Active deformation in Algeria from Continuous GPS measurements

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Abstract

The present-day kinematics of plate boundary deformation in the western Mediterranean is now well described by space geodetic measurements, except for the Algeria-Tunisia part of north Africa where results are still lacking. Yet, that portion of the Nubia-Eurasia plate boundary likely concentrates most of the oblique plate convergence, with an on-going debate on the role of offshore versus onland active – and seismogenic – structures. Here we use 10 years of continuous GPS data from the Algerian REGAT network to compute a new geodetic velocity field in Algeria. In the west, velocities are uniform and collinear to the plate convergence trend, with a sharp gradient at the coast. In the east, the velocity pattern is slightly more complex with deformation involving a broader region. Using a simple block kinematic model, we show that the GPS results are consistent with a kinematic model where an active, reverse, offshore fault system runs along the toe of the Algerian margin, with a slip rate that decreases from west to east. In the western half of Algeria, the GPS data does not require any major additional faults system onland. In the eastern half of Algeria, the GPS velocity field requires an E-W-trending strike-slip fault separating two blocks, that accounts for the strike-slip component of the overall plate motion. We also observe significant shortening between the Saharan platform and and the Aures range in southeastern Algeria.

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