Kinematics and active tectonics of Western Greece in the geodynamic framework of Central and Eastern Mediterranean

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The Mediterranean is a diffuse plate boundary zone between the slowly converging Eurasian and African plates (~5 mm/yr), where remnants of old Tethyan basins are progressively consumed by fast trench retreat (~20-30 mm/yr at the Hellenic subduction zone). In Eastern Mediterranean, a collision-subduction transition occurs in Western Greece (collision of the Apulian Platform to the north and Hellenic subduction zone to the south), close to the westward Corinth Rift termination and in a region that may be potentially affected by a westward propagation of the North Anatolian Fault.

We used a multi-scale deformation approach to investigate Western Greece active kinematics:

(1) We run a large scale model of horizontal velocities measured by GPS to constrain the kinematic boundary conditions of Western Greece, both onshore and offshore. A major result is the occurrence of distributed N-S extension spreading from Bulgaria to the Eastern Corinth rift, resulting in de-activation of the western termination of the North Anatolian Fault in the North Aegean Sea. This large scale extension could be associated to the retreat of the Hellenic slab.

(2) An active tectonics study has been performed to provide an accurate mapping of active faults in the region, to constrain their relative chronology and to estimate their geological slip-rate. The Amvrakikos Gulf active half-graben and the N155° active Katouna-Stamna Fault, which form the northern and eastern boundaries of a Ionian Island-Akarnania block (IAB), have geological slip rates of at least ~ 4mm/yr and GPS slip-rates of ~ 10 mm/yr. The IAB is bounded to the west by the Kefalonia transform fault and appears to behave rigidly.

(3) Once the IAB boundaries are defined, we show that the velocity field measured by GPS in the region can be totally accounted by transient elastic loading along the IAB bordering faults. Subduction interface coupling has no surface expression, suggesting low coupling. Finally, we justify the occurrence of a Rift-Fault-Fault triple junction at the western termination of the Corinth Rift.