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HAIL FREQUENCY AND INTENSITY IN NORTHERN GREECE

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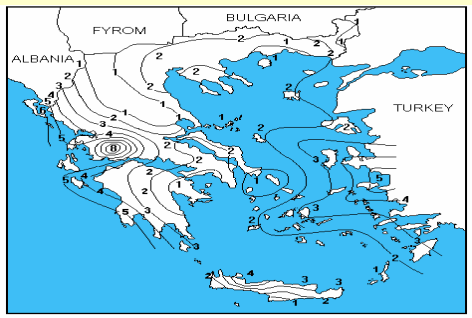
OBJECTIVES

- An overview of hail occurrence in Greece.
- A hail climatology for central Macedonia in northern Greece, based on met stations and insurance hail records (Sioutas, 1999).
- A hail climatology for "Area 1" of central Macedonia, for space and time as derived by hailpad network measurements.
- A hail intensity classification for northern Greece using the TORRO hail intensity scale, and based on hailpad data.

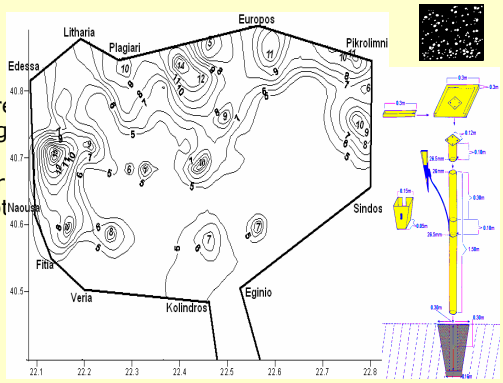


HAIL IN GREECE

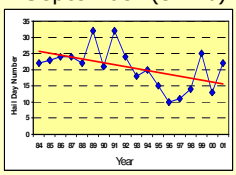
- Based on the HNMS conventional met stations the most hail days occur over western Greece (Kotinis-Zambakas, 1989).
- Annual average maximum of 8 hail days in the west-central parts.
- In the warm period (Apr.-Sep.) most hail days occur over northern Greece.
- In the cold period (Oct.-Mar.) most hail occurs over western and southern Greece.
- About 2 hail days (point hail events) are averaged for central Macedonia, N. Greece.

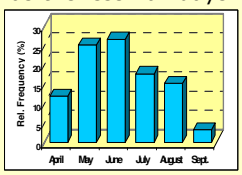
A HAIL CLIMATOLOGY FOR CENTRAL MACEDONIA, NORTHERN GREECE

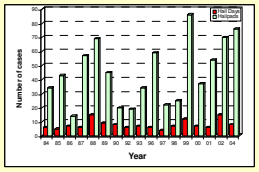
- AREA 1 of central Macedonia, in northern Greece is a significant agricultural area with expensive cultivation. Hail damage costs the insurance, about 20 million of euros annually.
- Such huge crop losses explain why in this are a hail suppression program has been operating from ELGA for ~ 20 years.
- Based in insurance data, an average number of 22 hail days for the warm season (Apr.-Sept is found for central Macedonia.
- In the previous decade (1990-2000) a decreasing trend had been prominent.
- June (26%) and May (25%) exhibit the highest frequency of hail days.
- July follows (18%) and then August (15%).
- September (3.2%) has the less hail days.

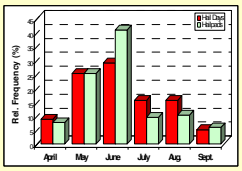


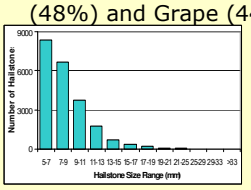
- A total of 134 hail days were recorded by the network in the 17 seasons (15 Apr.-30 Sept.) within the period 1984-94.
- In the years 1991, 1994, 1995, 2003 the hailpad network was not operated.
- A total of 764 hailpads recorded hail during the 17 operational seasons.
- A mean number of 8 hail days is seasonally recorded by the hailpads.
- A yearly number of about 45 hailpads record hail, on average.
- About 22,000 hailstones from 9 years (1984-93) of hailpad data, were studied.
- 85% of hailstones had size up to 11 mm.
- The majority of hailstone size was for Pea (48%) and Grape (44%).

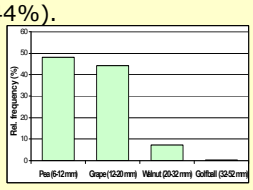










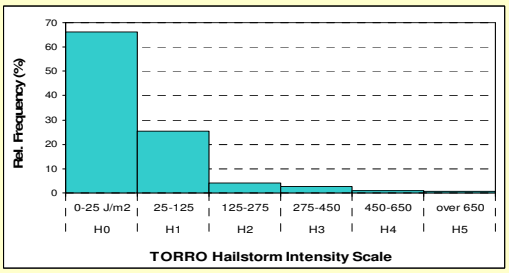


USING THE TORRO HAILSTORM INTENSITY SCALE

The TORRO hailstorm intensity scale (Webb et al., 1986 & 2001). http://www.torro.org.uk/TORRO/severeweather/hailscale.php.

	Intensity category	Hail diam. (mm)	Hail kinetic energy (J·m^{-2})	Typical damage impacts
H0	Hard Hail	5	0-25	No damage
H1	Potentially Damaging	5-15	>25	Slight damage to plants, crops
H2	,,	10-20	>125	Significant damage to fruit, crops
H3	Severe	20-30	>275	Severe damage to fruit, crops, damage to glass and plastic
H4	,,	25-40	>450	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>650	Glass - wholesale destruction, damage to tiled roofs, significant risk of injuries
H6	,,	40-60		Aircraft bodywork dented, brick walls pitted
H7	Very destructive	50-75		Severe roof damage, risk of serious injuries
H8	,,	60-90		
H9	Super Hailstorms	75-100		
H10	,,	>100		

- The TORRO hailstorm intensity scale was applied to classify hailfalls of northern Greece, using hail kinetic energy values as derived from hailpad data.
- 66.1%, of hailfalls are classed as H0 on the H-scale.
- 25.4% reached up to H1.
- 4.2% of the hailfalls corresponds to H2
- 2.7% to H3, 1.2% to H4 and 0.3% of hailfalls to H5.



SUMMARY AND CONCLUSIONS

- Hail occurrence in Greece based on the HNMS met stations data shows a yearly maximum of 8 hail days in the central-west parts.
- In N. Greece, with a mean yearly number of 2 hail days ("point frequency") there is a trend for decreasing hailfalls from the interior to coastal areas. Based on insurance data an average of 22 hail days ("regional frequency") is found for central Macedonia.
- In the hailpad network of Area 1, a mean number of 8 hail days is recorded seasonally corresponding to a total of 45 hailpads, on average. June is the highest hail frequency month, in term of hail-days and hailpad number, followed by May.
- A mean of 18 hailpads record hail in June and 11 hailpads in May, revealing a greater extent of hail in June compared with May.
- Large spatial variability of the hail occurrence in the Area 1, with a maximum in the north and the northwest and a decrease in hail towards to south of the area.
- About 85% of the total 22,000 hailstones examined had sizes up to 11 mm. Most hailstones categorised as Pea (48%) and Grape (44%).
- The majority of northern Greece hailfalls, 66.1% are at level H0 on the TORRO hailstorm intensity scale, while 25.4% reach H1.

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