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The March 1, 2004 Kalamata Earthquake Aftershock Sequence as recorded by the Tripoli Seismic Array (TRISAR).

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On March 1, 2004, an earthquake of moderate magnitude Ml=5.0 occurred in the vicinity of the town of Kalamata, in the southern Peloponnese, Greece. The main shock was followed by a relatively small number of low magnitude aftershocks. The Institute of Geodynamics of the National Observatory of Athens (NOA) processed and located 5 events during the first 36 hours of the seismic sequence and a total of 10 events during a time period of 20 days (http:/www.gein.noa.gr). The epicentral area coincides with that of the September 13, 1986, Kalamata earthquake aftershock sequence (Lyon-Caen et al., 1988, Papazachos et al., 1988).

The Tripoli Seismic Array (TRISAR), is a 4-element, 3-component, small aperture seismic array operated by the Seismological Laboratory of the University of Athens and is located approximately 50 km to the NNE of the epicentral area. The very small aperture (approximately 0.25 km) combined with the favorable epicentral distance, provided high coherence recording of the Kalamata event and its aftershocks. TRISAR recorded more than 50 events during the first 5 days of the aftershock sequence. All aftershocks recorded by TRISAR display a characteristic Sg - Pg arrival time difference of 6.4 +/- 0.5 seconds.

The data were processed by application of broadband f-k analysis (Kvaerna and Ringdal, 1986) both on vertical and horizontal components. Events were located using the HYPOSAT routine (Schweitzer, 2001), with the regional velocity model (Sweeney and Walter, 1998) typically used for TRISAR data locations. The resulting epicentres were characterized by good accuracy levels, both in terms of error-ellipsoid dimensions and actual horizontal errors. The spatial distribution of the epicentres is quite

limited and restricted in the area of northern Tayghetos Mt., in the immediate NE of the town of Kalamata.

Relocation of these events was performed using a different velocity model which resulted from the combination of the above mentioned regional model and a local model constructed for the upper crust in the area of Kalamata, for the 1986 Kalamata earthquake aftershock sequence (Lyon-Caen et al., 1988). Resulting locations indicate very good agreement for the two velocity models, most of the epicentres being characterized by a difference of less than 2 km in the horizontal directions. Moreover, relocated epicentres display a slightly more restricted spatial distribution.

The main shock and nine of the aftershocks were also located by the National Observatory of Athens. Comparison of single array location results with the locations provided by NOA displayed quite good agreement between the two solutions. However, TRISAR locations display a much more limited spatial distribution in the N-S direction, while for NOA some events are located further to the South, close to Messiniakos Bay. Such a case suggests activation of a fault segment whose size (approximately 30 km) is inconsistent with the magnitude of the main shock and the magnitudes reported for the whole of the aftershock sequence.

In order to investigate this matter further, a relocation of the selected events was performed using data both from NOA and TRISAR with the use of the new velocity model produced for this study. Location results are characterized by good accuracy and very restricted spatial distribution, both in the N-S and E-W direction. The reduction of the aftershock area extent is significant especially in the N-S dimension.

TRISAR recordings from the previous interval of operation (July 2003-February 2004) were checked in order to investigate previous seismic activity in the area, and a small number of earthquakes from the broader area of Kalamata were found. Only two of the events were located in the epicentral area of the March 2004 activity. Both earthquakes, which occurred in August 2003, are low magnitude events.

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REFERENCES

Kvaerna, T., and Ringdal, F., 1986: Stability of various f-k estimation techniques. NORSAR Sci. Report No. 1-86/87, Kjeller, Norway.

Lyon-Caen, H., Armijo, R., Drakopoulos, J., Baskoutas, J., Delibassis, N., Gaulon, R., Kouskouna, V., Latoussakis, J., Makropoulos, K., Papadimitriou, P., Papanastassiou,

D., and Pedotti, G., 1988: The 1986 Kalamata (South Peloponnesus) earthquake: Detailed study of a normal fault, evidences for east-west extension in the Hellenic Arc. J. Geophys. Res., 93 (B12), 14967-15000.

Papazachos, B., Kiratzi, A., Karacostas, B., Panagiotopoulos, D., Scordilis, E., and Mountrakis, D., 1988: Surface fault traces, fault plane solution and spatial distribution of the aftershocks of the September 13, 1986 earthquake of Kalamata (southern Greece). PAGEOPH, 126, 55-68.

Schweitzer, J., 2001: HYPOSAT - An enhanced routine to locate seismic events. PAGEOPH, 158, 277-289.

Sweeney, J., and Walter, W., 1998: Preliminary definition of geophysical regions for the Middle East and North Africa. Lawrence-Livermore National Laboratory, UCRL-ID-132899, 40 pp.