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Stress Field Variation after the 2001 Skyros Earthquake, Greece, Derived from Seismicity Rate Changes

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The spatial variation of the stress field (ΔCFF) after the 2001 strong (Mw=6.4) Skyros earthquake in North Aegean Sea, Greece, is investigated in association with the changes of earthquake production rates. A detailed slip model is considered in which the causative fault is consisted of several sub-faults with different coseismic slip onto each one of them. First the spatial distribution of aftershock productivity is compared with the static stress changes due to the coseismic slip. Calculations of ΔCFF are performed at different depths inside the seismogenic layer, defined from the vertical distribution of the aftershocks. Seismicity rates of the smaller magnitude events with $M \geq Mc$ for different time increments before and after the main shock are then derived from the application of a Probability Density Function (PDF). These rates are computed by spatially smoothing the seismicity and for this purpose a normal grid of rectangular cells is superimposed onto the area and the PDF determines seismicity rate values at the center of each cell. The differences between the earthquake occurrence rates before and after the main shock are compared and used as input data in a stress inversion algorithm based upon the Rate/State dependent friction concept in order to provide an independent estimation of stress changes. This model incorporates the physical properties of the fault zones (characteristic relaxation time, fault constitutive parameters, effective friction coefficient) with a probabilistic estimation of the spatial distribution of seismicity rates, derived from the application of the PDF. The stress patterns derived from the previously mentioned approaches are compared and the quantitative correlation between the respective results is accomplished by the evaluation of Pearson linear correlation coefficient and its confidence intervals to quantify their significance. Different assumptions and combinations of the physical and statistical parameters are tested for the model performance and robustness to be evaluated. Simulations will provide a measure of how robust is the use of seismicity rate changes as a stress meter for both positive and negative stress steps.
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