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Finite Fault Inversion of the January 8 2006 (Mw 6.7) Kythira Earthquake, southern Greece

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On January 8 2006 (11:34 GMT) a Mw $\sim$ 6.7 earthquake occurred to the east of Kythira island in southern Greece with a focal depth of 65 km. The event was recorded by the 23 broadband three-component stations of the Greek seismic national network (HL) that is operated by the National Observatory of Athens as well as by seven more stations in the southern Aegean operated by the GEOFON and MEDNET groups. Here we use regional waveforms recorded at 13 stations resulting in the best possible azimuthal coverage around the Kythira event epicenter in order to investigate its source process and determine the fault plane. The finite fault inversion problem is parameterized by numerous subfaults (1x1 kmˆ2) set at depths ranging from 1 to 80 km. The regional ground motion at any given station is then the linear sum of slip stemming from these subfaults. Green's functions on each subfault for each station were calculated using the F-K method and 1D velocity models derived from tomographic studies of the Greek region. Furthermore we considered multiple-time windows that allowed each subfault to slip in any of 2 s time-windows following the passage of the rupture front assuming a rupture velocity of 3 km/s. A parallel non-negative least squares inversion technique was used to solve this problem utilizing different computing nodes and promoting program performance. The inversion results can be summarized as follows: (a) there are two areas of large slip ($\sim$60 cm), the largest of them extending at a depth range 40-60 km while a smaller one extended down to 75 km, (b) the resulting moment rate function consists of a large initial peak with a duration of about 10 s

followed by a number of smaller peaks with a duration of 20 s (probably representing the moment release due to the rupture of the smaller patch and repeated slip on some subfaults). Finally, we relocate both the Kythira event and its 47 aftershocks using catalogue and cross-correlation travel times in order to obtain precise relative locations. The location of the mainshock falls near the largest maximum slip area, while the locations of its aftershocks fall to the east at the area of minimum slip (1-3 cm) confirming the robustness of our results.