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Static Stress Changes Inverted from Microseismicity in Eastern Aegean Sea

Konstantinos Leptokaropoulos (1,2), Eleftheria Papadimitriou (2), Beata Orlecka-Sikora (1), and Vassilios Karakostas (2)

(1) Institute of Geophysics, Polish Academy of Sciences, Warsaw, Poland, (2) Aristotle University of Thessaloniki, Greece

In this study we attempted to derive static stress field variations from the changes of earthquake production rates in Kusadasi bay and Samos island (eastern Aegean), by applying the Dieterich et al. (2000) Rate/State formulation. The calculation of stress changes from earthquake occurrence rates fluctuations should be obtained from catalogues which achieve adequate spatial and temporal resolution and well determined hypocenter coordinates. For this reason we took advantage of the data from a regional network operating since July of 2007, providing continuous monitoring of microseismicity, along with data available from seismological stations of the permanent Hellenic Unified Seismological Network (HUSN). The high accuracy and large sized regional catalogue is utilized for inverting seismicity rate changes into stress variation through a Rate/State dependent friction model. After explicitly determining the physical parameters incorporating in the modeling (reference seismicity rates, characteristic relaxation time, constitutive properties of fault zones) we investigated stress changes in both space and time regime and their possible connection with earthquake clustering and fault interactions. The main interest is focused on the June 2009 Samos Mw=5.1 event, which was followed by an intense seismic activity for several days. We attempt to reproduce and interpret stress changes both before and after the initiation of this seismic burst. The differences between the earthquake occurrence rates before and after the main shock are used as input data in a stress inversion algorithm based upon the Rate/State dependent friction concept in order to provide an estimation of stress changes. Diverse assumptions and combinations of the parameters values are tested for the model performance and sensitivity to be evaluated. The approach followed here could provide evidence of the robustness of the seismicity rate changes usage as a stress meter for both positive and negative stress steps in an actively tectonic region accommodating complex fault systems.

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