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The complex Africa-Eurasia plate boundary system in the Mediterranean: new kinematics and tectonics constraints from GPS and focal mechanisms data

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It is widely accepted that the structural complexity of the Euro-Mediterranean region is related to the interaction of several microplates and crustal blocks in a context of slow convergence of the African and Eurasian plates. This is translated into a complex pattern of the actual crustal stress and strain fields. An integrated use of geodetic and seismic data, and in particular of GPS and earthquake focal mechanisms, provides a better resolution of the ongoing crustal deformations, allowing to put further constraints on the present day kinematics and rates of active strains. We analyze and discuss the kinematics and tectonics of the Africa-Eurasia plate boundary from the Azores triple junction to the Dead Sea fault, with particular emphasis on the central Mediterranean. We present a new GPS velocity field, obtained from the analysis of surveys, performed in the 1991-2003 time interval, and continuous observations collected at stations operating in the Euro-Mediterranean region in the 1998.0-2005.0 time span. The GPS velocities are used to frame local and regional tectonic features in the context of the actual Nubia-Eurasia plate convergence. We computed new absolute and relative rigid Euler rotation poles for the two major plates. We derived a regional geodetic strain-rate field by inverting planar strain tensors over a regular grid. We used the present day most complete focal mechanisms catalog available, obtained by merging the new Earthquake Mechanisms of the Mediterranean Area (EMMA) database with the Harvard-CMT, the INGV-RCMT and the ETH-MT catalogs, to derive the horizontal seismic strain field. We used the GPS velocity vectors and strain fields to constrain the deformation rates along major seismic belts. We observed a fairly good agreement between geodetic and seismic strain-rate fields. The latter, moreover,

both confirm the structural and kinematics complexity of the study area, and provide a strong framework for the analysis of the dynamic processes governing the present-day kinematics.