

# A REVISED CATALOGUE OF EARTHQUAKES IN THE BROADER AREA OF GREECE FOR THE PERIOD 1950-2000 <sup>(1)</sup>

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## INTRODUCTION

The Institute of Geodynamics, National Observatory of Athens, (IG-NOA) is one of the oldest Institutes in Greece, operating continuously since 1893. At that time the first seismograph installed in Greece while in 1897 the first seismological network of mechanical type started to operate. However 1964, is considered as the most important date. From that year, electromagnetic type satellite stations started to set up, so systematic and detailed seismic observations were continuously performed. In 1973, 13 satellite stations were in operation; in 1983 the network became telemetric, in 1988 started its' expansion with 14 more satellite stations and in 1994 the majority of the stations became digital. Since 1964 the initial network grew in size and extent so that today consists of 29 telemetric stations covering almost the whole country. Moreover from 1999, 7 telemetric stations belonging to OASP (Earthquake Planning and Protection Organization, Athens) are connected with the seismological network of the IG-NOA.

The detectability of the modern network enables accurate determination of earthquake focal parameters with  $M_l > 4,0$  for the whole area of Greece (Papanastassiou 1989), while for some areas the threshold magnitude is lower.

The data collected from all the stations, corresponding to earthquakes occurring in the territory of Greece and the bordering areas, are analysed in detail. The results are presented in seismological bulletins. So from 1896 till 1936, these appear in the "Annales de l'Observatoire National d'Athènes", from 1936 till 1946 the observations are not systematically published and from 1950 till now are listed in the monthly bulletins of the Institute. These bulletins are distributed regularly all over the world, at several Seismological Centres and Universities, as well as at different National Centres, Universities, Organizations and Libraries.

The catalogue covers the area limited to latitudes 34°N to 42°N and longitudes 19°E to 29°E north of the 38°E parallel. South of the 38°E parallel, in order to cover the Dodecanese Islands, it extends till the 30°E longitude.

This catalogue is the first step of a project that IG-NOA has initiated, in order to relocate more accurately all the earthquakes recorded by its instruments during the period 1900 to 2000. Our ultimate goal is to produce a comprehensive and accurate catalogue for the seismicity of Greece and the adjacent areas spanning the 20<sup>th</sup> century.

## 2. DATA AND METHOD OF ANALYSIS

The data collected from all the stations, are analysed daily by the staff of IG-NOA, in detail. This means that all the necessary parameters, like the arrival times of P and S-waves and latter phases, are measured accurately in order to calculate the earthquake source parameters, which are the coordinates of the epicentre, the focal depth and the origin time.

During the period 1964 – 1982 the determination of the source parameters was carried out manually, by using appropriate travel time curves according to the crustal model of Herrin et al. (1968). In 1983 for accurate calculation of the source parameters, a computer program started to use, Hypo 71-Revised (Lee and Lahr 1975). As input in this program the velocity model given by Herrin et al. (1968) and the  $V_p/V_s = 1,73$  ratio are used.

From the installation of the mechanical type seismographs in the station of Athens, surface magnitude ( $M_s$ ) for the strong events is calculated from these instruments. Since 1967, local magnitude ( $M_l$ ) is routinely determined on the Richter scale from the maxima trace amplitudes recorded by the existing in IG-NOA, unique in Greece standard Wood - Anderson torsion seismograph. Since 1990 average duration magnitude ( $M_d$ ) corresponding to  $M_l$  is also computed for shallow earthquakes.

In order to provide a uniform catalogue for the period 1950-2000, firstly all the earthquakes of the period 1964-1982 were processed by using the crustal model of Herrin et al. (1968), and the Hypo 71-Revised computer program, Lee and Lahr (1975). Their local magnitudes were also recalculated.

**The used Velocity Model of Herrin et al. (1968)**

<b>Layer width (km)</b>	<b><math>V_p</math> (km/sec)</b>
0 – 15	6.0
15 – 40	6.75
> 40	8.05

Moreover the parameters of the earthquakes of the period 1950-1964 were checked carefully, corrected for several errors and incorporated in this catalogue.

Finally, all the earthquakes during the period 1983-end of 2000 were checked. Several invalid solutions mainly magnitudes and focal depths were found. The parameters of these shocks recalculated and the new final valid solutions are included in the final catalogue.

In the presented revised catalogue, 59,284 events are included, covering the period 1950-2000. For the time period 1950-1965 surface magnitude ( $M_s$ ) is given. Since 1966, local magnitude ( $M_l$ ) is given and after 1990 duration magnitude ( $M_d$ ) is also calculated and is indicated by an asterisk.

## **REFERENCES**

- HERRIN, E., TUCKER, W., TAGGART, J.N. AND LOBDELL, J.L. 1968. Estimation of surface-focus travel times. *Bull. Seism. Soc. America*, 58, 1273-1292.
- LEE W.H.K. and LAHR, J.C. (1975. HYPO71 (revised). A computer program for determining hypocenter, magnitude, and first motion patten of local earthquakes. U.S. Geological Survey, Open-File report 75 - 311, 114 pp.
- PAPANASTASSIOU, D. 1989. Detectability and accuracy of the determination of earthquake source parameters of the seismological networks of the National Observatory of Athens. Ph. D. Thesis, University of Athens, 235p, (In Greek).