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UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS
34100 TRIESTE (ITALY) - P.O.B. 586 - MIRAMARE - STRADA COSTIERA 11 - TELEPHONE: 2240-1
CABLE: CENTRATOM - TELEX 460392-1

H4.SMR.203 - 4

" SPRING COLLEGE ON GEOMAGNETISM AND AERONOMY "

(2 - 27 March 1987)

" Characteristic features of the electric conductivity anomalies in the crust and upper mantle of the Pannonian basin"

presented by :

A. ADAM
Geodetical and Geophysical Research Institute of
the Hungarian Academy of Sciences
P.O. Box 5
H-9401 Sopron
Hungary

Lecture note

Characteristic features of the electric conductivity anomalies in the crust and upper mantle of the Pannonian basin

A. Ádám
Geodetic and Geophysical Research Institute of the Hungarian Academy of Sci., H-9401 Sopron, POB 5, Hungary

After discussing some methodical questions of the EM induction studies such as the penetration depth resolving power of the magnetotelluric deep sounding, etc. the factors governing the resistivity of rocks in the Earth's inner are taken into consideration. Among them the role of fluids, that of temperature are emphasized.

This introduction is followed by the short description of the geology of the PANNONIAN BASIN which is a basin-like subsidence between the Eastern Alps, the Carpathians and the Dinarides diagonally crossed by the Hungarian Central Mts.

The electric conductivity distribution in the crust and upper mantle of the Pannonian basin has been studied with the aid of the EM induction methods from the surface till the asthenosphere during the last two decades and very characteristic conductivity anomalies (CA) were discovered.

The discussion of the features of the CA-s starts with the case history of the sedimentary basin having great importance from the point of view of mineral resources (hydrocarbon research).

Into the resistive crystalline basement rocks graphitized coalbeds are embedded causing, in some cases, more than 1000 m thick conducting formations.

The famous "Transdanubian crustal anomaly" covers an area characterized by extensional tectonics, Neogene volcanism and

plate collision. More than 50 deep magnetotelluric soundings enable here a detailed study of the different EM field distortions due to near surface inhomogeneities. This anomaly is best approximated by twodimensional narrow dyke model representing tectonic zones containing graphitic shales and electrolyte in an average depth of 6-7 km. This anomaly is well correlated with that of the Periadriatic lineament which is the continuation of the Balaton-line.

An other famous crustal CA is the Carpathian one. Its strike can be traced from the Western to the Southern Carpathians by Wiese induction arrows, represents the contact zone between the Carpathian plate and the adjacent older geological units (suture zone of a continent-continent collision).

As an earliest result of the first wide band magnetotelluric sounding in the Pannonian basin (Ádám, 1963), it has already been stated that the first conductive layer in the upper mantle i.e. the asthenosphere has here an elevated position (45-70 km) with respect to the surrounding platform areas. (In the East European Platform it is deeper than 200 km.) This depth was supported later by seismic and seismological data.

The effect of the shallow asthenosphere on the MTS curves is demonstrated by well determined MTS curves (e.g. in the Great Hungarian Plain best approximating the 1-D Cagniard model) and averaged MTS curves. Their 1-D inversions (layer sequences) are also given.

The data of the asthenosphere layer in the Pannonian basin fit well to Ádám's empirical relation (1978) between the lithospheric thickness and the regional heat flow.

Origin of conductive anomalies are discussed using EM induction results from other areas, too.