Static Stress Changes and Fault Interactions in Western Greece (Ionian Islands and Gulf of Corinth)

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SUMMARY

The complicated tectonics of the Mediterranean region are dominated by the collision of the Arabian and African plates with Eurasia and affect the whole of Greece. The total extension rate across the Aegean sea, estimated from satellite geodetic observations, is about 4-5cm/yr, while intense seismic acceleration is observed in parts of the Hellenic arc and several large earthquakes (Ms>6) of intermediate depth take place along it. Most of the Aegean, from the north Aegean trough to the southwest Hellenic trench, is involved, while an intricate pattern of strike-slip and normal faults accommodate this extensional deformation. In Western Greece, the NW part of the Aegean plate is characterised by transcurrent fault systems one of which is the transform fault of the Cefallonia Island with right-lateral slip, in the direction of N213oE, and a slip rate of about 3cm/yr, the fastest fault slip observed so far in the Aegean. The Ionian Islands are situated in a transitional zone characterized by a high crustal deformation rate as revealed by the high seismicity of this zone, which is the highest in the Aegean. The Gulf of Corinth, one of the fastest opening rifts in the world, is bordered both north and south by active normal faults where large destructive earthquakes take place. The rift appears to be still in its early phases of opening, while its continental crust is strongly heterogeneous both vertically and laterally, obstructing growth and linkage of the evolving active normal faults. Repeated GPS campaigns have been carried out on extensive geodetic networks covering the Ionian Islands and most of the Gulf rather densely. So far, the analysis of these data has provided estimates of the secular motion of the free surface. In some cases the geodetic data, combined with tectonic and seismological ones have, also, supplied information regarding the discontinuous deformation due to earthquake activity in the region. In the present work an attempt is made to assess the Coulomb stress change associated with well documented earthquake activity in Western Greece (Ionian Islands and Gulf of Corinth). The efficiency of the earthquake modeling is further evaluated by comparing the free surface displacement fields corresponding to the Coulomb stress changes with the ones derived from the GPS observations. Since the tectonics of the region are controlled by both normal (Corinth Gulf) and strike slip (Ionian Islands) faults a comparison is carried out regarding the behaviour of the different types of faulting to static stress changes, while the possibility of probable correlation between the two systems of faults is also investigated.

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