0			+1.3
MLTT	Malatya	70.91	304		↑/P	15 03 46.0			+1.1
KTK1	Kautokeino	70.92	338		↑/P	15 03 43.5			−0.9
KTK1	[.26μm,1s8,Mb5.9]			pP	e	15 03 49.3		−7	
KTK1	Kautokeino			PP	ePP	15 06 21.2		−3	−3
KMSA	Khamâsîn	71.21	284		↑eP	15 03 45.6			−1.4
KAF	Kangasniemi	71.73	330		P	15 03 48.9	(2.0)		−0.5
BALM	Baldy	71.78	31		eP	15 03 48			−1.7
FINES	FINESS Array	72.03	330		P	15 03 50.7			−0.4
FINES	[13nm,0s45,Mb5.1]			pP	pP	15 04 04.1		+1	+1
FINES	FINESS Array			PP	PP	15 06 28.5		−4	−4
GZTT	Gaziantep	72.08	303		eP	15 03 52.0			+0.1
GAZ	Gaziantep	72.12	303		/P	15 03 53.0			+0.9
TRO	Tromsø	72.17	339		eP*	15 03 53.5			+1.7
DAWY	Dawson	72.17	27		P	15 03 51.4	(1.7)		−0.6
WHAB	Al Wahab	72.22	302		↓/P	15 04 59.4			+66.7
KIR	Kiruna	72.29	337		↑P	15 03 51.9	(2.9)		−0.7
RUWJ	Ruweisid	72.58	298		P	15 03 58.4			+3.5
HON	Honolulu	72.63	74						
HON	[17μm,21s:Z,Ms6.3]								
BNN	Bûnyan	72.65	305		/P	15 03 54.8			−0.4
DRWC	Darouich	72.70	303		↓/P	15 05 03.7			+68.1
CTK	Çatak	72.87	307		eP	15 03 57.0			+0.5
INK	Inuvik	72.95	22		P	15 03 55.4	(1.9)		−1.0
NUR	Nurmijarvi	72.98	329		P	15 03 56.6	(2.0)		−0.2
DHJN	Dharan Janob	73.03	282		↑/P	15 03 58.3			+0.4
COBT	Iskenderun	73.04	303		eP	15 03 56.0			−1.7
MBC	Mould Bay	73.14	13		P	15 03 56.0			−1.5
MBC	[34nm,0s35,Mb5.7]			S	S	15 13 24.3		+4	+4
MBC	Mould Bay				LR	15 39 04.4			
ZALF	Zalf	73.30	299		↓/P	15 05 06.2			+67.0
KAS	Kastamonu	73.43	308		↑/P	15 03 59.5			−0.3
KOOC	Abou Kooc	73.52	300		↓/P	15 05 07.1			+66.6
HAWK	Haweek	73.54	301		↓/P	15 05 07.2			+66.6
MNK	Minsk	73.57	322		eP	15 03 58			−2.4
MNK	[40μm,20s:Z,			PP	e	15 06 44		−2	
MNK	Ms6.7]			PPP	ePPP	15 08 24		−7	−7
MNK	[14μm,20s:N]			S	eS	15 13 28		+2	+2
MNK	Minsk			SS	eSS	15 18 08		−3	−3
HAJJ	Hajja	73.60	280		↓/P	15 04 02.7			+1.5
HAJJ	Hajja			sP	/S	15 04 23.8		+5	
MARH	Ras Al Marh	73.63	300		↓/P	15 05 08.4			+67.3
SALA	Sala	73.84	299		↓/P	15 05 09.2			+66.9
ARTJ	Al Aritein	73.91	298		P	15 04 04.9			+2.1
QASN	Qassioun	73.95	300		↓/P	15 05 11.4			+68.5
BDRN	Badran	73.98	300		↓/P	15 05 10.0			+66.8
BHL	Bhannes	74.32	300		↑P	15 04 04			−1.2
BHL	Bhannes			S	S	15 13 36		+1	+1
HRI	Mt Hermon	74.46	300		P	15 04 06.5			+0.6
KSHT	Keshet	74.48	299		P	15 04 06.6			+0.5
MOSJ	Mudaysisat	74.58	298		P	15 04 09.0			+2.4
GLH	Golan-Tel Qazir	74.70	299		P	15 04 08.0			+0.6
MMR	Mount Meron	74.80	300		P	15 04 08.7			+0.8
QTRJ	Qatrana	74.88	298		P	15 04 09.7			+1.4
SALJ	Salt	74.91	299		P	15 04 10.7			+2.2
ADI	Adamit	74.93	300		P	15 04 08.9			+0.2
HMDT	Nahal Hemdat	74.96	299		P	15 04 09.0			+0.1
MASJ	El Maslubiya	74.97	298		P	15 04 11.2			+2.3
MML	Mount Malkishua	74.99	299		P	15 04 09.4			+0.4
KIS	Kishinev	75.00	315		α/P	15 04 07.0			−1.8
KIS	[1.1μm,2s0,Mb6.4]			PcP	/	15 04 24.0		+1	
KIS	[43μm,18s:Z,			PP	/	15 06 58.0		−1	
KIS	Ms6.8]			PPP	/PPP	15 08 42.0		−2	−2
KIS	[18μm,18s:N,			S	/S	15 13 42.0		0	0
KIS	30μm,18s:E,Ms6.7]			ScS	/PS	15 14 14.0		0	−9
MKRJ	Makawir	75.09	298		P	15 04 11.7			+2.0
IKL	Islidi	75.10	303		/P	15 04 09.0			−0.6
MOR8	Moi Rana	75.10	336		eP	15 03 57.0			−11.9
MOR8	[.19μm,1s5,Mb5.8]				e	15 04 00.7			
WHY	Whitehorse	75.34	30		P	15 04 11.1			+0.6
WHY	[91nm,1s20,Mb5.6]			PcP	pP	15 04 23.7		0	+1
WHY	Whitehorse			S	S	15 13 49.7		+4	+4
ZNT	Zur Nathan	75.36	299		P	15 04 11.4			+0.3
MZDA	Masada	75.45	298		P	15 04 11.6			−0.1
BGIO	Bar Giyyora	75.48	298		P	15 04 11.9			0.0
YTIR	Yattir	75.58	298		P	15 04 12.3			−0.1
ARVI	'Arava Valley	75.77	297		P	15 04 13.7			+0.2
CSS	Cyprus	75.79	302		eP	15 04 13.0			−0.6
PRNI	Paran	76.02	297		↑P	15 04 15.0			+0.1
CFR	Carcaliu	76.08	313		↑P	15 04 14			−1.0
GPA	Gölpazarı	76.26	308		/P	15 04 15.0			−1.1
RMN	Mount Ramon	76.27	297		↑P	15 04 15.7			−0.7
MBH	Mount Berech	76.31	297		↑P	15 04 16.5			−0.1
SAGI	Saggi Highlands	76.33	297		↑P	15 04 16.6			−0.1
TLB	Topalu	76.37	313		↑eP	15 04 16.5			−0.1
UPP	Uppsala	76.48	330		↑P	15 04 16.3			−0.7
UPP	[lgA/T2.7,Mb6.4]			S	/S	15 13 58		0	0
SALT	Sultana	76.54	296		eP	15 04 18.0			+0.1
SIT	Sitka	76.55	33		↑eP	15 04 17.8	(2.1)		+0.5
DAG	Danmarks Havn	76.62	351		↓/P	15 04 16.0			−1.5
DAG	[.24μm,1s3,Mb6.0]			PP	/sP	15 07 07.2		−4	
GBZT	Gebze	76.71	309		eP	15 04 17.7			−0.9
VRI	Vrincioaia	76.78	314		↓P	15 04 19			0.0
YLV	Yalova	76.84	309		eP	15 04 17.0			−2.4
IZI	Iznik	76.85	308		/P	15 04 19.0			−0.4
ISK	Istanbul-Kandilli	76.89	309		eP	15 04 18.0			−1.7
LVV	L'vov	77.04	319		↑P	15 04 19.0			−1.3
LVV	L'vov			S	eS	15 14 01.0		−3	−3
ISR	Istrita	77.16	314		↓P	15 04 22			+0.9
MLR	Muntele Roşu	77.43	314		↓P	15 04 22			−0.6
DST	Dursunbey	77.71	308		/P	15 04 23.0			−1.3
SNX	Sinaia	77.76	314		↓P	15 04 24			−0.4
ELL	Elmali	77.79	305		/P	15 04 23.8			−0.9
WAR	Warsaw	77.85	322		P	15 04 26			+1.3
WAR	Warsaw			PP	PP	15 07 23		+1	+1
WAR	Warsaw			PPP	PPP	15 09 12		+1	+1
WAR	Warsaw				S	15 14 21			+8
EDC	Edincik	77.99	309		/P	15 04 25.0			−0.8
JMB	Yambol	78.11	311		/P	15 04 26.5			+0.1
HFS	Hagfors	78.13	331		P	15 04 26.2			+0.1
HFS	[32nm,0s75,Mb5.3]			pP	pP	15 04 39.3		+1	+1
HFS	Hagfors				PP	15 07 16.8			−8
BMR	Baia Mare	78.18	317		↓eP	15 04 30			+3.4
KSL	Kastellórizon	78.25	304		e(P)	15 04 26.5			−0.8
UZH	Uzhgorod	78.54	318		↑/P	15 04 29.0			+0.4
NB2	NORSAR 2B	78.77	332		P	15 04 29.0	(2.7)		−0.6
NORES	NORESS Array	78.79	332		P	15 04 28.0			−1.7
NORES	[11nm,0s75,Mb4.9]				PP	15 07 22.2			−8
NORES	NORESS Array				LR	15 42 51.3			
CEI	Carei	78.82	317		eP	15 04 32			+1.9
DIM	Dimitrovgrad	78.99	311		c/P	15 04 31.3			+0.1
ALN	Alexandroupolis	79.07	310		e(P)	15 04 30.0			−1.7
JNW	Jan Mayen West	79.13	345		eP	15 04 32.5			+1.1
IZM	Izmir	79.14	307		eP	15 04 32.0			−0.1
HLW	Helwan	79.15	298		eP	15 04 33.0			+0.6
HLW	Helwan			sP	ePP	15 04 48.0		−2	
HLW	Helwan			PP	ePP	15 07 38		+4	+4
HLW	Helwan				ePPP	15 09 32.0			+8
HLW	Helwan			S	eS	15 14 32.0		+4	+4
KDZ	Kürdzhali	79.22	311		c/P	15 04 33.0			+0.5
DEV	Deva	79.25	315		↓P	15 04 33.5			+0.9
EZN	Ezine	79.28	309		/P	15 04 32.0			−0.9
ARG	Arkhángelos	79.32	305		e(P)	15 04 33.1			0.0
RDO	Rodhópi	79.33	310		e(P)	15 04 32.9			−0.2
OJC	Ojców	79.38	320		↑/P	15 04 33.1			−0.1
OJC	[.75μm,1s2,Mb6.5]			S	S	15 14 32		+3	+3
NIE	Niedzica	79.42	319		↓/P	15 04 34.0			+0.6
MOL	Molde	79.48	335		eP	15 04 33.4			+0.1
MOL	[.58μm,1s5,Mb6.3]			PcP	e	15 04 37.9		−4	
GZR	Gura Zlata	79.53	315		↓P	15 04 34			−0.1
PRK	Paraskevi	79.54	308		e(P)	15 04 33.0			−1.3
SPC	Skalnate-Pleso	79.55	319		/P	15 04 34.4	(2.5)		+0.3
RZN	Rozhen	79.69	311		c/P	15 04 35.0			0.0
SMG	Sámos	79.71	307		e(P)	15 04 35.5			+0.3
PGB	Panagyurishte	79.73	312		c/P	15 04 35.2			0.0
KONO	Kongsberg	80.17	332		↑/P	15 04 36.2			−1.0
KONO	Kongsberg			PcP	e	15 04 42.0		−3	
KONO	Kongsberg			PP	ePP	15 07 37.9		−3	−3
KONO	Kongsberg			SS	eSS	15 19 50.3		0	0
BZS	Buziaş	80.18	316		↓P	15 04 38			+0.4
VTS	Vitosha	80.37	312		c/P	15 04 39.0			+0.4
RAC	Racibórz	80.38	321		P	15 04 38			−0.5
RAC	Racibórz			SKS	S	15 14 46		−2	+6
MMB	Musomiste	80.41	311		c/P	15 04 38.3			−0.6
AAE	Addis Ababa	80.48	276		eP	15 04 47.5			+7.7
OKC	Ostrava-Krásné	80.51	320		↑P	15 04 39.8			+0.6
OKC	Ostrava-Krásné			PP	PP	15 07 44.6		0	0
OKC	Ostrava-Krásné			S	e(S)	15 14 42.0		+1	+1
SRS	Sérrai	80.70	311		e(P)	15 04 39.2			−1.2
EWZ	Erewhon	80.71	146		/P	15 04 41.2			+0.8
OUR	Ouranopolis	80.74	310		e(P)	15 04 39.2			−1.4
KKB	Krupnik	80.74	312		c/P	15 04 40.3			−0.3
HYA	Høyanger	80.79	334		eP	15 04 40.9			+0.6
HYA	[.37μm,1s7,Mb6.0]			PcP	e	15 04 45.5		−2	
COP	Copenhagen	80.86	327		α/P	15 04 41.6			+0.6
COP	[.46μm,1s5,Mb6.2][69.0μm,18s:Z,Ms7.1]								
MORC	Moravský Beroun	80.89	321		/P	15 04 41.6			+0.4
SOH	Sokhós	80.98	311		e(P)	15 04 40.2			−1.7
BUD	Budapest	81.02	318		eP	15 04 42			+0.1
BUD	Budapest			sP	e	15 04 58		−1	
BUD	Budapest				e	15 05 10			
BUD	Budapest				e	15 05 35			
WAHZ	Wakarara	81.06	141		/P	15 04 46.0			+3.7
PLG	Polygyros	81.10	310		e(P)	15 04 42.0			−0.5
PAIG	Paliouri	81.11	310		e(P)	15 04 41.7			−0.9
KSP	Ksiaz	81.12	322		↓/P	15 04 42.6			+0.2
KSP	Ksiaz			SKS	S	15 14 51.0		−2	+4
LLD	Lilie Linde	81.14	327		/P	15 04 44.3			+1.9
MRW	Makara Radio	81.15	143		/P	15 04 45.7			+2.9
KNT	Kendrikon	81.16	311		e(P)	15 04 40.8			−2.0
SNZO	South Karori	81.20	143		eP	15 04 51			+7.9
SNZO	South Karori			SKS	(S)/SKS	15 14 53		−1	−1
SNZO	South Karori			SS	SS	15 20 14		+6	+6
SNZO	South Karori				LR	15 31			
MRZ	Mangatainoka R.	81.26	142		/P	15 04 43.4			+0.1
DPC	Dobruška-Polom	81.28	321		↑/P	15 04 43.2	(1.8)		0.0
ODD1	Odda	81.30	333		eP	15 04 43.0			−0.1
ODD1	[.20μm,1s7,Mb5.8]			PcP	e	15 04 47.7		−2	
SRO	Srobarova	81.30	319		/P	15 04 44.8			+1.4
SRO	Srobarova					15 07 24.3			
SRO	Srobarova			PP	/PP	15 07 53.2		+2	+2
VAY	Valandovo	81.32	311		↑/P	15 04 43.3	(2.7)		−0.4
THE	Thessaloniki	81.33	311		e(P)	15 04 41.9			−1.8
KHZ	Kahutara	81.33	144		/P	15 04 42.5			−1.2
WNDE	Wendo Genet	81.36	274		eP	15 04 47.5			+3.1
SUE	Sulen	81.42	334		eP	15 04 44.5			+0.8
SUE	[.37μm,1s7,Mb6.0]				e	15 04 48.9			
SUE	Sulen			PcP	epP	15 04 52.4		+2	−4
NPS	Neápolis	81.57	305		e(P)	15 04 45.0			−0.1
BER	Bergen	81.57	333		eP	15 04 46.3			+1.7
GRG	Griva	81.58	311		e(P)	15 04 43.7			−1.3
BLS5	Blåsjø	81.65	332		eP	15 04 45.7			+0.7
BLS5	[98nm,1s5,Mb5.5]			PcP	e	15 04 49.4		−2	
BLS5	Blåsjø			pP	esP	15 04 55.9		−2	−6
VRAC	Vranov	81.65	320		/P	15 04 45.9			+0.7
SKO	Skopje	81.82	312		↑/P	15 04 46.5			+0.3
SKO	[.40μm,1s5,Mb6.1]			PP	/PP	15 07 56.0		0	0
SKO	[20μm,20s:Z,			ScS	/S	15 15 07.0		−3	+12
SKO	Ms6.5]			SPP	/PS	15 15 59.0		−6	+10
SKO	Skopje				/SSS	15 24 27.0			+48
SKO	Skopje				LR	15 45 31.0			
ZST	Bratislava	81.86	319		/P	15 04 47.4			+1.1
ZST	Bratislava			sP		15 05 05.8		+2	
ZST	Bratislava			PP	ePP	15 07 54.9		−1	−1
ZST	Bratislava			ScS	'AS'	15 15 11.4		+2	
ZST	Bratislava				'LMV'	15 57 00.0			
LIT	Litókhoron	81.88	310		/(P)	15 04 44.7			−1.8
ATH	Athens Obs.	81.88	308		c/(P)	15 04 46.0			−0.7
BRNL	Berlin-Lankwitz	81.98	324		↑/P	15 04 47.4			+0.5
BRNL	Berlin-Lankwitz			SKS	eS	15 14 59.5		0	+3
MUD	Monsted U'grnd	82.04	329		/P	15 04 48.4			+1.3
BRN	Berlin	82.07	324		↑eP	15 04 48.5			+1.2
KZN	Kozani	82.29	311		c/(P)	15 04 48.0			−0.7
VKA	Vienna	82.29	320		↑/P	15 04 49.0	(3.0)		+0.5
VKA	Vienna				'MLRZ'	15 47 40			
SCO	Scoresbysund	82.36	349		↓/P	15 04 49.0	(2.5)		+0.6
FNA	Florina	82.36	311		e(P)	15 04 47.7			−1.3
SOP	Sopron	82.42	319		eP	15 04 49.0			−0.2
SOP	Sopron			PcP	e	15 04 57.0		+2	
BRG	Berggiesshübel	82.42	323		/P	15 04 49.5			+0.4
BRG	[.29μm,1s7,Mb5.9]			PcP		15 04 52.2		−2	
BRG	[35.0μm,21s:N,			ScS	/S	15 15 16		+2	+15
BRG	27.0μm,21s:E,Ms6.8](OB3 MPV6.1)								
AGG	Agios Georgios	82.44	309		e(P)	15 04 47.8			−1.7
IVA	Berane	82.46	314		↑/P	15 04 50.4			+0.9
PRU	Průhonice	82.51	322		↑/P	15 04 49.9			+0.3
PRU	[.82μm,2s1,Mb6.4]			sP		15 05 08.0		+1	
PRU	[32.7μm,17s:Z,			PP	PP	15 07 59.2		−2	−2
PRU	Ms6.8]			SKS	S	15 15 04.0		+1	+2
PRU	[21.2μm,16s:N,23.5μm,17s:E,Ms6.8]								
PVY	Plav	82.53	313		↑/P	15 04 50.6			+0.7
PRA	Prague	82.53	322		↑P	15 04 50.0			+0.3
PRA	[.55μm,2s0,Mb6.2][16.0μm,16s:Z,Ms6.5]								
VAM	Vámos	82.57	305		e(P)	15 04 50.1			−0.2
PLE	Pljevlja	82.60	314		↑/P	15 04 51.3			+1.2
OHR	Ohrid	82.62	312		/P	15 04 48.0	(2.2)		−2.4
YKA	Yellowknife Ar.	82.68	23		eP	15 04 50.6	(2.1)		+0.4
CLL	Collm	82.73	323		↑/P	15 04 50.0			−0.7
CLL	[.58μm,2s1,Mb6.2]			SKS	eS	15 15 05		+1	+1
CLL	[58.5μm,17s:Z,			S3KS2		15 34 43		−3	
CLL	Ms7.0]								
EVR	Evrytania	82.85	309		e(P)	15 04 51.1			−0.5
VLI	Veliai	82.96	307		e(P)	15 04 52.0			−0.2
TTG	Podgorica	83.08	313		↑/P	15 04 52.7			0.0
NKY	Nikšić	83.08	314		↑/P	15 04 52.9			+0.3
LSK	Leskovik	83.17	311		↓/P	15 04 53.5			+0.3
JAN	Janina	83.21	310		e(P)	15 04 53.5			+0.1
ULC	Ulcinj	83.29	313		↑/P	15 04 53.3			−0.4
BRY	Bratogost	83.34	314		↑/P	15 04 54.0			0.0
RLS	Riolos of Patras	83.46	309		eP	15 04 54.5			−0.2
ITM	Ithomi	83.50	308		e(P)	15 04 54.0			−1.0
GERES	GERESS Array	83.55	321		P	15 04 54.0			−0.9
GERES	[46nm,0s85,Mb5.6]			PP	PP	15 08 01.7		−7	−7
GERES	GERESS Array			S	S	15 15 11.6		−1	−1
GEC2	GERESS C2	83.55	321		eP	15 04 55.3			+0.4
GEC2	[.13μm,1s41,			PcP		15 05 04.3		+5	
GEC2	Mb5.9]			pP		15 05 06.8		−1	
GEC2	GERESS C2			sP		15 05 09.6		−2	
GEC2	GERESS C2					15 05 19.9			
GEC2	GERESS C2					15 07 59.4			
GEC2	GERESS C2			PP		15 08 10.5		+1	
GEC2	GERESS C2					15 08 58.3			
GEC2	GERESS C2					15 09 07.9			
HCY	Herceg Novi	83.58	314		↑/P	15 04 54.6			−0.6
PTJ	Puntijarka	83.60	318		↑/P	15 04 55.6			+0.4
IGT	Igoumenitsa	83.62	310		e(P)	15 04 53.2			−2.3
ZAG	Zagreb	83.63	318		↑/P	15 04 56.1			+0.7
KMR	Kremsmünster	83.68	320		/P	15 04 56.9			+1.3
KMR	Kremsmünster			S		15 15 18.3		+5	
MOX	Moxa	83.81	323		α/P	15 04 56.5			+0.3
MOX	[lgA/T2.4,Mb6.3]				e	15 05 40			
MOX	Moxa				PP	15 08 08			−3
MOX	Moxa				PPP	15 10 08			+2
MOX	Moxa				S/(SKS)	15 15 18			+3
MOX	Moxa				PS	15 16 11			−3
MOX	Moxa				SS	15 20 57			+12
MOX	Moxa				P2KP	15 23 16			+21
MOX	Moxa				P2KP	15 23 27			+32
MOX	Moxa				LQ	15 25 15			
MOX	Moxa				LR	15 30 30			
MOX	Moxa				P'PKS	15 34 40			−13
MOX	Moxa				RM	15 46 37			
MOX	Moxa				QM	15 47 24			
MOX	Moxa				e	15 05 40			
MOX	Moxa				PP	15 08 08			−3
MOX	Moxa				PPP	15 10 08			+2
MOX	Moxa				PS	15 16 11			−3
MOX	Moxa				SS	15 20 57			+12
MOX	Moxa				P2KP	15 23 16			+21
MOX	Moxa				P2KP	15 23 27			+32
MOX	Moxa				LQ	15 25 15			
MOX	Moxa				LR	15 30 30			
MOX	Moxa				P'PKS	15 34 40			−13
MOX	Moxa				RM	15 46 37			
MOX	Moxa				QM	15 47 24			
WET	Wettzell	83.87	321		↑/P	15 04 57.2	(2.2)		+0.7
KEK	Kérkira	83.91	311		e(P)	15 04 55.5			−1.5
VLS	Valsamáta	84.03	309		e(P)	15 04 56.5			−1.1
LJU	Ljubljana	84.42	318		↑eP	15 04 59.5			+0.1
LJU	[27.5μm,20s,			PcP	ePcP	15 05 02.0		−1	−1
LJU	Ms6.6]			PP	ePP	15 08 16		0	0
LJU	Ljubljana			SKS	eS	15 15 18		+2	−3
LJU	Ljubljana				LR	15 47 30			
GRF	Gräfenberg Ar.	84.53	322		↑/P	15 05 00.5			+0.7
GRF	[.66μm,1s9,Mb6.4]			PP	ePP	15 08 13.0		−4	−4
GRF	[56.1μm,19s6:Z,				epPP	15 08 30.3			
GRF	Ms7.0]				esPP	15 08 44.7			
GRFO	Gräfenberg	84.53	322		↑/P	15 05 00.2	(2.7)		+0.4
BHG	Bad Reichenhall	84.58	320		↑/P	15 05 00.7			+0.6
KBA	B. Koelnbrein	84.63	320		↑/P	15 05 00.4			0.0
KBA	[.10μm,1s3,Mb5.8]			sP		15 05 21.4		+4	
KBA	[.18μm,1s8:4]					15 08 13.9			
KBA	B. Koelnbrein			PP		15 08 17.6		0	
KBA	B. Koelnbrein					15 08 34.4			
VOY	Vojsko	84.81	318		↑/P	15 05 01.2	(2.0)		−0.1
TRI	Trieste	85.05	318		↑eP	15 05 02.2			−0.3
TRI	Trieste			PP	ePP	15 08 20.0		−1	−1
TRI	Trieste			PPP	ePPP	15 10 16.0		−1	−1
TRI	Trieste				e	15 12 00.0			
TRI	Trieste			S	eS	15 15 28.0		+1	+1
TRI	Trieste			SP	eSP	15 16 16.0		−7	−7
TRI	Trieste				eSS	15 21 16.0			+13
FVI	Forni Avoltri	85.20	319		P	15 05 02.4			−0.9
WIT	Witteveen	85.25	327		eP	15 05 04			+0.7
WIT	Witteveen			sP		15 05 27		+7	
WIT	Witteveen					15 05 47			
FUR	Fürstenfeldbruck	85.28	321		↑/P	15 05 04.6			+1.0
FUR	[52.9μm,17s:Z,			S2KS	eS	15 15 24.8		−1	−5

Code	Station Name	Δ° ISC	Z° Op	Time h m s	Residuals ISC	Op
FUR	*Ms7.0]*					
WATA	Walderaim	85.54	320 ↑iP	15 05 04.8		−0.1
WATA	*[.47μm,1*8,Mb6.4]*	sP		15 05 20.3	−2	
WATA	Walderaim	PP	/PP	15 08 25.2	0	0
WTS	Winterswijk	85.64	326 eP	15 05 05.5		+0.2
WTS	*[.80μm,2*0,Mb6.6]*	sP		15 05 26.5	+4	
WTS	Winterswijk			15 05 38.5		
VVI	Villa di Villa	85.73	319 P	15 05 05.5		−0.3
MOTA	Moosalm	85.81	321 ↑iP	15 05 06.1		−0.1
SQTA	Sankt Quirin	85.81	320 ↑iP	15 05 06.2		0.0
SQTA	*[.41μm,1*7,Mb6.4]*	PP	/PP	15 08 27.4	0	0
KMBO	Kilima Mbogo	85.90	267 ↑iP	15 05 08.5		+1.0
BNS	Bensberg	86.03	325 ↑iP	15 05 08.0		+0.8
BNS	*[.42μm,1*7,Mb6.4]*	PP	/PP	15 08 28.1	−1	−1
BNS	Bensberg	S	S	15 15 35.0	−1	−1
ORI	Oriolo Calabro	86.05	312 P	15 05 08.3		+0.8
OGA	Obergurgl	86.10	320 ↑iP	15 05 07.9		+0.3
CTI	Castel Tesino	86.15	319 P	15 05 07.5		−0.4
TDS	Terranova Sibari	86.31	312 P	15 05 09.8		+0.9
ABH	Altenburg	86.43	324 P	15 05 09.6		+0.4
SGO	Sicignano	86.58	319 P	15 05 10.8		+0.7
MGR	Morigerati	86.61	313 P	15 05 10.1		−0.2
GRI	Giarifalco	86.66	311 P	15 05 11.6		+1.1
ARV	Arcevia	86.66	317 P	15 05 11.2		+0.7
OSS	Ova Spin	86.71	320 iP	15 05 11.3		+0.7
RSM	Rep. San Marino	86.75	317 dP	15 05 12.6		+1.7
HGN	Heimansgroeve	86.79	325 ↑iP	15 05 11.3		+0.4
HGN	*[MSZ8.9]*	PP	ePP	15 08 32.7	−3	−3
HGN	Heimansgroeve			15 14 51.0		
HGN	Heimansgroeve	SKS	eS	15 15 34.0	+2	−10
HGN	Heimansgroeve		eSS	15 21 38.9		+11
HGN	Heimansgroeve			15 26 10.3		
LANF	Langenberg	86.79	323 P	15 05 11.5		+0.5
RUP	Ruppelstein	86.80	324 P	15 05 11.2		+0.2
DAVOS	Davos	86.83	321 ↑P	15 05 12.0	(2.3)	+0.8
MEM	Membach	86.84	325 ↑P	15 05 11.2		+0.1
MEM	Membach	S2KS	'SKSAC'	15 15 35.4	−2	
GDH	Godhavn	86.89	359 ↖eP	15 05 10	(2.3)	−1.0
AQU	l'Aquila	86.94	315 P	15 05 12.8		+0.9
ASS	Assisi	87.06	316 P	15 05 13.3		+0.9
SAL	Salò	87.06	319 P	15 05 13.8		+1.4
SLE	Schleitheim	87.08	322 iP	15 05 12.2		−0.2
RFI	Roccamonfina	87.09	314 P	15 05 14.6		+2.1
SFI	Santa Sofia	87.13	317 P	15 05 14.2		+1.5
MCW	Mt Constitution	87.20	37 eP	15 05 15		+2.0
VDL	Val di Lei	87.21	320 iP	15 05 13.6		+0.5
PGD	Poggio Sodo	87.23	317 P	15 05 14.8		+1.5
SOI	Samo	87.26	311 P	15 05 14.0		+0.5
LLS	Linth-Limmern	87.28	321 iP	15 05 13.6		+0.2
FEL	Feldberg	87.29	322 ↑eP	15 05 13.3		−0.1
ZLA	Zuerich Laegern	87.29	322 iP	15 05 13.3		−0.2
WLF	Walferdange	87.30	324 ↑P	15 05 14.2		+0.8
GMB	Gambarie	87.35	311 P	15 05 15.3		+1.4
WLS	Welschbruch	87.36	323 P	15 05 13.8		+0.1
LIBD	Limburg	87.37	322 P	15 05 12.7		−1.1
MNS	Montasola	87.39	316 cP	15 05 13.5		−0.6
CDF	Champ du Feu	87.40	323 ↑eP	15 05 14.0		0.0
MDI	Monti di Nese	87.45	320 P	15 05 13.2		−1.1
ECH	Echery	87.58	323 P	15 05 14.7		−0.1
UCC	Uccle	87.59	326 P	15 05 15		+0.2
UCC	Uccle	S2KS	'SKSAC'	15 15 41	−2	
APL	Alpnach	87.67	321 iP	15 05 15.2		−0.1
RDP	Rocca di Papa	87.68	315 P	15 05 15.9		+0.5
TMA	Tamaro	87.77	320 iP	15 05 15.6		−0.2
MOF	Molkenrain	87.80	322 P	15 05 15.8		0.0
SNF	Seneffe	87.80	326 ↑P	15 05 15.7	(1.8)	0.0
BBS	Basel-Blauen	87.80	322 ↑eP	15 05 15.6		−0.2
BDI	Bagni Di Lucca	87.83	318 P	15 05 15.9		−0.2
LWH	Whinny Nab	87.83	331 iP	15 05 16.5		+0.6
GMW	Gold Mountain	87.86	38 eP	15 05 17		+0.8
DOU	Dourbes	87.88	325 ↑P	15 05 16.2		+0.1
SARO	Sassorosso	87.88	318 P	15 05 16.6		+0.3
LCP	Cassop	87.93	331 eP	15 05 20		+3.7
VAI	Varese	87.96	320 P	15 05 15.9		−0.8
JCW	Jim Creek	87.97	37 P	15 05 18.5		+1.8
BSF	Ballon Servance	88.00	323 ↑iP	15 05 16.6	(2.2)	−0.2
PII	Pisa	88.05	318 P	15 05 16.4		−0.8
HAU	Haudompre	88.14	323 ↑iP	15 05 17.4		−0.1
HAU	*[.22μm,1*6,Mb6.1][53μm,1*:Z,Ms7.0]*					
BOB	Bobbio (Coll)	88.15	319 P	15 05 18.0		+0.4
RAR	Rarotonga	88.17	114 iP	15 05 22.0		+3.7
CALI	Calice	88.20	318 P	15 05 16.7		−1.1
BMW	Boistfort Mt.	88.21	39 eP	15 05 19		+1.1
THEF	They Montfort	88.21	323 P	15 05 17.4		−0.4
LMK	Market Resen	88.24	330 iP	15 05 16.6		−1.2
LOMF	Lomont	88.25	322 P	15 05 17.3		−0.7
EKA	Eskdalemuir Ar.	88.26	332 P	15 05 17.0	(2.4)	−0.9
LRN	Richmond	88.27	331 iP	15 05 20.6		+2.6
ESK	Eskdalemuir	88.29	332 ↑eP	15 05 17.8	(2.2)	−0.2
MMK	Mattmark	88.32	321 iP	15 05 19.2		+0.8
SIERE	Sierre	88.42	321 ↑P	15 05 19.4	(2.3)	+0.5
RMW	Rattlesnake Mt.	88.46	38 eP	15 05 20		+1.0
HPK	Haverah Park	88.50	331 iP	15 05 20.1	(2.3)	+1.0
ORX	Oropa	88.55	320 P	15 05 17.8		−1.6
ORO	Oropa	88.55	320 P	15 05 18.5		−1.0
DIX	Grande Dixence	88.63	321 iP	15 05 20.5		+0.6
PCP	Pian Castagno	88.81	319 P	15 05 19.7		−1.1
FMW	Mount Fremont	88.84	38 P	15 05 22.6		+1.8
LON	Longmire	88.86	38 eP	15 05 22.1		+1.2
LHO	Holmfirth	88.88	330 iP	15 05 19.9		−1.0
EMS	Emosson-Mur	88.91	321 iP	15 05 21.3		+0.1
CKI	Cairo Montenotte	89.04	319 P	15 05 21.4		−0.5
LSD	Ceresole Reale	89.13	320 P	15 05 22.3		+0.1
FIN	Finale Ligure	89.20	319 P	15 05 21.7		−0.9
COR	Corvallis	89.21	41 eP	15 05 24.8		+2.2
COR	*[.44μm,1*4,Mb6.6][6.0μm,20*:Z,Ms6.0]*					
ASR	Mount Adams	89.33	39 P	15 05 25.0		+1.9
LPG	La Plagne	89.34	321 ↑iP	15 05 23.6	(2.4)	+0.5
LPL	La Plagne	89.34	321 ↑iP	15 05 23.6	(2.2)	+0.3
WTV	Waterville	89.34	37 P	15 05 24.5		+1.3
ROB	Roburent	89.35	319 P	15 05 21.7		−1.6
BHB	Bricherasio	89.41	320 P	15 05 21.1		−2.5
EBG	Ellensburg	89.47	38 P	15 05 25.8		+2.0
MONE	Monesi	89.54	319 P	15 05 23.2		−1.0
IMI	Imperia	89.55	319 P	15 05 23.4		−0.9
SSOR	Sweet Springs	89.56	40 P	15 05 26.2		+2.0
PGF	Pioggiola	89.62	317 ↓eP	15 05 24.9		+0.3
BNI	Bardonecchia	89.63	320 P	15 05 24.7		0.0
SAW	Saint Andrews	89.64	36 P	15 05 26.0		+1.4
RRL	Cesana Torinese	89.65	320 P	15 05 24.5		−0.2
ENR	Entracque	89.66	319 P	15 05 22.0		−2.8
PZZ	Prazzo	89.69	320 P	15 05 22.8		−2.2
STV	St Anna Valdieri	89.71	319 P	15 05 22.4		−2.5
SAOF	Saorge	89.71	319 P	15 05 24.8		−0.3
AUTN	L'Aution	89.78	319 P	15 05 25.3		−0.1
SBF	Sospel	89.85	319 ↓eP	15 05 25.4		−0.3
TOUF	Mont Tournerait	89.88	319 P	15 05 25.7		−0.1
AURF	Auriere	89.90	319 P	15 05 25.4		−0.6
LOR	Lormes	89.94	323 ↑iP	15 05 25.6		−0.4
LOR	*[.23μm,1*5,Mb6.3][55μm,1*:Z,Ms7.0]*					
VBEM	Beaver Butte	89.95	40 P	15 05 27.9		+1.8
MVIF	Mont Viel	90.00	319 P	15 05 26.2		−0.2
LBF	Les Buteaux	90.05	323 ↑iP	15 05 26.2	(2.4)	−0.3
WAH2	Wahluke Slope	90.12	37 P	15 05 28.6		+1.8
VGB	Gordon Butte	90.16	39 eP	15 05 28		+0.9
DPW	Davenport	90.19	36 eP	15 05 28		+0.8
CALN	Calern	90.24	319 P	15 05 27.3		−0.2
SSF	Saint Sauige	90.26	323 ↑iP	15 05 27.2	(2.0)	−0.3
SMF	Signal de Mont	90.32	323 ↑iP	15 05 27.6	(2.5)	−0.3
CROR	Criterion Ridge	90.35	39 P	15 05 29.7		+1.7
FRF	La Forêt Royale	90.50	319 ↑iP	15 05 28.3		−0.4
AVF	Avril sur Loire	90.51	323 ↑iP	15 05 28.5	(2.5)	−0.2
GANF	Garnagobie	90.69	320 P	15 05 29.8		+0.2
LMR	La Mourre	90.71	319 ↑iP	15 05 29.6	(2.2)	−0.1
OCF	Saint Nazaire	90.71	320 P	15 05 29.9		+0.2
JBO	Jordan Butte	90.73	38 P	15 05 31.5		+1.7
LRG	Lorgues	90.73	319 ↑iP	15 05 29.9	(2.4)	+0.1
SSB	St Sauveur Rue	90.74	321 P	15 05 29.4		−0.4
TAVF	Tavernes	90.82	319 P	15 05 30.9		+0.7
DMUB	Kingscourt	90.84	333 eP	15 05 30		−0.1
PLDF	La Plantade	90.85	322 P	15 05 30.7		+0.4
VILF	Villemus	90.88	320 P	15 05 30.9		+0.3
BGF	Bois d'Agland	90.92	323 ↑iP	15 05 30.5	(2.1)	−0.2
DSB	Dublin	91.07	332 eP	15 05 30.3	(2.0)	−0.9
AGO	St Agoulin	91.07	323 P	15 05 31.7		+0.3
COLF	Collangettes	91.08	322 P	15 05 31.5		+0.1
PUYF	Puyloubier	91.08	319 P	15 05 31.7		+0.2
DLF	Lyons Farm	91.10	332 eP	15 05 30.9		−0.4
CGL	Cagliari Serpeddì	91.16	314 P	15 05 32.9		+0.9
TREF	Trevarease	91.21	320 P	15 05 32.5		+0.4
PRAF	Pradon	91.23	320 P	15 05 32.7		+0.5
LDF	La Druitière	91.24	326 ↑iP	15 05 31.6	(2.1)	−0.5
MAF	Mazirat	91.28	323 ↑iP	15 05 32.6	(2.7)	+0.2
FLN	La Folinière	91.31	326 ↑iP	15 05 31.8		−0.6
FLN	*[.15μm,1*7,Mb6.1][73μm,1*:Z,Ms7.1]*					
PYM	Petit Puy Manson	91.32	322 P	15 05 32.9		+0.3
GELF	Grande-Etoile	91.33	319 P	15 05 32.9		+0.3
LNOR	Linctos Mountain	91.36	37 P	15 05 34.4		+1.8
ETA	Tara	91.38	332 eP	15 05 33.2		+0.5
DCN	Croghan	91.38	332 eP	15 05 32.6		0.0
TCF	Toulx Ste Croix	91.44	323 ↑iP	15 05 33.1	(2.4)	0.0
DRV	Dumont d'Urville	91.46	173 P	15 05 45		+12.3
DRV	Dumont d'Urville		PP	15 09 22		+8
LBL	Loubilhac	91.50	322 P	15 05 33.8		+0.4
WALA	Waterton Lakes	91.66	33 P	15 05 34.9	(1.7)	+0.9
GRR	Gorron	91.74	326 ↑iP	15 05 34.2	(2.2)	−0.2
ECP	Cameron Point	91.81	331 eP	15 05 35.0		+0.4
LSF	La Souterraine	91.83	323 ↑iP	15 05 34.7	(2.1)	−0.2
LBFM	Black Fox Mt.	91.89	43 eP	15 05 36		+0.7
WDC	Whiskeytown	91.91	44 ↑eP	15 05 36.5		+1.1
WDC	*[.30μm,1*9,Mb6.3][5.0μm,19*:Z,Ms6.0]*					
BSMT	Bassoo Peak	92.00	34 ↑eP	15 05 37.6		+2.0
LPF	le Pertre	92.07	326 ↑iP	15 05 35.9		0.0
CAF	Calviac	92.35	322 ↑iP	15 05 37.9	(2.5)	+0.6
RJF	Les Réjaudoux	92.43	323 ↑iP	15 05 38.2	(2.8)	+0.6
FBMT	Ferry Basin	92.47	35 ↑eP	15 05 39.0		+1.2
MFF	St Martin	92.52	324 ↑iP	15 05 38.1	(2.2)	+0.1
SWMT	Swartz Lake	92.63	34 ↑eP	15 05 39.8		+1.3
MIN	Mineral	92.64	43 ↑eP	15 05 39.2		+0.5
MIN	*[3.5μm,1*:Z,Ms5.9]*					
LCHF	La Châtaigneraie	92.79	325 P	15 05 38.9		−0.4
FFC	Flin Flon	92.83	24 eP	15 05 39.4	(2.4)	+0.3
LPO	Le Pouchou	92.99	322 ↑iP	15 05 40.6	(2.2)	+0.3
LFF	La Frestale	93.08	323 ↑iP	15 05 41.3	(2.5)	+0.6
ORV	Oroville	93.15	44 ↑eP	15 05 41.3		+0.2
ORV	*[.19μm,1*6,Mb6.3][3.0μm,19*:Z,Ms5.8]*					
WVOR	Wild Horse Valley	93.22	40 eP	15 05 42.6		+1.2
WVOR	*[.51μm,1*9,Mb6.6][5.3μm,19*:Z,Ms6.0]*					
HRY	Holter Research	94.27	34 eP	15 05 47.2		+1.3
MHC	Mount Hamilton	94.32	46 ↑eP	15 05 47.6		+1.2
MHC	*[4.3μm,1*:Z,Ms6.0]*					
ARN	Arnold Ranch	94.39	46 eP	15 05 47		+0.3
HBMT	Mount Humbug	94.48	35 ↑eP	15 05 48.5		+1.6
EPF	Esparros	94.50	321 ↑iP	15 05 47.0	(2.1)	−0.1
LRM	Limeldin Ridge	94.54	35 eP	15 05 48.7		+1.5
CMB	Columbia College	94.74	45 ↑eP	15 05 49.2		+0.9
CMB	*[.11μm,1*2,Mb6.2][3.5μm,19*:Z,Ms5.8]*					
BMN	Battle Mountain	95.28	41 eP	15 05 52.6		+1.8
BMN	*[.12μm,1*3,Mb6.1][5.7μm,20*:Z,Ms6.0]*					
EGRA	Graus	95.41	321 eP	15 05 50.4		−0.8
ELIZ	Elizondo	95.47	322 eP	15 05 50.2		−1.3
KVN	Kalsersville	95.58	43 eP	15 05 54		+1.8
EBR	Ebro Roquetas	95.80	320 eP	15 05 54		+0.9
EBR	Ebro Roquetas	PP	ePP	15 09 46	−1	−1
EBR	Ebro Roquetas	SKS		15 16 25	0	
EBR	Ebro Roquetas	PS	ePS	15 18 31	−3	−3
KCC	Kaiser Creek	95.84	45 ↑eP	15 05 54.3		+1.0
KCC	*[6.0μm,19*:Z,*	PP	↑ePP	15 09 49.2	+2	+2
KCC	*Ms6.1]*	S2KS	'SKSA'	15 16 37.2	−6	
KCC	Kaiser Creek		/S	15 17 14.2		+9
KCC	Kaiser Creek	sS	eScS	15 17 19.2	−7	+14
KCC	Kaiser Creek	SP	↑eSP	15 18 24.2	−4	−4
KCC	Kaiser Creek	PS	ePS	15 18 31.2	−3	−3
KCC	Kaiser Creek		'PKKPS'	15 23 04.2		
KCC	Kaiser Creek	SS	/SS	15 23 32.2	−6	−6
KCC	Kaiser Creek		↓eSKKP	15 26 35.2		
KCC	Kaiser Creek		eSSS	15 27 45.2		+23
KCC	Kaiser Creek	S2KS	3'SSSS'	15 29 37.2	−6	
KCC	Kaiser Creek		eSKKS	15 29 51.2		
KCC	Kaiser Creek		/LQ	15 31 18.2		
KCC	Kaiser Creek		eLR	15 36 52.2		
MEMM	E. Mammoth Hills	95.88	44 (P)	15 05 55.9		+2.4
MNV	Mina	95.92	43 eP	15 05 54.8	(1.6)	+1.1
PHAM	Harlan Ranch	96.00	47 eP	15 05 55		+0.9
PKEM	Kettleman Hills	96.06	46 eP	15 05 57		+2.6
ELK	Elko	96.27	40 eP	15 05 57.1	(1.8)	+1.9
MTUM	Tungsten Hills	96.31	44 (P)	15 05 57.1		+1.6
ECRI	Cripan	96.38	322 eP	15 05 56.7		+1.1
BCH	Branch Mountain	96.58	47 eP	15 05 58		+1.2
HVU	Hansel Valley	97.03	38 eP	15 06 00		+1.3
ABL	Mount Abel	97.35	47 eP	15 06 01		+0.7
ISA	Isabella	97.37	46 eP	15 06 00.4		+0.1
ISA	*[21nm,1*1,Mb5.5][7.3μm,18*:Z,Ms6.2]*					
TPNV	Topopah Spring	98.02	44 eP	15 06 04.9		+1.7
TPNV	*[18nm,1*0,Mb5.6][4.1μm,19*:Z,Ms5.9]*					
DUG	Dugway	98.04	39 eP	15 06 06.0		+2.7
DUG	*[.21μm,2*2,Mb6.3][7.8μm,19*:Z,Ms6.2]*					
PDAR	Boulder Array	98.13	36 P	15 06 03.5		−0.1
PDAR	Boulder Array		P2KP	15 22 42.7		+12
GUD	Guadarrama	98.61	322 eP	15 06 05.7		−0.1
ULM	Lac du Bonnet	98.65	24 P	15 06 05.1		−0.7
ULM	*[12nm,0*90,Mb5.4]*	pP	pP	15 06 17.0	−2	−2
ULM	Lac du Bonnet		P2KP	15 22 41.4		+12
DAU	Daniels Canyon	98.79	38 eP	15 06 08		+1.3
ESDC	Sonseca Array	99.14	321 P	15 06 09.2		+0.9
ESDC	Sonseca Array		P2KP	15 22 39.5		+11
ESDC	Sonseca Array		LR	15 56 01.2		
PEC	Perris	99.29	47 (P)	15 06 10.6	(1.4)	+1.5
EMUT	Emma Park	99.44	39 (P)	15 06 12.4		+2.8
PAB	San Pablo	99.45	321 iP	15 06 09.0		−0.7
PAB	San Pablo	PP	/PP	15 10 12.0	−3	−3
PAB	San Pablo	S	eS	15 17 29.0	−6	−6
MSU	Marysvale	99.52	40 eP	15 06 11		+1.0
PFO	Pinyon Flat Obs.	99.93	46 P	15 06 13.0		+0.9
PFO	*[6nm,0*80,Mb5.1]*		LR	15 51 29.2		
RSSD	Black Hills	99.98	32 eP	15 06 13.2	(1.8)	+1.2
SRU	San Rafael	100.06	39 (P)	15 06 14.5		+1.9
KNB	Kanab	100.10	42 eP	15 06 14		+1.2
BGCA	Bogoin	100.45	280 P	15 06 15.5		+0.6
PTO	Porto	100.71	324 eP	15 06 16.1		+0.7
SCHQ	Schefferville	101.02	5 P	15 06 16.7	(1.2)	+0.3
PV10	Paradox Valley	101.43	39 eP	15 06 20.1		+1.4
GOL	Golden	102.53	36			
GOL	*[13μm,19*:Z,Ms6.5]*					
GLD	Golden	102.58	36			
GLD	*[11μm,20*:Z,Ms6.4]*					
SFS	San Fernando	102.61	320 ePdif	15 06 25.0		
SFS	San Fernando	PP	ePP	15 10 35.0	−5	−5
SFS	San Fernando	SKS	eS	15 17 05.0	+6	−57
LIS	Lisbon	102.72	323 eSKS	15 17 03		+3.6
LIS	Lisbon		LR	15 48 18		
IFR	Ifrane	103.93	317 /Pdif	15 10 45.0		
AVE	Averroes	105.49	318 ePdif	15 10 57.5		
CBKS	Cedar Bluff	106.10	33			
CBKS	*[15μm,20*:Z,Ms6.5]*					
TIO	Tiouine	107.00	316 iPdif	15 11 07.0		
TIO	Tiouine		i	15 11 24.0		
WMOK	Wichita Mts	109.73	35			
WMOK	*[13μm,19*:Z,Ms6.5]*					
TUL	Tulsa (Univ.Okla.)	110.32	32 Pdif	15 06 59.0		
SLM	Saint Louis	110.57	27			
SLM	*[7.8μm,18*:Z,Ms6.3]*					
TSUM	Tsumeb	110.58	258 PKP	15 10 59.3		+0.8
LBNH	Lisbon	110.78	11 PKP	15 10 59.9		+1.6
LBNH	Lisbon	110.78	11			
LBNH	*[18μm,20*:Z,Ms6.6]*					
TXAR	Lajitas Array	110.93	42 PKP	15 11 00.3		+1.3
TXAR	*[3nm,0*90:1]*	PPS	P2KP	15 22 14.9	−3	+8
YSNY	Yorkshire	111.04	16			
YSNY	*[12μm,20*:Z,Ms6.5]*					
FVM	French Village	111.05	27			
FVM	*[19μm,20*:Z,Ms6.7]*					
MIAR	Mount Ida	112.49	32 PKP	15 11 03.3	(.7)	+1.4
MIAR	Mount Ida	112.49	32			
MIAR	*[9.7μm,20*:Z,Ms6.4]*					
HRV	Harvard	112.53	11			
HRV	*[15μm,20*:Z,Ms6.6]*					
SSPA	Standing Stone	112.94	17			
SSPA	*[12μm,20*:Z,Ms6.5]*					
LSCT	Lakeside	113.02	13			
LSCT	*[14μm,20*:Z,Ms6.6]*					
MCWV	Mont Chateau	113.31	18			
MCWV	*[12μm,20*:Z,Ms6.5]*					
PNJ	Paterson	113.57	14 Pdif	15 07 11.8		
SPA	South Pole	113.93	180 ePKP	15 11 07.0	(.8)	+3.3
GWDE	Greenwood	115.22	15			
GWDE	*[13μm,20*:Z,Ms6.5]*					
TKL	Tuckaleechee	115.67	23 PKP	15 11 09.2	(.8)	+1.1
MYNC	Murphy	116.07	24			
MYNC	*[14μm,19*:Z,Ms6.6]*					
CEH	Chapel Hill	117.02	19			
CEH	*[16μm,20*:Z,Ms6.6]*					
LKO	Korhogo	119.10	297 PKP	15 11 18.7	(1.3)	+3.5
DBIC	Dimbokro	120.07	294 PKP	15 11 18.5		+1.3
DBIC	*[5nm,0*50:1]*	pPKP	pPKP	15 11 30.7	0	0
DBIC	Dimbokro	P2KP3	'PKKPBC'	15 21 29.8	+6	
KIC	Kosan Boka	120.14	293 PKP	15 11 18.8	(1.4)	+1.5
TIC	Toumodi	120.22	294 PKP	15 11 18.7	(1.1)	+1.3
LIC	Lamto	120.45	293 PKP	15 11 19.4		+1.5
LIC	*[30nm,1*1:1][1.2μm,20*:Z,Ms5.5]*					
VNA1	Neumayer Stn	125.48	198 e(PKP)	15 11 34.0		+7.8
SDV	Santo Domingo	144.89	23 ↑iPKP	15 12 03.0		−0.4
OLLA	Las Ollas	144.97	16 ePKP	15 12 04.4		+0.8
TCE	Chacachacare	145.21	7 ePKP	15 12 04.3		+0.3
TRN	Trinidad (W)	145.30	6 ePKP	15 12 05.4		+1.3
TBH	Brigand Hill	145.49	6 ePKP	15 12 07.5		+3.1
BMG	Bucaramanga	145.61	28 ↑iPKP	15 12 10		+5.3
TPP	Pointe-à-Pierre	145.62	6 ePKP	15 12 07.4		+2.7
CHN	Chinchina	146.27	33 ePKP	15 12 09.0		+3.2
FUQ	Fúquene	146.74	30 ePKP	15 12 13.0		+6.4
BOG	Bogotá	147.33	31 ↑iPKP	15 12 12.0		+4.4
NNA	Nana	158.24	60 iPKP	15 12 28.7		+5.5
ARE	Arequipa	165.04	62 ePKP	15 12 36.0		+5.9
NATB	Natividade	165.16	279 iPKP	15 12 33.8		+3.6
NATB	Natividade	pPKP	e	15 12 41.4	−2	
NATB	Natividade	ScSP	2e	15 28 12.1	−3	
PEL	Peldehue	165.49	131 ePKP	15 12 32.5		+2.4
LPAZ	La Paz	167.54	53 PKP	15 12 34.8		+2.7
LPAZ	La Paz	pPKP	pPKP	15 12 46.0	+1	+1
LPAZ	La Paz	PKP2	PKP2	15 13 39.6	0	0
BAO	Brasilia Array	167.57	311 e(PKP)	15 12 33.1		+1.0
BDFB	Brasilia	167.59	311 PKP	15 12 34.0		+1.9
BDFB	*[18nm,0*80:1]*	pPKP	pPKP	15 12 45.4	0	0
BDFB	Brasilia	PKP2	PKP2	15 13 39.6	0	0
LPB	La Paz	167.72	54 ↑iPKP	15 12 36.2		+4.0
LPB	La Paz		eLR	15 38 30.0		
LPA	La Plata	169.21	179 ePKP	15 12 37.0		+4.4
LPA	*[8.0μm,20*:Z]*	PP2	ePP	15 19 16.0	−2	
VCA	Vinchina	169.54	119 ↑ePdif	15 11 19.0		
VCA	Vinchina		S	15 11 51.5		
CCH	Cochabamba	169.70	51 (PKP)	15 12 36.0		+2.7
RTPR	Patquia	170.03	130 ↑ePdif	15 11 15.8		
RTPR	Patquia		S	15 11 46.6		
CYA	Choya	171.56	123 ePKP	15 12 28.0		−6.2
YJA	Yavi	172.59	77 ↓ePKP	15 12 39.0		+4.1
CPUP	Villa Florida	177.73	189 PKP	15 12 38.5		+2.3
CPUP	*[8nm,1*00:1]*	pPKP	pPKP	15 12 50.0	+1	+1

I.S.C. Bulletin events for 1996 March



Magnitudes ○ 8 ○ 5 • < 5

5532 events

Robinson Projection, centred on 0°N 130°E

INTRODUCTION

Content of the Catalogue

The *Regional Catalogue of Earthquakes* comprises all of the summary information concerning each event which has previously been published in the *Bulletin of the International Seismological Centre*, each Catalogue containing the events for six months' Bulletins. The data are laid out in tabular form in the Catalogue as opposed to the 'free-format' style of the Bulletin and the description of the various events is re-arranged into four separate lists for easy reference.

For those who are subscribers to the Catalogue but not to the Bulletin, the following (adapted from the Introduction to the Bulletin) is a description of the procedures, both computational and otherwise, which are used by the ISC to produce the estimates of earthquake focal parameters:

Both preliminary estimates of earthquake foci and observational data are collected in computer-readable form on such media as magnetic tapes, punched cards and punched paper tape as well as in the form of coded data sheets and station bulletins, the latter being converted into computer-readable form at the Centre. These data are entered into a combination disc-magnetic tape storage system as soon as possible after receipt. When a month's data are to be processed, the relevant estimates and observations are arranged in chronological order and the revision process begins.

All stations and agencies have been instructed to give their observational times and the times of epicentral estimates in Universal Coordinated Time *uncorrected* for either the effects of small movements of the earth relative to the axes of rotation or seasonal variations. The times listed can therefore be assumed to be UTC.

Those epicentral estimates whose positions are the same within two degrees in both latitude and longitude and whose times of origin are the same within 60 seconds are considered to be estimates of the same event and henceforward treated as such. Once all of the preliminary estimates have been identified, then all of the observations (an observation being defined as all the data reported by a given observatory concerning a single event) which follow the earliest estimate by 40 minutes are considered individually to determine whether or not each should be associated with the event. A *preliminary* association is made if:

1. the first longitudinal arrival is identified as a crustal phase, i.e. Pg, P* or Pn, the station is within 15° of the epicentre and the absolute value of the residual against the given phase is less than 70 seconds or failing that,
2. the otherwise unspecified first longitudinal arrival (abbreviated to 'P/PKP') has a residual of less than 70 seconds against the P, PKP (DEF, BC or AB branches, according to Shimshoni (1967)) or failing that,
3. P/PKP has a residual of less than 70 seconds against P diffracted around the core boundary or failing that,
4. in the absence of P/PKP, the first transverse arrival is identified as a crustal phase (Sg, S* or Sn), the station is within 15° of the epicentre and the residual is less than 70 seconds or failing that,
5. in the absence of P/PKP, the otherwise unspecified first transverse arrival ('S/SKS') has a residual of less than 70 seconds against the S or SKS (AC and DF branches) tables.

Each of the above possibilities is considered in turn and is given a priority in the above order. Where it is possible to associate an observation with more than one event, the association which results in a higher priority level or has a smaller residual at the same priority level would be the one taken. It must be noted here that the associations referred to above are only provisional and that at later stages in the procedure they are refined by both automatic and manual means.

A revision of the focal parameters is then attempted using a program based on the Method of Uniform Reduction, a variant of the Method of Least Squares (Jeffreys 1961) where each equation of condition is weighted with w_i

$$w_i^{-1} = 1 + \mu \exp\{h^2(\xi_i - \alpha)^2\}, \qquad (1)$$

where $h^2 = \dfrac{1}{2\sigma^2}$

and $\alpha = \sum_1^n w_i\xi_i \Big/ \sum_1^n w_i,$

and μ and σ are approximated by inspecting the frequency distribution of residuals (Buland, 1986). The computation then proceeds as in the case of a classic Least Squares solution. All computations of focal parameters are based on the *Seismological Tables* by Jeffreys and Bullen (1940) and only P, Pg, P* and Pn observations are included. Calculated travel-times used to compute residuals are corrected for the earth's ellipticity using the method suggested by Gutenberg and Richter (1933) and developed by Jeffreys and Bullen (Bullen 1937). The correction is of the form:

$$\delta t = f(\Delta)(h + H)$$

where h and H are the heights of the station and epicentre above the mean sphere and $f(\Delta)$ is as given on page 50 of the 1967 edition of the *Seismological Tables*.

During this revision procedure the tentative associations referred to above are refined. In general, observations whose residuals have an absolute value between 20 and 50 seconds are returned to the unassociated data stream; duplicate readings are eliminated, preference being given to those observations received directly from the stations themselves and those which are marked as final readings; and all observations and epicentral estimates are examined in detail by a seismologist for evidence that can alter the association. Once a final set of associations has been arrived at, the revised estimate is re-calculated with only those data.

If the P-data have not been sufficient to determine depth of focus, or if the apparent value is negative, the final revision is carried out with the depth fixed from other evidence or held at an arbitary value, commonly at the base of the crust. If the depth is obtained from pP-P intervals, at least three consistent observations are required. An estimate of the 90% confidence interval (introduced in 1986 Catalogue) is *always* calculated for each of the focal parameters which has been revised. Depth of focus is expressed in kilometres from the surface.

Calculation of unified magnitudes, M_b follows the procedure outlined by Gutenberg and Richter (1956) for P waves of period ≤ 3 seconds. If Q is the depth-distance factor and q_i is $\log_{10}$ (amplitude in nanometres/period in seconds) for the ith station, then for *n* observations:

$$M_b = n^{-1} \sum_1^n [Q(\Delta_i, h) + q_i] - 3 \qquad (2)$$

assuming the amplitude is observed on a short-period vertical instrument. Station corrections are ignored as are observations at distances less than 21° or more than 100°. An average unified magnitude is calculated and printed in the epicentre line. If this is derived from three or more stations, the magnitude is printed in **bold**.

Where amplitudes and periods are given for surface waves in the 10 – 60 second range, a surface-wave magnitude, Ms, is calculated for that observation by employing the 'Prague formula' (Vanek *et al.* 1962).

$$M_s = \log_{10}\left(\frac{A}{T}\right)_{max} + 1.66 \log \Delta + 3.3$$

where A is the vertical or resultant horizontal amplitude, T is the mean period and Δ is the epicentral distance in degrees. Ms is calculated only for events at depths 60 km or less in the distance range 5° – 160°. An average Ms is calculated from observations reported from stations in the distance range 20° – 160°. The value is printed in **bold** if three or more observations are used.

All phases except the longitudinal first-motion are then compared with the seismological tables by a logical process which associates each supplementary phase with the most plausible branch of the travel-time curves (Arnold *et al.* 1968), provided the residual is less than 7.5 seconds. This process is carried out only for observations where the epicentral distance is greater than 25° and then only on epicentres which have been successfully revised by the procedures described above. Details of the phases which can be identified are given in the first section of the list on the inside back cover of the *Bulletin*.

If the revision process has been deemed successful, the revised estimate of epicentral position etc. will be adopted and all residuals will be calculated against these focal parameters. However, if the revision process is unsuccessful, one of the preliminary estimates is selected for adoption and the distances and residuals are re-calculated against that estimate. For each adopted epicentre a geographical region corresponding to that given by Flinn and Engdahl (1965) and Flinn, Engdahl and Hill (1974) is found.

After station readings have been associated with epicentral estimates supplied by other agencies, the residue of unassociated data is subjected to a search to find associations that lead to new events. The computer program used is similar to that developed for the US National Earthquake Information Service (Engdahl and Gunst, 1966). These new events are characterised by their listing under an ISC epicentral estimate only. Some of these events may have arisen from chance misassociation. It is essential that before any tectonic or seismological significance be attached to unusual earthquakes, the readings on which the events are based should be carefully examined and the reliability of the determinations assessed. This procedure began in the *Bulletin* for 1974 January.

It should be noted that the names used to classify seismic and geographic regions are meant to be only a guide to their location and in no way to be taken to imply recognition of sovereignity or an official view of the ISC on any political matter. The boundaries of these regions follow integral degree lines of latitude and longitude and this system of division leads, on occasion, to discrepancies with state or national frontiers.

Layout of the Catalogue

Ordering

The Catalogue proper is divided into four main sections: Major Earthquakes, Felt and Damaging Earthquakes, Probable Explosions and the Regional Catalogue of Events. In addition to this, there is a list of all seismological observatories, past and present, known to the Centre, this being itself divided into three and, finally, a list of all agencies contributing epicentral estimates.

The period covered by a Catalogue is indicated at the top of every page by the year in arabic numbers surrounded by the range of months covered, given in roman numerals. The heading for each page also includes the page number on the edge nearest the binding and a reference appropriate to each section nearest the cut, or outside, edge. In each case, these quick-reference headings are constructed like a dictionary so that the heading on the left-hand page refers to the first entry on that page, that on the right-hand page to the last entry.

The list of Major Earthquakes contains all large-magnitude earthquakes and is divided into three parts depending upon the focal depth. The first section, Major Shallow Focus Earthquakes contains those earthquakes with a magnitude of 5·5 or more whose focal depth is 60 km or less. The second list, Major Intermediate Focus Earthquakes, contains all earthquakes with a magnitude again equal to or greater than 5·5, but with a focal depth of more than 60 km but less than or equal to 300 km. And finally, Major Deep Focus Earthquakes contains all those with a magnitude of 5·0 or more and with a depth in excess of 300 km. Within each of these three sections all earthquakes are listed in chronological order.

The list of Felt and Damaging Earthquakes contains all located events for which macroseismic reports have been received. These events are ordered chronologically.

The section entitled Probable Explosions contains all events which are either confirmed or suspected of being man-made in nature. This, of course, includes underground nuclear tests and quarry blasts but does *not* include such events as rock bursts. Again, the events in this section are listed chronologically.

The Regional Catalogue of Events, which forms the bulk of the publication, is a list of all seismic events reported to the ISC sorted into the seismic and geographical regions devised by Flinn and Engdahl (1965), and Flinn, Engdahl and Hill (1974). Within each geographical region the earthquakes are, as always, listed in chronological order.

A list of seismic and geographical regions can be found as an appendix to the Table of Contents beginning on page iii, together with the page number where a particular region's entries start. If there is no page number opposite a particular geographical region, there were no earthquakes in the region for the period covered by the Catalogue. The quick-reference headings for this section are simply the seismic and geographical region numbers, seismic in roman (or ordinary) type, geographical in **bold**.

The list of seismological observatories is divided into three sections:

a) A List of Seismological Observatories in Alphabetical Order of the Station Name as it occurs in the Bulletin including the basic parameters viz., the location of the station, its international three-letter code, its geographical co-ordinates, altitude above mean sea-level in metres and various remarks, such as the dates of opening and closing and the characteristics of the timing system used. Here 'alphabetical order' is taken to mean the position a name would occupy if it were spelled out in full, e.g. 'St Sauveur' would be ordered as if it were spelled 'Saint Sauveur'.

b) The List of Seismological Observatories in Alphabetical Order of Station Code is, as its title suggests, a cross reference between station code and station name. Where a station has been assigned more than one code, another code is listed *after* the station name and this should be interpreted as the one recognized as the most common, or 'primary' one.

c) The List of Seismological Observatories in Order of Geographical Zone is, like the previous section, merely a list of the code and station name in alphabetical order of an arbitrary 'zone'. These zones, which are not to be confused with the Flinn-Engdahl regions used to classify the earthquakes in the Catalogue are arranged alphabetically, first by continent or oceanic region, then by country. In some cases, either where the land area covered is vast, as in the case of the US, or where the density of either earthquakes or seismic stations is high, as in the case of Japan or Indonesia, up to two more subdivisions are used. For example, Japan is listed, of course, in Asia then it is subdivided first by Island and then by Prefecture.

These three lists therefore comprise a cross-referencing system that enables the user to find the basic parameters of a station, knowing only the station name, code or approximate location.

The list of Agencies Contributing Epicentral Estimates is simply given in alphabetical order of the agency code.

Layout of Entries

All entries in the first four sections of the Catalogue are essentially identical in form.

Below is an entry for the Qir earthquake in Southern Iran, taken from the Regional Catalogue for 1972 January-June:

	(353) Southern Iran							
ISC	**IV**	**10 02 06 50 ± 1·3**	**28·39 ± 0·020N**	**052·78 ± 0·015E**	**11 ± 7·9**	**6·0b**	**355**	**1-157**
QUE	IV	10 02 06 48	26·5N	052·4E	96			¶72iv0295
SHI	IV	10 02 06 48·0	28·0N	052·7E				
MOS	IV	10 02 06 53	28·5N	052·9E		6·4b		
NEIS	IV	10 02 06 53·2	28·4N	052·8E	33	6·1b,6·9s		
BCIS	IV	10 02 06 56	28·5N	052·7E				
MOS	Ms = 6·8							
MOS	Press report. Ground cracks extending 20 km to depths of several metres were made. Roads							
MOS	and bridges destroyed. Many date palms felled. 60 villages totally wrecked. Approximately							
MOS	40000 homeless. Preliminary number dead amounted to 4000							
BCIS	Severe damage in the region of Qir (Qhir, Ghir) I = IX MCS and greater at the epicentre							
BCIS	Press report gives Qir and 45 villages completely destroyed. 75% of the population of Qir killed							
BCIS	Total of 5044 dead, 1336 severely injured, 64 other villages suffered damage. Total of 3174							
BCIS	houses destroyed. Area of destruction extended over 3000 km². Strongly felt at Jahrom							
BCIS	and Firuzabad. Felt also at Fesa, Lar and Shiraz.							

This entry should be interpreted as follows: the first six lines are epicentral estimates by the six agencies whose codes are shown on the left. The first line is always the adopted epicentre, in this case the ISC re-calculation, and is always printed in **bold** type. All the other estimates are then listed in chronological order following the adopted one. The first group of numbers in each of these lines is the origin time, first the month in roman numerals, then the day, hour, minutes, and seconds followed by an error, where known. Next are given the geographical coordinates of the epicentre along with errors if known, the depth of focus in kilometres and estimates of magnitude with an identifying letter following each. If the adopted epicentre is an ISC one, then follows the number of observations on which this re-calculated epicentre is based, in this case 355, and then the epicentral distances to the nearest and furthest observations printed to the nearest degree and separated by a hyphen (-). Right-justified on the second line is a paragraph sign (¶) followed by the sequential event identifier, which is made up of a two-digit year number, a lower-case roman numeral representing the month and a four-digit sequence number indicating its place in the appropriate Bulletin. Following all of the epicentral estimates the self-explanatory commentaries are printed.

It should also be noted that the zones used to classify stations are meant to be only a handy guide to the location of the various seismic observatories and should in no way be taken to imply recognition of sovereignty or an official view of the ISC on any political matter.

The last section is a list of agencies which have contributed epicentral estimates to the ISC. Full postal addresses are provided.

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MAJOR EARTHQUAKES

MAJOR SHALLOW FOCUS EARTHQUAKES
(h≤60k,M≥5.5)

Agency		Origin Time mo d h m s	φ °	λ °	h km	Mag	n	Δ-Rng °	
		(229) Off east coast of Honshu							
ISC	I	01 06 59 55.1± 1.0	40.65N± .017	143.60E± .030	7±6.1	5.7b,6.4s	636	2-162	
BJI	I	01 06 59 54.8	40.73N	143.47E	14	5.7b,6.7s			¶95i0059
MOS	I	01 06 59 54.9	40.68N	143.54E	12	6.3b,6.7s			
JMA	I	01 06 59 55.7± .1	40.60N± .00	143.84E± .01	0	6.4			
NEIC	I	01 06 59 55.9	40.70N	143.55E	15	5.8b,6.2s			
EIDC	I	01 06 59 59.3	40.69N	143.51E	27	4.9b			
HRVD	I	01 07 00 01.7± .1	40.73N± .01	143.65E± .01	15				

JMA Felt I-II J Aomori, Hachinohe, Monoka, Urakawa, Kushiro
NEIC Mw6.4(HRV), Mw6.5(GS). Felt I=III MM.
NEIC Radiated energy from the P-wave first-motion solution: 4.2±0.5×10^{13}Nm/12
NEIC MS 5.9 (BRK). Mo=3.4×10^{18}Nm (PPT). Two events about 3 seconds apart. Depth from broadband displacement seismograms, based on first event.
NEIC Fault plane solution P waves. NP1:ϕ_s24°,δ86°,λ90°. NP2 ϕ_s204°,δ64°,λ90°. Principal axes: T Plg49°,Azm294°; P Plg41°,Azm114°. The local mechanism is poorly controlled and corresponds to reverse faulting. The preferred fault plane is NP2.
NEIC Moment tensor solution: s47, scale 10^{18}Nm; M_{rr}1.47; $M_{\theta\theta}$-0.67; $M_{\phi\phi}$-0.80; $M_{r\theta}$2.36; $M_{r\phi}$5.53; $M_{\theta\phi}$-0.85. Depth 8km; Principal axes: T 6.24,Plg51°,Azm288°; N -0.06,Plg5°, Azm24°; P -6.17,Plg38°,Azm118°. Best double couple: $M_0$6.2×10^{18}Nm; NP1:ϕ_s240°,δ8°, λ126°. NP2 ϕ_s24°,δ83°,λ85°.
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s68,c168; Mantle waves: s41,c50. Half duration: 4±0. Moment tensor: Scale 10^{18}Nm; M_{rr}1.39±.01; $M_{\theta\theta}$-0.02±.01; $M_{\phi\phi}$-1.37±.01; $M_{r\theta}$2.11±.05; $M_{r\phi}$4.62±.05; $M_{\theta\phi}$-0.30±.01. Principal Axes: T 5.28,Plg53°,Azm298°; N -0.02,Plg3°,Azm204°; P -5.26,Plg37°,Azm111°. Best double couple: $M_0$5.3×10^{18}Nm, NP1 ϕ_s181°,δ8°,λ67°. NP2 ϕ_s24°,δ82°,λ93°.

		(228) Near east coast of Honshu							
ISC	I	01 12 30 05.5± .35	40.05N± .022	142.74E± .044	44±3.1	5.1b,4.7s	253	1-154	
BJI	I	01 12 30 04.2	40.01N	142.69E	44	5.2b,4.7s			¶95i0133
JMA	I	01 12 30 04.3± .1	40.07N± .00	142.76E± .01	25±1	4.9			--
NEIC	I	01 12 30 05.3	40.05N	142.69E	42	5.2b,4.6s			
MOS	I	01 12 30 05.7	40.09N	142.67E	46	5.6b,4.8s			
HRVD	I	01 12 30 07.9±1.4	40.06N	142.67E	15				
EIDC	I	01 12 30 09.2	39.99N	142.63E	64	4.3b			

JMA Felt I-II J Monoka
NEIC Mw5.2(HRV)
NEIC Felt I-III MM at Misawa
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s14,c20. Half duration: 1±0. Moment tensor: Scale 10^{16}Nm; M_{rr}1.91±.60; $M_{\theta\theta}$-0.23±.59; $M_{\phi\phi}$-1.68±.50; $M_{r\theta}$5.08±1.29; $M_{r\phi}$3.22±1.70; $M_{\theta\phi}$-1.95±.72. Principal Axes: T 6.27,Plg53°,Azm342°; N 0.57,Plg12°,Azm235°; P -6.84,Plg34°,Azm136°. Best double couple: $M_0$6.6×10^{16}Nm, NP1: ϕ_s164°,δ16°,λ38°. NP2 ϕ_s57°,δ80°,λ103°.

		(229) Off east coast of Honshu							
ISC	I	03 06 01 23.8± .94	40.47N± .024	143.61E± .054	17±6.7	5.0b,4.7s	189	1-89	
BJI	I	03 06 01 24.4	40.54N	143.38E	24	5.1b,4.7s			¶95i0447
JMA	I	03 06 01 24.5± .1	40.46N± .01	143.70E± .02	0	4.8			
NEIC	I	03 06 01 25.6	40.51N	143.45E	27	5.1b,4.6s			
MOS	I	03 06 01 25.8	40.50N	143.54E	33	5.5b			
EIDC	I	03 06 01 28.0	40.42N	143.59E	34	4.0b			
		(149) Drake Passage							
ISC	I	03 16 11 57.1± .17	57.68S± .030	65.97W± .087	14	6.0b,5.6s	463	23-180	
BJI	I	03 16 11 56.0	57.69S	65.88W	16	6.1b,6.0s			¶95i0535
NEIC	I	03 16 11 57.0	57.70S	65.88W	14	6.2b,5.6s			
MOS	I	03 16 12 00.6	57.61S	66.19W	33	6.2b,5.5s			
HRVD	I	03 16 12 00.7± .1	57.67S± .02	66.42W± .03	16				
EIDC	I	03 16 12 01.9	57.75S	66.02W	39	5.7b			

NEIC Mw5.9(HRV), Mw5.7(GS).
NEIC Depth from broadband displacement seismograms.
NEIC Radiated energy from the USGS moment tensor solution: 1.0±0.2×10^{13}Nm/9
NEIC Moment tensor solution: s16, scale 10^{17}Nm; M_{rr}4.19; $M_{\theta\theta}$-2.75; $M_{\phi\phi}$-1.43; $M_{r\theta}$0.64; $M_{r\phi}$0.66; $M_{\theta\phi}$1.84. Depth 19km; Principal axes: T 4.37,Plg79°,Azm310°; N -0.32,Plg11°, Azm125°; P -4.05,Plg1°,Azm215°. Best double couple: $M_0$4.2×10^{17}Nm; NP1:ϕ_s316°,δ45°, λ106°. NP2 ϕ_s114°,δ47°,λ74°.
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s60,c124; Half duration: 2±0. Moment tensor: Scale 10^{17}Nm; M_{rr}6.29±.09; $M_{\theta\theta}$-2.79±.11; $M_{\phi\phi}$-3.50±.11; $M_{r\theta}$1.12±.30; $M_{r\phi}$2.58±.31; $M_{\theta\phi}$4.64±.11. Principal Axes: T 7.48,Plg66°,Azm307°; N 0.41, Plg23°,Azm141°; P -7.89,Plg5°,Azm49°. Best double couple: $M_0$7.7×10^{17}Nm, NP1:ϕ_s115°, δ45°,λ56°. NP2 ϕ_s339°,δ54°,λ119°.

		(7) Andreanof Islands							
ISC	I	04 02 47 28.9± .19	51.55N± .042	173.66W± .032	47±6.6	5.5b,4.9s	377	2-160	
MOS	I	04 02 47 25.7	51.39N	173.47W	33	5.7b,4.9s			¶95i0618
BJI	I	04 02 47 27.0	51.60N	173.70W	38	5.4b,5.1s			
NEIC	I	04 02 47 27.2	51.58N	173.65W	33	5.5b,4.8s			
HRVD	I	04 02 47 29.2± .6	51.70N± .06	173.39W± .08	15				
EIDC	I	04 02 47 29.9	51.60N	173.72W	42	4.9b			

NEIC Mw5.3(HRV)
NEIC ML 5.1 (PMR). Felt I=III MM on Atka.
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s41,c59; Half duration: 1±2. Moment tensor: Scale 10^{16}Nm; M_{rr}7.04±.30; $M_{\theta\theta}$-5.53±.31; $M_{\phi\phi}$-1.51±.30; $M_{r\theta}$5.48±1.55; $M_{r\phi}$3.49±1.36; $M_{\theta\phi}$-4.13±.45. Principal Axes: T 9.45,Plg70°,Azm327°; N 1.07,Plg0°,Azm58°; P -10.52,Plg20°,Azm148°. Best double couple: $M_0$1.0×10^{17}Nm, NP1: ϕ_s239°,δ25°,λ91°. NP2 ϕ_s58°,δ65°,λ90°.

		(229) Off east coast of Honshu							
ISC	I	04 04 54 49.2± .95	40.27N± .026	143.48E± .052	20±6.8	5.1b,4.8s	211	1-149	
BJI	I	04 04 54 48.6	40.32N	143.33E	21	5.1b,4.7s			¶95i0636
NEIC	I	04 04 54 49.9	40.31N	143.40E	24	5.3b,4.7s			
JMA	I	04 04 54 50.0± .4	40.27N± .01	143.58E± .02	3±5	4.9			
MOS	I	04 04 54 51.6	40.31N	143.39E	43	5.5b,5.0s			
EIDC	I	04 04 54 55.0	40.24N	143.37E	56	4.4b			
		(684) Easter Island Cordillera							
ISC	I	04 06 28 39.3± .42	56.0S± .12	123.3W± .13	10	5.1b,5.8s	128	32-178	
BJI	I	04 06 28 38.3	56.07S	123.26W	12	4.8b,6.0s			¶95i0650
EIDC	I	04 06 28 38.4	56.02S	123.44W	0	4.5b			
NEIC	I	04 06 28 39.0	56.06S	123.23W	10	5.0b,5.8s			
MOS	I	04 06 28 42.7	56.07S	122.76W	10	5.7b			
HRVD	I	04 06 28 46.6± .1	55.90S± .01	123.45W± .02	15				

NEIC Ms6.0(BRK), Mw6.0(HRV). Less reliable solution.
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s75,c168; Half duration: 2±5. Moment tensor: Scale 10^{17}Nm; M_{rr}-0.19±.09; $M_{\theta\theta}$5.40±.12; $M_{\phi\phi}$-5.21±.10; $M_{r\theta}$1.38±.29; $M_{r\phi}$-1.25±.30; $M_{\theta\phi}$8.53±.10. Principal Axes: T 10.17,Plg3°,Azm331°; N 0.08, Plg80°,Azm80°; P -10.25,Plg10°,Azm241°. Best double couple: $M_0$1.0×10^{18}Nm, NP1: ϕ_s16°,δ81°,λ-175°. NP2 ϕ_s286°,δ85°,λ-9°.

		(221) Kuril Islands							
ISC	I	04 23 14 41.4± .57	43.16N± .032	147.49E± .047	45±5.2	5.3b,4.7s	297	1-152	
MOS	I	04 23 14 38.0	43.12N	147.89E	33	5.9b,4.8s			¶95i0725
BJI	I	04 23 14 41.3	43.33N	147.44E	49	5.2b,4.6s			
NEIC	I	04 23 14 42.0	43.25N	147.45E	49	5.3b,4.7s			
EIDC	I	04 23 14 43.8	43.34N	147.29E	57	4.5b			
JMA	I	04 23 14 44.3± .3	43.13N± .03	147.27E± .03	44	5.2			
HRVD	I	04 23 14 46.0± .5	43.36N± .05	147.83E± .07	60±4.4				

MOS Felt I=V-VI MSK Malokuril'sk, IV Mendeleevo, Golovnino, III Burevestnik, II Kuril'sk
NEIC Mw5.3(HRV)
NEIC Felt I=VI MM on Shikotan; IV MM on Kunashir, III MM on Iturup.
JMA Felt I=II J Kushiro
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s24,c33; Half duration: 1±1. Moment tensor: Scale 10^{16}Nm; M_{rr}4.71±.32; $M_{\theta\theta}$-1.79±.45; $M_{\phi\phi}$-2.91±.47; $M_{r\theta}$3.26±.54; $M_{r\phi}$4.75±.53; $M_{\theta\phi}$-5.77±.54. Principal Axes: T 7.02,Plg66°,Azm282°; N 3.30, Plg10°,Azm37°; P -10.32,Plg21°,Azm131°. Best double couple: $M_0$8.7×10^{16}Nm, NP1: ϕ_s239°,δ26°,λ115°. NP2:ϕ_s33°,δ67°,λ79°.

		(229) Off east coast of Honshu							
ISC	I	05 09 18 40.1± .3	39.31N± .021	143.48E± .043	12±7.6	5.2b,5.3s	285	1-162	
JMA	I	05 09 18 40.9± .1	39.31N± .01	143.67E± .02	0	5.1			¶95i0787
BJI	I	05 09 18 42.2	39.34N	143.32E	31	5.3b,5.3s			
NEIC	I	05 09 18 43.1	39.32N	143.37E	32	5.3b,5.1s			
MOS	I	05 09 18 43.5	39.38N	143.35E	33	5.7b,5.4s			
HRVD	I	05 09 18 44.1± .7	39.24N± .07	143.66E± .08	33				
EIDC	I	05 09 18 45.1	39.23N	143.56E	40	4.3b			

NEIC Mw5.2(HRV).
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s24,c28; Half duration: 1±1. Moment tensor: Scale 10^{16}Nm; M_{rr}4.39±.35; $M_{\theta\theta}$-0.51±.57; $M_{\phi\phi}$-3.88±.43; $M_{r\theta}$1.95±1.04; $M_{r\phi}$5.79±.80; $M_{\theta\phi}$-1.16±.46. Principal Axes: T 7.55,Plg63°,Azm289°; N -0.15,Plg1°,Azm198°; P -7.40,Plg27°,Azm107°. Best double couple: $M_0$7.5×10^{16}Nm, NP1: ϕ_s195°,δ18°,λ87°. NP2:ϕ_s18°,δ72°,λ91°.

		(229) Off east coast of Honshu							
ISC	I	05 12 07 32.8± .22	39.19N± .023	143.62E± .036	4	5.1b,5.0s	253	1-150	
JMA	I	05 12 07 34.2± .4	39.18N± .01	143.84E± .02	4±4	4.9			¶95i0808
BJI	I	05 12 07 35.8	39.25N	143.46E	27	5.1b,5.0s			
MOS	I	05 12 07 36.7	39.25N	143.59E	33	5.5b,4.8s			
NEIC	I	05 12 07 36.7	39.21N	143.51E	30	5.2b,4.9s			
EIDC	I	05 12 07 38.4	39.12N	143.68E	34	4.3b			
HRVD	I	05 12 07 39.9±1.2	39.21N	143.47E	30				

NEIC Mw5.2(HRV).
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s11,c13; Half duration: 1±0. Moment tensor: Scale 10^{16}Nm; M_{rr}1.09±.45; $M_{\theta\theta}$1.03±.79; $M_{\phi\phi}$-2.12±.59; $M_{r\theta}$-0.01±1.29; $M_{r\phi}$5.44±.88; $M_{\theta\phi}$-2.20±.45. Principal Axes: T 5.57,Plg48°,Azm244°; N 1.02,Plg22°,Azm0°; P -6.60,Plg34°,Azm105°. Best double couple: $M_0$6.1×10^{16}Nm, NP1: ϕ_s250°,δ23°,λ162°. NP2:ϕ_s357°,δ83°,λ68°.

		(187) New Caledonia							
ISC	I	05 23 30 11.1± .1	22.05S± .041	168.83E± .046	53±9.4	5.5b,5.3s	331	2-164	
BJI	I	05 23 30 07.4	21.99S	168.94E	32	5.5b,5.5s			¶95i0875
NEIC	I	05 23 30 07.4	22.03S	168.90E	29	5.6b,5.4s			
MOS	I	05 23 30 07.9	21.98S	169.53E	33	6.0b			
HRVD	I	05 23 30 12.3± .1	22.04S± .02	168.88E± .02	29				
EIDC	I	05 23 30 12.8	21.88S	168.87E	61	4.9b			

NEIC Mw5.7(HRV).
NEIC Mo=3.7×10^{17}Nm (PPT).
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s59,c112; Half duration: 1±8. Moment tensor: Scale 10^{17}Nm; M_{rr}1.35±.04; $M_{\theta\theta}$0.05±.07; $M_{\phi\phi}$-1.40±.07; $M_{r\theta}$-0.04±.11; $M_{r\phi}$2.57±.11; $M_{\theta\phi}$3.37±.05. Principal Axes: T 3.97,Plg36°,Azm310°; N 0.86, Plg47°,Azm167°; P -4.83,Plg19°,Azm55°. Best double couple: $M_0$4.4×10^{17}Nm, NP1:ϕ_s99°, δ49°,λ14°. NP2:ϕ_s359°,δ79°,λ138°.

		(229) Off east coast of Honshu							
ISC	I	06 16 41 30.1± .3	39.14N± .022	143.59E± .040	10±7.8	5.2b,5.2s	307	1-154	
BJI	I	06 16 41 29.8	39.17N	143.47E	17	5.2b,5.3s			¶95i1003
JMA	I	06 16 41 29.9± .4	39.11N± .01	143.88E± .02	3±4	5.3			
NEIC	I	06 16 41 30.8	39.12N	143.51E	18	5.2b,5.1s			
HRVD	I	06 16 41 32.6± .8	39.05N± .10	143.72E± .10	15				
MOS	I	06 16 41 34.7	39.23N	143.32E	46	5.5b,5.3s			
EIDC	I	06 16 41 36.5	39.02N	143.54E	57	4.4b			

NEIC Mw5.4(HRV).
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s20,c27; Half duration: 1±0. Moment tensor: Scale 10^{16}Nm; M_{rr}5.17±.49; $M_{\theta\theta}$0.49±.62; $M_{\phi\phi}$-5.66±.58; $M_{r\theta}$6.26±1.49; $M_{r\phi}$8.92±1.55; $M_{\theta\phi}$-1.27±.59. Principal Axes: T 12.31,Plg56°,Azm316°; N -0.12,Plg10°,Azm210°; P -12.19,Plg32°,Azm114°. Best double couple: $M_0$1.2×10^{17}Nm, NP1:ϕ_s171°,δ16°,λ50°. NP2:ϕ_s32°,δ77°,λ101°.

		(153) South Sandwich Islands region							
ISC	I	06 18 01 13.0± .28	56.50S± .057	25.4W± .12	33	5.4b,4.9s	114	16-158	
EIDC	I	06 18 01 09.4	56.56S	25.67W	0	4.9b			¶95i1013
BJI	I	06 18 01 12.5	56.44S	25.42W	33	5.3b,5.6s			
NEIC	I	06 18 01 12.8	56.50S	25.32W	33	5.2b,4.8s			
HRVD	I	06 18 01 20.0± .2	56.73S± .03	25.28W± .06	15				

NEIC Mw5.5(HRV).
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s42,c76; Half duration: 1±3. Moment tensor: Scale 10^{17}Nm; M_{rr}1.20±.04; $M_{\theta\theta}$0.13±.05; $M_{\phi\phi}$-1.32±.05; $M_{r\theta}$-0.51±.11; $M_{r\phi}$1.57±.15; $M_{\theta\phi}$0.51±.04. Principal Axes: T 1.98,Plg65°,Azm252°; N 0.29, Plg0°,Azm342°; P -2.26,Plg25°,Azm73°. Best double couple: $M_0$2.1×10^{17}Nm, NP1:ϕ_s163°, δ20°,λ91°. NP2:ϕ_s342°,δ70°,λ90°.

		(153) South Sandwich Islands region							
ISC	I	06 19 01 51.4± .34	56.56S± .067	25.7W± .13	33	5.1b,4.9s	69	16-158	
NEIC	I	06 19 01 51.0	56.63S	25.72W	33	5.0b			¶95i1027
BJI	I	06 19 01 51.3	56.63S	25.72W	39	5.1b,5.8s			
HRVD	I	06 19 01 55.7± .4	56.64S± .05	25.53W± .08	15				
EIDC	I	06 19 01 57.2	56.74S	26.27W	68	4.5b			

NEIC Mw5.4(HRV).
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s23,c38; Half duration: 1±1. Moment tensor: Scale 10^{17}Nm; M_{rr}0.77±.04; $M_{\theta\theta}$0.00±.05; $M_{\phi\phi}$-0.77±.05; $M_{r\theta}$0.05±.10; $M_{r\phi}$1.33±.16; $M_{\theta\phi}$0.30±.04. Principal Axes: T 1.57,Plg59°,Azm284°; N 0.01, Plg10°,Azm176°; P -1.57,Plg29°,Azm80°. Best double couple: $M_0$1.6×10^{17}Nm, NP1: ϕ_s143°,δ19°,λ55°. NP2:ϕ_s359°,δ75°,λ101°.

		(228) Near east coast of Honshu							
ISC	I	06 22 37 37.3± .24	40.23N± .014	142.23E± .023	51±2.2	6.6b,6.9s	986	0-165	
BJI	I	06 22 37 34.3	40.27N	142.14E	33	6.2b,7.0s			¶95i1065
NEIC	I	06 22 37 34.3	40.25N	142.18E	27	6.7b,6.9s			
JMA	I	06 22 37 37.1± .1	40.22N± .01	142.31E± .02	48±3	7.1			
MOS	I	06 22 37 37.4	40.29N	142.18E	50	7.2b,7.2s			
EIDC	I	06 22 37 41.0	40.21N	142.15E	73	6.0b			
HRVD	I	06 22 37 42.6± .1	40.33N± .01	142.41E± .01	48±.3				

NEIC Mw6.9(GS), Mw7.0(HRV). Casualties I=VII MM.
NEIC Radiated energy from the P-wave first-motion solution: 3.8±0.4×10^{14}Nm/39

FELT AND DAMAGING EARTHQUAKES

(159) North Island, New Zealand
ISC I 01 00 12 50.3±.45 39.29S±.035 175.36E±.061 20±6.2 30 0-4
WEL I 01 00 12 50.6 39.32S 175.39E 8 4.3L ¶95I0003
WEL Felt Ohakune.

(285) Sumbawa region
ISC I 01 05 04 46±1.0 9.26S±.084 118.19E±.087 91±10 4.9b 51 2-154
BJI I 01 05 04 44.2 9.57S 118.10E 93 5.1b ¶95I0043
NEIC I 01 05 04 44.4 9.57S 118.13E 98 5.2b
EIDC I 01 05 05 00.1 10.94S 119.10E 0
NEIC Felt I=III MM at Denpasar, Bali.

(229) Off east coast of Honshu
ISC I 01 06 59 55±1.0 40.65N±.017 143.60E±.030 7±6.1 5.7b,6.4s 636 2-162
BJI I 01 06 59 54.8 40.73N 143.47E 14 5.7b,6.7s ¶95I0059
MOS I 01 06 59 54.9 40.68N 143.54E 12 6.3b,6.7s
JMA I 01 06 59 55.7±.1 40.60N±.00 143.84E±.01 0 6.4
NEIC I 01 06 59 55.9 40.70N 143.55E 15 5.8b,6.2s
EIDC I 01 06 59 59.3 40.69N 143.51E 27 4.9b
HRVD I 01 07 00 01.7±.1 40.73N±.01 143.65E±.01 15
JMA Felt I=II J Aomori, Hachinohe, Morioka, Urakawa, Kushiro
NEIC Mw6.4(HRV), Mw6.5(GS). Felt I=III MM.
NEIC Radiated energy from the P-wave first-motion solution: 4.2±0.5x10[13]Nm/12
NEIC MS 5.9 (BRK). Mo=3.4x10[18]Nm (PPT). Two events about 3 seconds apart. Depth from broadband displacement seismograms, based on first event.
NEIC Fault plane solution: P waves. NP1:φs24°,δ86°,λ90°. NP2:φs204°,δ4°,λ90°. Principal axes: T Plg49°,Azm294°; P Plg41°,Azm114°. The focal mechanism is poorly controlled and corresponds to reverse faulting. The preferred fault plane is NP2.
NEIC Moment tensor solution: s47, scale 10[18]Nm; M_{rr}1.47; $M_{\theta\theta}$-0.67; $M_{\phi\phi}$-0.80; $M_{r\theta}$2.30; $M_{r\phi}$5.53; $M_{\theta\phi}$-0.85. Depth 8km; Principal axes: T 6.24,Plg51°,Azm288°; N -0.06,Plg5°,Azm24°; P -6.17,Plg38°,Azm118°; Best double couple: Mo6.2x10[18]Nm; NP1:φs240°,δ8°,λ126°. NP2:φs24°,δ83°,λ85°.
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s68,c168; Mantle waves: s41,c50; Half duration: 4s0. Moment tensor: Scale 10[18]Nm; M_{rr}1.39±.01; $M_{\theta\theta}$-0.02±.01; $M_{\phi\phi}$-1.37±.01; $M_{r\theta}$2.11±.05; $M_{r\phi}$4.62±.05; $M_{\theta\phi}$-0.30±.01. Principal Axes: T 5.28,Plg53°,Azm298°; N -0.02,Plg3°,Azm204°; P -5.26,Plg37°,Azm111°. Best double couple. Mo5.3x10[18]Nm, NP1:φs181°,δ8°,λ67°. NP2:φs24°,δ82°,λ93°.

(348) Iran
ISC I 01 08 51 09.5±.67 30.57N±.040 50.39E±.032 48±7.4 4.7b,4.9s 109 2-94
MOS I 01 08 51 02.2 30.20N 50.44E 10 5.2b ¶95I0085
NEIC I 01 08 51 08.8 30.54N 50.40E 42 4.8b,4.7s
EIDC I 01 08 51 21.3 30.99N 50.47E 122 4.1b
NEIC Felt at Nurabad and Yasuj.

(2) Southern Alaska
ISC I 01 11 30 02.6±.22 60.15N±.024 153.28W±.050 131±1.9 4.7b 199 0-150
EIDC I 01 11 30 01.6 60.20N 153.30W 106 4.4b ¶95I0122
NEIC I 01 11 30 04.7 60.04N 153.27W 118 4.8b
MOS I 01 11 30 05.9 60.49N 153.41W 145 4.6b
NEIC After AEIC.
NEIC (AEIC). Felt I=III MM at Kasilof and Port Graham; II MM at Homer and Kenai.

(243) Taiwan region
ISC I 01 11 53 16±1.4 22.1N±.11 121.5E±.14 7±19 6 0-2
TAP I 01 11 53 13.6 22.08N 121.75E 12 3.8L ¶95I0124
TAP Felt I=III J Lanyu

(228) Near east coast of Honshu
ISC I 01 12 30 05.5±.35 40.05N±.022 142.74E±.044 44±3.1 5.1b,4.7s 253 1-154
BJI I 01 12 30 04.2 40.01N 142.69E 44 5.2b,4.7s ¶95I0133
JMA I 01 12 30 04.3±.1 40.07N±.00 142.76E±.01 25±1 4.9
NEIC I 01 12 30 05.3 40.05N 142.69E 42 5.2b,4.6s
MOS I 01 12 30 05.7 40.09N 142.67E 46 5.6b,4.8s
HRVD I 01 12 30 07.9±1.4 40.06N 142.67E 15
EIDC I 01 12 30 09.2 39.99N 142.63E 64 4.3b
JMA Felt I=II J Morioka
NEIC Mw5.2(HRV)
NEIC Felt I=III MM at Misawa
HRVD Centroid moment tensor solution. Data used: GSN; LP body waves: s14,c20; Half duration: 1s0. Moment tensor: Scale 10[16]Nm; M_{rr}1.91±.60; $M_{\theta\theta}$-0.23±.59; $M_{\phi\phi}$-1.68±.50; $M_{r\theta}$5.08±1.29, $M_{r\phi}$3.22±1.70; $M_{\theta\phi}$-1.95±.72. Principal Axes: T 6.27,Plg53°,Azm342°; N 0.57,Plg12°,Azm235°; P -6.84,Plg34°,Azm136°. Best double couple: Mo6.6x10[16]Nm, NP1: φs184°,δ16°,λ38°. NP2:φs57°,δ80°,λ103°.

(40) California-Nevada border region
ISC I 01 14 59 43.2±.41 35.95N±.041 114.86W±.046 5 27 2-7
NEIC I 01 14 59 43.0 35.96N 114.86W 5 ¶95I0150
NEIC ML 3.6 (GS). Felt I=III MM at Boulder City, Henderson and Sunrise; II MM at Las Vegas, Nevada.

(211) South of Honshu
ISC I 01 15 31 41.4±.41 32.83N±.032 140.24E±.033 130±2.9 4.9b 296 0-161
BJI I 01 15 31 40.3 32.66N 140.00E 129 5.1b ¶95I0158
JMA I 01 15 31 40.4±.3 32.76N±.02 140.32E±.02 141±3 5.2
NEIC I 01 15 31 41.1 32.65N 139.90E 128 5.1b
MOS I 01 15 31 41.4 32.93N 140.45E 132 5.2b
EIDC I 01 15 31 41.9 32.67N 140.00E 123 4.5b
JMA Felt I=II J Hachijo jima

(243) Taiwan region
ISC I 02 01 14 40±1.6 24.8N±.14 122.40E±.066 30±16 3.9b 11 1-46
JMA I 02 01 14 36.8±.8 24.91N±.07 122.28E±.06 20 3.8 ¶95I0219
TAP I 02 01 14 39.7 24.71N 122.16E 4 3.6L
TAP Felt I=II J

(244) Taiwan
TAP I 02 03 03 01.6 24.57N 121.87E 11 2.6L ¶95I0233
TAP Felt I=II J

(29) Washington State
ISC I 02 04 10 12.4±.63 46.76N±.017 122.37W±.034 15±5.7 83 0-4
NEIC I 02 04 10 13.0 46.75N 122.36W 19 ¶95I0247
NEIC After SEA
NEIC MD 3.3 (SEA). Felt I=IV MM at Elbe and Mineral; III MM at Cinebar and Silver Creek.

(378) Pyrenees
ISC I 02 05 58 19.5±.58 43.23N±.052 0.40W±.061 10 18 0-4
LDG I 02 05 58 20.2 43.1N 0.4W 2.6L ¶95I0264
NEIC I 02 05 58 20.2 42.99N 0.41W 10
MDD I 02 05 58 20.7 42.99N 0.43W 5 2.5
PIST Felt I-II MSK Ossau Valley
NEIC Mb2.4(BTH)

(116) Peru
ISC I 02 06 49 18.3±.81 12.93S±.092 75.9W±.10 33 8 1-8
NEIC I 02 06 49 17.8 [illegible]
NEIC Felt I=III MM at Chincha Alta and II MM at Pisco.

(159) North Island, New Zealand
ISC I 02 07 41 45.2±.45 39.28S±.036 175.37E±.062 19±6.3 32 0-4
WEL I 02 07 41 45.9 39.30S 175.41E 12 4.1L ¶95I0272
WEL Felt I=IV MM at Ohakune and Mount Ruapehu

(228) Near east coast of Honshu
ISC I 02 16 42 36.3±.39 40.13N±.024 142.65E±.057 47±3.6 4.6b 128 1-87
JMA I 02 16 42 36.3±.2 40.15N±.01 142.54E±.02 34±2 4.4 ¶95I0336
MOS I 02 16 42 36.5 40.18N 142.61E 52 4.9b
NEIC I 02 16 42 36.7 40.17N 142.55E 49 4.8b
EIDC I 02 16 42 40.0 40.14N 142.50E 62 3.8b
JMA Felt I=II J Morioka

(243) Taiwan region
ISC I 03 02 22 38±5.4 24.5N±.15 122.2E±.42 27±29 5 1-3
TAP I 03 02 22 40.7 24.48N 121.87E 19 3.3L ¶95I0426
ISC Poorly determined
TAP Felt I-II J

(233) Near south coast of Southern Honshu
ISC I 03 04 09 49.3±.72 34.06N±.032 135.20E±.027 12±6.0 4.3b 62 0-57
EIDC I 03 04 09 47.9 34.09N 134.75E 0 4.3b ¶95I0436
JMA I 03 04 09 49.2±.0 34.09N±.00 135.19E±.00 13±2 3.8
JMA Felt I=III J Wakayama

(224) Hokkaido region
ISC I 03 04 42 34.2±.32 42.22N±.030 143.26E±.061 72±3.7 4.5b 95 0-152
MOS I 03 04 42 33.5 42.22N 143.27E 75 4.9b ¶95I0442
NEIC I 03 04 42 34.2 42.25N 143.17E 70 4.7b
JMA I 03 04 42 34.7±.2 42.26N±.02 143.16E±.01 65±2 4.2
EIDC I 03 04 42 35.5 42.38N 143.02E 59 3.8b
JMA Felt I=II J Urakawa

(243) Taiwan region
ISC I 03 07 20 07±1.9 23.00N±.085 121.5E±.24 16±18 6 0-1
TAP I 03 07 20 06.7 23.03N 121.39E 22 3.5L ¶95I0457
TAP Felt I=II J Chengkung

(244) Taiwan
TAP I 03 08 55 43.3 24.45N 121.85E 11 2.8L ¶95I0469
TAP Felt I=III J

(136) Central Chile
ISC I 03 12 46 54.4±.72 35.11S±.059 71.00W±.082 90±5.4 4.8b 75 1-169
NEIC I 03 12 46 54.2 35.12S 70.97W 90 4.8b ¶95I0507
GUC I 03 12 47 00.3 34.71S 71.13W 51 4.8n
EIDC I 03 12 47 07.7 36.46S 72.67W 231 4.4b
NEIC Felt in the Linares-San Fernando-Valparaiso area, Chile.

(244) Taiwan
TAP I 03 16 15 36.7 24.48N 121.91E 10 2.8L ¶95I0536
TAP Felt I=III J

(244) Taiwan
ISC I 03 16 55 34±1.6 23.24N±.080 120.3E±.15 12 6 0-1
TAP I 03 16 55 33.1 23.28N 120.19E 12 3.7L ¶95I0542
TAP Felt I=III J

(244) Taiwan
TAP I 03 18 21 49.6 24.44N 121.89E 12 2.9L ¶95I0556
TAP Felt I=III J

(500) Central Texas
NEIC I 04 01 46 14.0 29.45N 96.95W 5 5-6
NEIC Non-instrumental ¶95I0616
NEIC (MACRO). mbLg 2.7 (GS). Felt I=IV MM at Shiner. Also felt in the Hallettsville area

(7) Andreanof Islands
ISC I 04 02 47 28.9±.19 51.55N±.042 173.66W±.032 47±.6* 5.5b,4.9s 377 2-160
MOS I 04 02 47 25.7 51.39N 173.47W 33 5.7b,4.9s ¶95I0618
BJI I 04 02 47 27.0 51.60N 173.70W 38 5.4b,5.1s
NEIC I 04 02 47 27.2 51.58N 173.65W 33 5.5b,4.8s
HRVD I 04 02 47 29.2±.6 51.70N±.06 173.39W±.08 15
EIDC I 04 02 47 29.9 51.60N 173.72W 42 4.9b
NEIC Mw5.3(HRV)
NEIC ML=5.1 (PMR). Felt I=III MM on Atka.
HRVD Centroid moment tensor solution. Data used: GSN. LP body waves: s41,c59; Half duration: 1s2. Moment tensor: Scale 10[16]Nm; M_{rr}7.04±.30; $M_{\theta\theta}$-5.53±.31; $M_{\phi\phi}$-1.51±.30; $M_{r\theta}$5.48±1.55; $M_{r\phi}$3.49±1.36; $M_{\theta\phi}$-4.13±.45. Principal Axes: T 9.45,Plg70°,Azm327°; N 1.07,Plg0°,Azm58°; P -10.52,Plg20°,Azm148°. Best double couple: Mo1.0x10[17]Nm, NP1: φs239°,δ25°,λ91°. NP2 φs58°,δ65°,λ90°.

(139) Mendoza Province, Argentina
ISC I 04 05 38 57±2.2 33.45S±.061 68.32W±.083 1±16 18 1-4
NEIC I 04 05 38 56.0 33.43S 68.21W 5 ¶95I0643
GUC I 04 05 38 59.8 33.40S 68.54W 2 4.3n
NEIC Less reliable solution
NEIC Felt I=III MM at San Carlos.

(228) Near east coast of Honshu
ISC I 04 15 36 52.1±.37 37.97N±.025 141.95E±.055 90±3.4 4.5b 146 1-146
MOS I 04 15 36 50.0 38.15N 141.89E 33 4.9b ¶95I0689
NEIC I 04 15 36 52.3 38.03N 141.84E 88 4.6b
JMA I 04 15 36 53.2±.1 37.98N±.01 141.83E±.02 87±2 4.6
EIDC I 04 15 36 55.1 37.93N 141.74E 97 4.2b
JMA Felt I=II J Ofunato, Ishinomaki

(216) Marianas
ISC I 04 22 14 51±1.5 13.08N±.099 145.3E±.27 68±9.8 4.1b 18 1-145
NEIC I 04 22 14 51.5 13.09N 145.19E 71 4.4b ¶95I0721
EIDC I 04 22 14 53.6 13.08N 145.30E 80 4.0b
NEIC Less reliable solution.
NEIC Felt I=IV MM at Agat, Andersen Air Force Base and Yona; III MM at Agana, Mangilao, Potts Junction, Tamuning and Tumon, Guam.

(244) Taiwan
ISC I 04 22 14 54.1±.84 24.99N±.068 121.9E±.17 99±7.7 4.3b 16 0-82
BJI I 04 22 14 50.4 24.83N 121.92E 26 3.9L,4.4b ¶95I0722
TAP I 04 22 14 55.8 24.96N 121.70E 92 4.5L
BJI Ms3.6
TAP Felt I-II J

(221) Kuril Islands
ISC I 04 23 14 41.4±.57 43.16N±.032 147.49E±.047 45±5.2 5.3b,4.7s 297 1-152
MOS I 04 23 14 38.0 43.12N 147.89E 33 5.9b,4.8s ¶95I0725
BJI I 04 23 14 41.3 43.33N 147.44E 49 5.2b,4.6s
NEIC I 04 23 14 42.0 43.25N 147.45E 49 5.3b,4.7s
EIDC I 04 23 14 43.8 43.34N 147.29E 57 4.5b
JMA I 04 23 14 44.3±.3 43.13N±.03 147.27E±.03 44 5.2
HRVD I 04 23 14 46.0±.5 43.36N±.05 147.83E±.07 60±4.4
MOS Felt I=V-VI MSK Malokurilsk, IV Mendeleevo, Golovnino, III Burevestnik, II Kurilsk

PROBABLE EXPLOSIONS

(479) Colorado
ISC I 01 12 43 18.8±.77 38.86N±.091 107.39W±.065 0 16 1-6
NEIC I 01 12 43 19.3 38.87N 107.45W 1 ¶95I0135
NEIC Mb3.0(GS). Coal bump or rockburst in coal mine in the Somerset Field.

(548) Poland
WAR I 02 12 00 55.8 50.4N 18.8E 2.9 ¶95I0298
WAR Mining induced

(536) Sweden
BER I 02 13 52 54.8 67.8N 20.3E 15 2.1L,2.3b ¶95I0312
BER Possible explosion

(548) Poland
ISC I 03 04 32 15±2.8 51.5N±.20 15.9E±.15 0 8 1-3
ISC Probably mining induced (after BRG) ¶95I0440

(548) Poland
ISC I 03 13 12 07±2.5 50.3N±.18 18.9E±.17 0 6 1-4
WAR I 03 13 12 08.3 50.3N 18.8E 2.9 ¶95I0511
WAR Mining induced

(548) Poland
ISC I 04 08 31 42±2.7 50.5N±.19 19.0E±.20 0 7 1-4
WAR I 04 08 31 45.2 50.2N 18.9E 2.8 ¶95I0661
WAR Mining induced

(548) Poland
ISC I 05 10 31 48±2.1 50.2N±.15 19.2E±.17 0 9 1-5
WAR I 05 10 31 48.0 50.2N 19.1E 3.2 ¶95I0794
WAR Mining induced

(335) Ural Mountains region
ISC I 05 12 45 59.5±.26 59.61N±.042 56.62E±.070 0 4.7b,4.2s 84 3-149
MOS I 05 12 46 00.3 59.54N 56.54E 10 5.0b ¶95I0809
NEIC I 05 12 46 01.1 59.60N 56.65E 10 4.8b
EIDC I 05 12 46 01.2 59.52N 56.31E 0 4.4b
NEIC Possible implosion at the Silvinit salt mine near Solikamsk. The ventilation systems at the mine were destroyed, hydrogen and methane gas built up, then exploded, causing a fire that burned for 3 days. Three metres of surface subsidence occurred over an area of nearly 1km². Felt I=V MM at Solikamsk.

(535) Southern Norway
BER I 05 14 15 52.8 58.3N 6.2E 0 2.1b ¶95I0816
BER Explosion

(548) Poland
ISC I 05 19 17 43.7±.47 51.68N±.040 16.19E±.076 0 3.7b 34 1-71
NEIC I 05 19 17 45.1 51.68N 16.15E 10 ¶95I0847
EIDC I 05 19 17 46.4 51.56N 16.16E 0 2.5L
WAR I 05 19 17 48 51.54N 16.07E 3.3
NEIC ML 3.8 (GRF), 3.7 (VIE), 3.5 (MOX).
WAR Mining induced

(543) Germany
ISC I 07 18 35 21.2±.89 51.66N±.083 7.82E±.070 0 17 0-5
BUG I 07 18 35 21.1 51.7N 7.8E 1 2.2L ¶95I1300
NEIC I 07 18 35 22.1 51.71N 7.81E 10
SZGRF I 07 18 35 23.6 51.60N 7.75E 1 2.3L
NEIC ML2.5(DBN), ML2.6(UCC). Less reliable solution. Probably mining induced (after SZGRF)

(548) Poland
ISC I 08 02 46 03±3.6 51.6N±.27 16.0E±.18 0 8 1-3
NEIC I 08 02 46 09.6 51.20N 15.86E 10 ¶95I1358
NEIC Less reliable solution. Probably mining induced (after WAR)

(548) Poland
ISC I 09 22 17 42±4.4 51.5N±.25 16.0E±.28 0 6 1-3
NEIC I 09 22 17 44.3 51.36N 16.17E 10 ¶95I1658
NEIC Poor solution. Probably mining induced (after WAR)

(543) Germany
ISC I 10 18 52 25.4±.88 51.52N±.064 6.9E±.10 0 10 0-3
NEIC I 10 18 52 26.0 51.52N 6.85E 5 ¶95I1794
SZGRF I 10 18 52 28.1 51.46N 6.95E 1 1.9L
NEIC ML2.8(UCC)
NEIC Probably mining induced.

(536) Sweden
ISC I 11 03 47 53±1.0 67.72N±.084 20.3E±.31 0 7 2-8
EIDC I 11 03 47 54.4 67.78N 20.39E 0 1.8L ¶95I1852
BER I 11 03 47 56.3 67.9N 20.3E 0 2.2L,2.4b
BER Probable explosion

(543) Germany
ISC I 11 10 56 19±1.3 50.47N±.088 12.2E±.14 0 7 0-1
SZGRF I 11 10 56 20.9 50.50N 12.19E 10 1.6L ¶95I1901
ISC Poorly determined
SZGRF Probably mining induced

(536) Sweden
ISC I 11 18 04 31.1±.89 66.97N±.076 21.1E±.25 0 8 2-11
EIDC I 11 18 04 32.2 67.10N 21.06E 0 1.9L ¶95I1949
NEIC I 11 18 04 32.3 66.97N 21.11E 10
BER I 11 18 04 38.2 67.2N 20.9E 12 2.7b
NEIC Less reliable solution. Probable explosion

(536) Sweden
BER I 12 00 30 46.6 67.8N 20.2E 0 2.5b ¶95I1979
BER Probable explosion

(548) Poland
ISC I 13 10 08 23.4±.65 51.68N±.050 16.12E±.079 0 18 1-18
NEIC I 13 10 08 24.7 51.66N 16.31E 10 ¶95I2198
EIDC I 13 10 08 25.1 51.62N 16.14E 0 2.9L
WAR I 13 10 08 27.6 51.5N 16.1E 3.0
NEIC Mb3.0(MOX), Less reliable solution.
WAR Mining induced

(548) Poland
ISC I 13 15 11 34±5.3 51.9N±.30 16.2E±.29 0 6 2-3
ISC Probably mining induced (after BRG) ¶95I2232

(548) Poland
ISC I 15 13 53 35.8±.57 51.67N±.046 16.07E±.080 0 3.1b 22 1-60
NEIC I 15 13 53 36.3 51.63N 16.25E 10 ¶95I2515
EIDC I 15 13 53 36.9 51.56N 16.25E 0 2.4L
WAR I 15 13 53 39.2 51.5N 16.0E 3.1
NEIC ML2.8(CLL), ML3.4(GRF)
WAR Mining induced

(379) Near south coast of France
ISC I 16 06 53 33.4±.72 43.44N±.049 5.49E±.065 0 22 0-3
ISC Probably mining induced (after LDG) ¶95I2616

(535) Southern Norway
ISC I 16 14 17 20±8.4 58.5N±.51 6.3E±.42 0 5 1-2
BER I 16 14 17 18.8 58.3N 6.5E 0 2.0b ¶95I2666
ISC Poorly determined
BER Explosion

(548) Poland
ISC I 17 09 40 07.0±.56 51.68N±.045 16.13E±.064 0 29 1-18
EIDC I 17 09 40 08.2 51.56N 16.22E 0 2.8L ¶95I3108
NEIC I 17 09 40 08.5 51.72N 15.88E 10
WAR I 17 09 40 10.6 51.4N 16.1E 3.0
NEIC Mb3.0(MOX), Mb3.4(VIE), Less reliable solution.
WAR Mining induced

(548) Poland
ISC I 17 18 22 35.0±.65 51.66N±.050 16.16E±.089 0 14 1-18
EIDC I 17 18 22 35.6 51.52N 16.36E 0 ¶95I3239
WAR I 17 18 22 37.8 51.5N 16.1E 2.8
NEIC I 17 18 22 43.5 51.18N 15.79E 10
WAR Mining induced
NEIC Mb2.6(MOX), Poor solution.

(548) Poland
ISC I 18 00 35 19.6±.73 51.71N±.054 16.2E±.11 0 11 2-18
EIDC I 18 00 35 20.6 51.57N 16.45E 0 2.3L ¶95I3302
NEIC I 18 00 35 21.3 51.74N 16.36E 10
NEIC Less reliable solution. Probably mining induced (after WAR)

(543) Germany
SZGRF I 18 07 06 44.0 51.48N 10.90E 1 1.4L ¶95I3357
SZGRF Probably mining induced

(646) Northern Norway
ISC I 18 11 59 46±1.0 66.43N±.075 14.6E±.31 0 6 0-7
BER I 18 11 59 48.0 66.3N 14.3E 0 2.2b ¶95I3397
EIDC I 18 11 59 52.0 66.30N 15.65E 0 1.5L
BER Explosion

(379) Near south coast of France
ISC I 18 19 49 46.8±.78 43.44N±.047 5.47E±.070 0 20 0-3
ISC Probably mining induced (after LDG) ¶95I3476

(548) Poland
ISC I 19 15 51 28±4.0 51.5N±.29 16.0E±.17 0 8 1-3
ISC Probably mining induced (after BRG) ¶95I3626

(548) Poland
ISC I 20 12 29 40±2.2 50.5N±.17 19.0E±.46 0 7 1-19
EIDC I 20 12 29 40.6 50.36N 19.07E 0 2.7L ¶95I3773
EIDC Probably mining induced (after WAR)

(535) Southern Norway
BER I 20 14 21 07.8 58.4N 6.5E 0 1.9b ¶95I3790
BER Explosion

(543) Germany
ISC I 21 06 58 14.5±.69 51.49N±.056 6.68E±.078 0 24 0-6
NEIC I 21 06 58 15.3 51.49N 6.60E 5 ¶95I3908
LDG I 21 06 58 16.9 51.5N 6.9E 2 2.8L
SZGRF I 21 06 58 19.5 51.42N 6.96E 1 2.0L
NEIC ML 2.7 (DBN), 2.6 (BNS). Probably mining induced.

(548) Poland
ISC I 21 07 40 26.7±.86 50.39N±.051 19.0E±.11 0 16 1-12
EIDC I 21 07 40 28.5 50.30N 19.13E 0 2.7L ¶95I3916
WAR I 21 07 40 30.0 50.2N 18.9E 3.4
NEIC I 21 07 40 31.2 50.11N 18.82E 10
WAR Mining induced
NEIC Mb3.3(CLL), Poor solution.

(548) Poland
ISC I 21 13 00 49.9±.52 51.71N±.042 16.18E±.067 0 3.5b 35 1-60
NEIC I 21 13 00 50.7 51.67N 16.28E 10 3.5b ¶95I3965
WAR I 21 13 00 54.2 51.5N 16.1E 3.4
EIDC I 21 13 00 54.8 51.75N 15.80E 24 2.5L
NEIC Mb3.7(VIE), Mb4.0(GRF)
WAR Mining induced

(548) Poland
ISC I 23 17 20 05±2.3 50.4N±.16 18.9E±.43 0 10 1-12
EIDC I 23 17 20 05.5 50.29N 18.94E 0 2.6L ¶95I4300
NEIC I 23 17 20 06.6 50.46N 18.83E 10
WAR I 23 17 20 07.9 50.2N 18.9E 2.7
NEIC Less reliable solution.
WAR Mining induced

(543) Germany
BUG I 23 20 16 14.9 51.7N 7.8E 1 2.0L ¶95I4320
SZGRF I 23 20 16 16.9 51.67N 7.71E 1 2.1L
BUG Probably mining induced

(543) Germany
ISC I 23 23 46 38±3.1 51.8N±.28 7.8E±.17 0 6 1-5
BUG I 23 23 46 38.0 51.7N 7.9E 1 2.1L ¶95I4349
SZGRF I 23 23 46 41.7 51.67N 7.93E 1 2.1L
BUG Probably mining induced

(536) Sweden
BER I 24 00 30 09.2 67.8N 20.3E 0 2.2b ¶95I4356
BER Probable explosion

(547) Czech and Slovak Republics
ISC I 24 02 52 06±3.5 50.1N±.12 14.1E±.37 0 7 0-2
SZGRF I 24 02 52 08.2 50.18N 14.08E 2.0L ¶95I4369
SZGRF Probably mining induced

(548) Poland
ISC I 24 09 24 39±3.2 51.6N±.19 16.0E±.16 0 7 1-3
WAR I 24 09 24 41.8 51.5N 16.1E 2.6 ¶95I4400
NEIC I 24 09 24 47.3 51.36N 15.75E 10
WAR Mining induced
NEIC Poor solution.

(536) Sweden
BER I 26 00 30 17.2 67.9N 20.1E 0 1.8L,2.2b ¶95I4655
BER Probable explosion

(548) Poland
ISC I 26 05 36 45.7±.54 51.70N±.043 16.16E±.071 0 3.5b 36 1-60
NEIC I 26 05 36 48.1 51.59N 16.20E 10 3.6b ¶95I4689
EIDC I 26 05 36 49.4 51.71N 15.89E 18 2.4L
WAR I 26 05 36 50.1 51.5N 16.1E 3.3
NEIC Less reliable solution.
NEIC ML 3.8 (GRF), 3.7 (MOX), 3.7 (VIE)
WAR Mining induced

(547) Czech and Slovak Republics
ISC I 26 08 33 43.4±.77 50.51N±.048 14.01E±.074 0 21 0-4
SZGRF I 26 08 33 46.8 50.47N 14.10E 2.8L ¶95I4710
SZGRF Probably explosion

REGIONAL CATALOGUE OF EVENTS

Agcy	Origin Time mo d h m s	φ °	λ °	h km	Mag	n	Δ-Rng °
			SEISMIC REGION 1. ALASKA-ALEUTIAN ARC.				
			(1) Central Alaska.				
	I 01 05 46 30.7±.73	63.32N±.027	151.14W±.083	17±8.4		58	0-17
C	I 01 05 46 30.5	63.26N	151.14W	9			¶95I0050
C	M_L 3.3(AEIC), After AEIC.						
	I 02 03 25 54.4±.35	63.52N±.034	149.91W±.092	123		50	0-4
C	I 02 03 25 55.0	63.53N	149.93W	123			¶95I0239
C	After AEIC.						
	I 02 04 09 24.7±.91	63.33N±.033	151.4W±.11	17±10		43	0-3
C	I 02 04 09 25.0	63.27N	151.29W	12			¶95I0246
C	M_L 2.8(AEIC), M_L 3.2(PMR), After AEIC.						
	I 02 07 46 46.8±.77	63.60N±.032	150.76W±.086	13±5.9		47	0-16
C	I 02 07 46 47.3	63.55N	150.66W	13			¶95I0273
C	M_L 3.1(AEIC), M_L 3.5(PMR), After AEIC.						
	I 02 08 46 03±1.2	63.28N±.038	151.2W±.13	9±10		31	0-3
C	I 02 08 46 02.6	63.27N	151.21W	12			¶95I0280
C	M_L 2.5(AEIC), After AEIC.						
	I 02 18 31 00±1.9	62.47N±.072	152.6W±.18	164±19		31	1-3
C	I 02 18 31 02.7	62.47N	152.73W	140			¶95I0359
C	After AEIC						
	I 03 18 20 35.2±.32	63.27N±.029	150.40W±.083	122		61	0-5
C	I 03 18 20 36.0	63.23N	150.47W	122			¶95I0555
C	After AEIC						
	I 04 14 07 52.9±.78	63.17N±.041	150.3W±.12	133±11		41	0-5
C	I 04 14 07 54.6	63.14N	150.44W	116			¶95I0682
C	After AEIC.						
	I 08 21 00 13.4±.57	63.20N±.030	150.64W±.084	146±8.8		78	0-16.
C	I 08 20 59 10.0	58.38N	159.48W	157	3.3b		¶95I1477
C	I 08 21 00 15.7	63.20N	150.59W	128	3.5b		
C	After AEIC.						
	I 08 23 36 16.1±.64	62.44N±.032	149.35W±.094	69±15		37	0-3
C	I 08 23 36 16.7	62.41N	149.45W	71			¶95I1501
C	After AEIC						
	I 09 17 24 14.4±.62	62.23N±.023	148.40W±.057	27±7.4		70	0-5
IC	I 09 17 24 15.6	62.22N	148.47W	27			¶95I1616
IC	M_L 2.9(AEIC), After AEIC.						
	I 10 01 46 54±1.6	63.77N±.075	146.7W±.37	33		9	1-5
IC	I 10 01 46 54.2	63.76N	147.13W	33			¶95I1672
IC	M_L 2.8(PMR), Less reliable solution.						
	I 10 23 30 23.8±.74	62.71N±.032	151.0W±.11	113±12		50	0-5
IC	I 10 23 30 25.2	62.70N	151.10W	92			¶95I1821
IC	After AEIC						
	I 11 02 42 38.4±.77	63.56N±.027	151.01W±.083	14±5.6		66	0-5
IC	I 11 02 42 38.8	63.48N	150.96W	11			¶95I1843
IC	M_L 2.9(AEIC), M_L 3.3(PMR), After AEIC.						
	I 13 05 45 45.5±.70	62.51N±.030	151.76W±.096	121±13		61	1-6
IC	I 13 05 45 46.5	62.51N	151.90W	105			¶95I2170
IC	After AEIC.						
	I 13 19 59 28.2±.45	63.34N±.033	151.32W±.096	9		34	1-4
IC	I 13 19 59 28.6	63.31N	151.27W	9			¶95I2269
IC	M_L 2.6(AEIC), M_L 3.0(PMR), After AEIC.						
	I 13 20 53 45±1.3	63.39N±.034	151.4W±.11	14±10		35	0-5
IC	I 13 20 53 44.6	63.41N	151.42W	19			¶95I2275
IC	M_L 2.6(AEIC), M_L 3.0(PMR), After AEIC.						
	I 14 07 21 08±1.0	62.81N±.068	159.9W±.20	10		23	2-6
IC	I 14 07 21 08.2	62.94N	159.73W	10			¶95I2335
IC	M_L 3.2(AEIC), M_L 3.4(PMR), After AEIC.						
	I 14 12 20 45.0±.74	63.41N±.061	150.2W±.14	33		17	2-3
							¶95I2360
	I 15 04 46 44.0±.67	62.90N±.030	149.60W±.093	102±13		46	0-4
IC	I 15 04 46 45.3	62.88N	149.57W	85			¶95I2459
IC	After AEIC.						
	I 18 09 22 14.4±.21	62.19N±.020	150.33W±.050	69±4.9	3.9b	113	0-146
IC	I 18 09 22 05.7	62.01N	150.96W	0	4.2b		¶95I3380
IC	I 18 09 22 15.6	62.15N	150.46W	60	3.6b		
IC	M_L 3.9(AEIC), M_L 4.0(PMR), After AEIC.						
	I 18 18 05 54.8±.99	63.45N±.030	151.02W±.095	4±7.6		45	0-5
IC	I 18 18 05 55.2	63.45N	151.02W	3			¶95I3460
IC	M_L 2.5(AEIC), M_L 3.0(PMR), After AEIC.						
	I 19 15 31 22.3±.65	63.41N±.045	151.9W±.13	7		27	0-3
IC	I 19 15 31 22.0	63.39N	151.92W	7			¶95I3621
IC	M_L 2.5(AEIC), After AEIC.						
	I 21 08 34 50.6±.73	63.33N±.026	151.15W±.081	18±8.3		66	0-17
IC	I 21 08 34 50.6	63.27N	151.09W	13			¶95I3921
IC	M_L 3.0(AEIC), M_L 3.6(PMR), After AEIC.						
	I 22 10 32 54±1.1	62.41N±.045	151.1W±.11	99±16		34	0-3
IC	I 22 10 32 56.3	62.38N	151.08W	73			¶95I4102
IC	After AEIC						
	I 22 16 08 57.2±.55	62.51N±.031	149.77W±.078	76±13		48	0-3
IC	I 22 16 08 58.3	62.49N	149.79W	65			¶95I4141
IC	M_L 3.0(PMR), M_L 3.0(AEIC), After AEIC.						
	I 23 11 35 03±1.57	64.94N±.045	148.97W±.087	24±6.4		34	0-5
IC	I 23 11 35 03.5	64.92N	148.93W	22			¶95I4267
IC	M_L 2.8(AEIC), M_L 3.2(PMR), After AEIC.						
	I 24 01 18 59.4±.50	63.58N±.029	149.91W±.075	147±8.1		86	0-16
IC	I 24 01 19 00.5	63.58N	149.94W	140			¶95I4359
IC	After AEIC.						
	I 24 08 48 25.0±.86	64.90N±.039	146.6W±.10	6±6.5		31	0-5
IC	I 24 08 48 25.4	64.85N	146.62W	13			¶95I4392
IC	After AEIC.						
IC	ML 2.9 (AEIC). Felt I=V MM at mile 22.5 on Chena Hot Springs Road.						
	I 24 12 57 41.6±.72	63.35N±.027	151.17W±.082	18±8.2		65	0-5
IC	I 24 12 57 41.4	63.27N	151.14W	11			¶95I4416
IC	M_L 2.7(AEIC), M_L 3.1(PMR), After AEIC.						
	I 27 05 23 15.5±.49	63.07N±.026	150.90W±.075	142±8.6		92	0-16
IC	I 27 05 23 17.0	63.06N	150.99W	130	2.9b		¶95I4823
IC	After AEIC						
	I 27 14 04 24.7±.54	63.27N±.029	149.81W±.087	114±10		55	0-16
NEIC	I 27 14 04 26.1	63.26N	149.75W	102	2.7b		¶95I4876
NEIC	After AEIC.						
ISC	I 30 20 28 04.1±.45	62.95N±.025	150.81W±.073	126±8.1		87	1-16
NEIC	I 30 20 28 05.3	62.95N	150.89W	114	3.0b		¶95I5341
NEIC	After AEIC.						
ISC	I 31 09 50 53.8±.46	64.71N±.033	147.43W±.075	14±4.6		42	0-5
NEIC	I 31 09 50 54.1	64.70N	147.38W	12			¶95I5435
NEIC	After AEIC.						
NEIC	(AEIC). ML 3.2 (AEIC), 3.4 (PMR). Felt I=III MM at Eielson Air Force Base. Also felt at Fairbanks and North Pole.						
ISC	I 31 10 41 18±1.5	63.90N±.027	147.33W±.074	7±13		50	1-7
NEIC	I 31 10 41 17.8	63.86N	147.37W	6			¶95I5445
NEIC	M_L 2.6(AEIC), M_L 3.0(PMR), After AEIC.						
ISC	II 01 04 40 14.0±.47	62.64N±.027	149.10W±.074	78±12		52	0-5
NEIC	II 01 04 40 14.8	62.62N	149.13W	63			¶95II0020
NEIC	M_L 2.6(AEIC), After AEIC.						
ISC	II 03 10 33 15±1.4	63.36N±.034	151.4W±.11	4±11		45	0-5
NEIC	II 03 10 33 15.8	63.32N	151.39W	4			¶95II0378
NEIC	M_L 2.5(AEIC), After AEIC.						
ISC	II 03 14 25 46.5±.64	63.09N±.034	150.39W±.097	123±11		53	0-5
NEIC	II 03 14 25 48.0	63.06N	150.46W	106			¶95II0394
NEIC	After AEIC.						
ISC	II 04 08 10 37.9±.83	62.28N±.039	151.31W±.093	103±14		47	1-4
NEIC	II 04 08 10 39.9	62.29N	151.33W	84			¶95II0488
NEIC	After AEIC.						
ISC	II 04 21 50 30.4±.42	63.53N±.032	150.67W±.088	5		30	0-3
NEIC	II 04 21 50 30.6	63.51N	150.72W	5			¶95II0576
NEIC	M_L 2.5(AEIC), After AEIC.						
ISC	II 04 21 50 55.8±.88	63.54N±.041	150.7W±.13	7±7.9		20	0-3
NEIC	II 04 21 50 56.0	63.54N	150.70W	7			¶95II0577
NEIC	M_L 2.6(AEIC), M_L 3.1(PMR), After AEIC.						
ISC	II 05 02 21 38.7±.86	62.76N±.084	151.5W±.17	33		9	1-3
NEIC	II 05 02 21 38.5	62.77N	151.55W	33			¶95II0604
NEIC	M_L 2.9(PMR).						
ISC	II 06 00 43 52.0±.92	62.75N±.036	150.8W±.13	116±14		40	0-5
NEIC	II 06 00 43 53.6	62.75N	150.82W	101			¶95II0798
NEIC	After AEIC.						
ISC	II 07 22 38 46±1.0	63.19N±.086	151.2W±.19	33		10	2-3
NEIC	II 07 22 38 45.2	63.18N	151.07W	33			¶95II1688
NEIC	M_L 2.7(PMR)						
ISC	II 08 04 19 04.8±.31	62.41N±.022	149.51W±.059	70±9.9		81	0-9
NEIC	II 08 04 19 05.9	62.38N	149.56W	59			¶95II1738
NEIC	M_L 3.3(AEIC), M_L 3.5(PMR), After AEIC.						
ISC	II 09 12 58 24.0±.47	62.06N±.028	151.42W±.075	96±9.8		64	0-6
NEIC	II 09 12 58 25.8	62.03N	151.46W	80			¶95II2169
NEIC	After AEIC.						
ISC	II 10 12 44 27.0±.35	62.03N±.033	149.49W±.061	39±20		47	0-4
NEIC	II 10 12 44 27.3	62.00N	149.52W	42			¶95II2531
NEIC	M_L 2.6(AEIC), After AEIC.						
ISC	II 10 21 18 24.9±.25	62.12N±.022	151.12W±.059	84±4.5	4.1b	104	0-49
NEIC	II 10 21 18 26.6	62.09N	151.18W	73	3.8b		¶95II2626
EIDC	II 10 21 18 29.0	62.27N	150.40W	71	4.0b		
NEIC	After AEIC.						
ISC	II 11 11 10 54.2±.63	64.98N±.050	148.98W±.095	26±6.9		25	0-5
NEIC	II 11 11 10 53.9	64.97N	149.05W	21			¶95II2749
NEIC	M_L 2.6(AEIC), M_L 2.9(PMR), After AEIC.						
ISC	II 12 06 27 04.4±.74	63.25N±.034	150.42W±.092	141±12		56	0-4
NEIC	II 12 06 27 06.3	63.22N	150.48W	123			¶95II2927
NEIC	After AEIC.						
ISC	II 12 14 51 33.0±.31	62.16N±.031	148.06W±.068	38		40	0-17
EIDC	II 12 14 50 31.4	58.33N	155.52W	0	4.0b		¶95II3010
NEIC	II 12 14 51 34.2	62.14N	148.11W	38	3.2b		
NEIC	M_L 3.4(AEIC), M_L 3.5(PMR), After AEIC.						
ISC	II 15 01 53 56.5±.51	62.60N±.028	149.58W±.079	86±11		49	0-5
NEIC	II 15 01 53 56.8	62.59N	149.67W	77			¶95II3547
NEIC	After AEIC.						
ISC	II 16 03 59 18±2.0	63.24N±.046	154.4W±.14	31±22		24	1-6
NEIC	II 16 03 59 17.2	63.23N	154.33W	16			¶95II3750
NEIC	M_L 2.8(AEIC), M_L 3.1(PMR), After AEIC.						
ISC	II 17 07 08 16.7±.87	63.40N±.033	151.3W±.11	17±9.4		36	0-5
NEIC	II 17 07 08 16.0	63.39N	151.29W	10			¶95II3968
NEIC	M_L 2.5(AEIC), M_L 3.0(PMR)						
ISC	II 17 19 00 54.9±.21	62.97N±.022	150.78W±.063	117±2.9	4.4b	124	1-80
EIDC	II 17 19 00 50.4	62.88N	151.18W	69	3.9b		¶95II4048
NEIC	II 17 19 00 55.9	62.96N	150.81W	110	4.2b		
NEIC	After AEIC.						
NEIC	(AEIC). Felt I=III MM at Skwentna.						
ISC	II 20 07 14 46.3±.57	62.14N±.033	150.83W±.077	81±13		50	0-4
NEIC	II 20 07 14 48.2	62.11N	150.87W	58			¶95II4415
NEIC	M_L 3.0(PMR), M_L 3.1(AEIC), After AEIC.						
ISC	II 20 11 35 56.4±.73	63.33N±.029	151.11W±.086	17±8.1	2.9b	57	0-45
NEIC	II 20 11 35 56.3	63.27N	151.07W	8	3.0b		¶95II4439
EIDC	II 20 11 36 14.1	63.42N	148.86W	97	2.7b		
NEIC	M_L 3.5(AEIC), M_L 3.7(PMR), After AEIC.						
ISC	II 20 13 14 22.8±.68	63.07N±.032	150.41W±.093	121±11		53	0-5
NEIC	II 20 13 14 24.5	63.05N	150.37W	102			¶95II4455
NEIC	After AEIC.						
ISC	II 20 20 18 45.3±.52	62.49N±.026	151.37W±.077	113±11		73	1-9
NEIC	II 20 20 18 47.2	62.47N	151.41W	95			¶95II4506
NEIC	After AEIC.						
ISC	II 23 13 52 54±1.0	63.16N±.051	150.9W±.15	144±14		25	0-5
NEIC	II 23 13 52 56.2	63.16N	150.76W	131			¶95II4940
NEIC	After AEIC.						
ISC	II 24 22 46 50.1±.56	62.30N±.032	150.82W±.078	87±11		50	0-4
NEIC	II 24 22 46 51.7	62.30N	150.93W	68			¶95II5197
NEIC	M_L 2.6(AEIC), After AEIC.						
ISC	II 26 04 23 47.2±.52	62.06N±.037	150.29W±.076	67±13		41	0-6
NEIC	II 26 04 23 48.1	62.07N	150.38W	58			¶95II5421
NEIC	M_L 2.5(AEIC), After AEIC.						
ISC	II 26 09 47 24.2±.62	62.90N±.029	150.74W±.092	118±11		61	1-5
NEIC	II 26 09 47 25.6	62.91N	150.76W	102			¶95II5450
NEIC	After AEIC.						
ISC	II 27 09 26 50.6±.68	63.16N±.032	150.31W±.098	130±11		51	0-5
NEIC	II 27 09 26 52.2	63.14N	150.38W	112			¶95II5588
NEIC	After AEIC.						

SEISMOLOGICAL OBSERVATORIES

IN ALPHABETICAL ORDER OF STATION NAME WITH BASIC PARAMETERS

Station Name	Location	Code	Geographical Co-ordinates φ:° ' "	λ:° ' "	Altitude m	Network	Remarks
Aachen	Nordrhein-Westfalen, Germany	AAC	50 47N	6 05E	179		*Closed.*
Abant	Turkey	ABT	40 36 21N	31 19 15E	1794		Correction to latitude Nov 1994. From 1991.
Abashiri	Abashiri, Hokkaidô, Japan	ABJ	44 00 54N	144 17 00E	38		
Abashiri 2	Abashiri, Hokkaidô, Japan	ADJ2	43 50 30N	143 52 12E	180		From 1994 II 10.
Abastumani	Gruziya, CIS	ABS	41 45N	42 50E			*Closed.*
Abborråsen	Sweden	ABB	57 50 42.0N	12 47 09.6E	239		*Closed.* From 1980 I to 1991.
Abéché	Chad	ABC	13 49 38N	20 50 40E	550		*Closed.* From 1965 to 1968 VI.
Aberdeen	Scotland, UK	ABE	57 10N	2 06W	12		
Aberfoyle	Scotland, UK	EAB	56 11 17N	4 20 24W	250		From 1969.
Abha	Saudi Arabia	ABHA	18 15N	42 45E	2200		From 1988 XI.
Abington	Pennsylvania, USA	ABG	40 07N	75 08W			
Abisko	Sweden	ABK	68 20 30N	18 49 00E	385		*Closed.*
Abou Kooc	Syria	KOOC	33 39 33.0N	36 45 48.0E	1120		From 1994 XII.
Abou Rabah	Syria	RABH	34 26 07.5N	37 12 19.5E	738		From 1994 XII.
Abra de Ilog	Mindoro, Philippines	ABP	13 26 38.4N	120 43 37.8E			*Closed.* From 1976 II to 1977 V 22.
Abû 'Arîsh	Saudi Arabia	ABAR	16 56 31.2N	42 56 20.4E			From 1996 III.
Abu Hadid	Egypt	AAHD	23 44 46.8N	32 45 10.2E			
Abu Simbel	Egypt	ASL	22 20 13N	31 36 58E			From 1975 X.
Abuyama	Osaka, Honshû, Japan	ABU	34 51 37N	135 34 26E	200		Moved 1975:04:11. From 1966 VII 08.
Academy	South Dakota, USA	AY-	43 31 40N	99 06 30W	610		*Closed.* From 1962 VII 14 to 1962 X 05.
Acapulco	Guerrero, México	ACX	16 52 00N	99 55 00W	300		
Acatlán	Puebla, México	ACP	18 12 28.2N	98 03 34.8W	1250		
Achnashellach	Scotland, UK	KAC	57 29 59.6N	5 17 53.5W	330		From 1983.
Acoyapa	Nicaragua	ACY	11 59 51.6N	85 13 30.6W	400		From 1975.
Acton	Ontario, Canada	ACTO	43 36 31.5N	80 03 45.3W	360		From 1991 VII 09.
Adagdak	Alaska and Aleutians, USA	AD8	51 58 50N	176 36 01W	259		*Closed.* From 1974 to 1992 II 01.
Adak	Alaska and Aleutians, USA	ADA	51 51 48N	176 39 18W			*Closed.* Finger Bay. From 1949 VII to 1954 IV.
Adak	Alaska and Aleutians, USA	ADK	51 53 01.4N	176 41 04.0W	116		From 1966 I.
Adak Island	Alaska and Aleutians, USA	AD-	51 52 30N	176 40 45W	61		*Closed.*
Adamit	Israel	ADI	33 04 44N	35 13 30E	470		Correction to coordinates from Jul 1990. From 1983 VII.
		ADI					
Adams	New York, USA	ADN	43 50 00.0N	76 07 10.8W	137		*Closed.* From 1974 XI 24 to 1977 VII 27.
Adana	Turkey	ADAT	37 03 44.4N	35 21 18.0E	150		From 1992 I 01.
Adana	Turkey	ADT	37 03 49.7N	35 21 18.0E	150		From 1979 XII.
Addis Ababa	Ethiopia	AAE	9 01 45N	38 45 56E	2442	WWSSN	From 1959 III.
Adel	Oregon, USA	AOT	42 09 59.4N	119 54 12.0W	1370		*Closed.*
Adelaida	California, USA	PADM	35 38 21.6N	120 51 51.6W	471		MNLO code PAD
Adelaida	El Salvador	ADES	13 39 30N	89 21 30W	1200		From 1991 XII.
Adelaide	South Australia, Australia	ADE	34 58 01S	138 42 32E	655	WWSSN	Mount Bonython. From 1958 VI.
Adelanto	California, USA	ADL	34 33 22.8N	117 25 01.2W	900		From 1975 II.
Adélie		DRV	*See* Dumont d'Urville				
Aden	Yemen	ADEN	12 47 00N	45 00 00E			From 1994 XI.
Adirondack	New York, USA	RSNY	44 32 54N	74 31 48W	396		*Closed.*
Adobe Creek	California, USA	GACM	38 52 22.2N	122 51 43.8W	985		
Adobe Valley	California, USA	AVC	37 54 57.5N	118 43 57.0W	2225		*Closed.* From 1975 VII to 1977 IX.
Aeknabara	Sumatera, Indonesia	AEKI	2 06 06N	98 27 13E	840		From 1991.
Afareaitu	Moorea, French Polynesia	AFR	17 32 18S	149 46 40W	50		
Afiamalu	Samoa Islands	AFI	13 54 34S	171 46 38W	706	WWSSN	From 1958 IV.
Afif	Saudi Arabia	AFIF	24 06 03.6N	43 10 48.0E	950		From 1990 III.
Agalyk	Uzbekistan, CIS	AGL	39 32N	66 54E			
Agana		GUAM	*See* Guam				
Agartala	Tripura, India	AGT	23 53N	91 15E	17		
Agassiz Lake	Alaska and Aleutians, USA	AGAM	60 09 15N	141 02 00W	1024		
Agenahambo	Papua New Guinea	AGE	8 48 49S	148 05 56E	303		*Closed.* From 1963 VIII to 1972
Aggia Anna	Greece	VAG	38 18 57.8N	22 54 01.0E	760		From 1982 X.
Ağin	Turkey	AGN	38 56 53.7N	38 42 55.3E	914		From 1973 IX 20.
Agios Georgios	Greece	AGG	39 01 20N	22 19 49E	540		From 1989 IV.
Agra	Uttar Pradesh, India	AGR	27 08N	78 01E	163		*Closed.*
Agram		ZAG	*See* Zagreb				
Agrihan Island	Mariana Islands	AGRI	18 43 59N	145 39 11E	25		From 1994 IV 23
Agrón	Spain	ERON	37 01 06.7N	3 48 20.9W	1304		From 1994 III 01.
Agualva	Azores	AGA	38 47 04.1N	27 10 23.5W	80		From 1981 V 16
Aguascalientes	Aguascalientes, México	AGX	21 52 43.2N	102 18 03.6W			From 1988.
Ahua	Hawaii, Hawaiian Islands	AHA	19 22 24N	155 15 54W	1070		From 1958.
Ahuachapán	El Salvador	AHU	13 55 18N	89 50 45W			
Aibetsu	Kamikawa, Hokkaidô, Japan	AIB	43 54 24.2N	142 38 46.0E	260		
Aida	Okayama, Honshû, Japan	JAD	34 56 24N	134 10 06E	170		
Aidu		AID	*See* Aizu				
Aigurande	Centre, France	NE08	46 25 12N	1 43 48E	360		*Closed.* From 1982 XI to 1984 XII
Aikawa	Niigata, Honshû, Japan	AIK	38 01 18N	138 14 30E	35		
Ailbek	Turkmeniya, CIS	ABKT	37 55 49.4N	58 07 08.0E	678		
l'Aileron	Martinique	AIL	14 48 03.6N	61 06 28.8W	879		*Closed.* From 1971 III 01.
Ainahou	Hawaii, Hawaiian Islands	AIN	19 22 30.0N	155 27 37.2W	1524		From 1973 IV 26.
Ainzon	Spain	NE11	41 48 50.4N	1 31 01.2W	440		From 1983.
Aioi	Tokushima, Shikoku, Japan	JAI	33 47 30N	134 27 06E	180		
Airport Hangar	New York, USA	APH	43 50 28.8N	74 29 49.2W	564		*Closed.* From 1974 VII to 1983 X
Airport Road	California, USA	AARM	39 16 34.3N	121 01 31.8W	930		From 1976 VII 20
Ait Ouarda	Morocco	AIT	32 06 36.0N	6 30 39.6W			From 1980 VI
Aizawl	Mizoram, India	AZL	23 43 12N	92 43 48E	750		
Aizu	Fukushima, Honshû, Japan	AID	37 34N	140 07E	526		*Closed.* Aidu Inawashino
Ajiro	Shizuoka, Honshû, Japan	AJI	35 02 36N	139 05 48E	68		
Ajmer	Rajasthan, India	AJM	26 28N	74 39E			
Akaike	Fukuoka, Kyûshû, Japan	JFA	33 42 42N	130 47 42E	130		
Akçakoca	Turkey	AKC	40 01 27.8N	31 10 50.9E	150		From 1979 XII.
Akhalkalaki	Gruziya, CIS	AKH	41 24N	43 29E	1720		*Closed.*
Akirkeby	Denmark	BSD*	55 06 50N	14 54 53E	88		From 1981 XI 03.
Akita	Akita, Honshû, Japan	AKI	39 43 06N	140 06 06E	10		*Closed.* Replaced by AKI1. To 1989 XI 01.
Akita	Akita, Honshû, Japan	AKI1	39 42 54N	140 06 12E	2		From 1989 XI 01.
Akita 2	Akita, Honshû, Japan	AKIJ	39 44 06N	140 08 30E	65		From 1990 IV 25.
Akkeshi	Kushiro, Hokkaidô, Japan	AKK	43 01 01.4N	144 50 32.2E	80		From 1976 VII 01.
Akkeshi	Abashiri, Hokkaidô, Japan	JAK	42 59 46.2N	144 41 47.4E	20		
Akkuş	Turkey	AKKT	40 47 04N	37 00 49E	1593		*Closed.* Correction to coordinates Oct 1994.
		AKKT					From 1992 to 1994 VI.
Akola	Maharashtra, India	AKL	20 07N	77 07E	310		
Akosombo	Ghana	AKGH	6 14 36N	0 02 25E	377		From 1987.

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CITATIONS TO IMPORTANT EVENTS

Ridgecrest earthquake, central California
NEIC 1995 Sep 20d 23h 27m 36s 35.8N×117.6W Mag=5.0
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