BLIND AND SURFACE FAULTING DURING LARGE AND MODERATE EARTHQUAKES DEDUCED FROM INSAR IN ALGERIA AND MOROCCO: INSIGHTS FOR THE ACTIVE DEFORMATION ALONG THE PLATE BOUNDARY IN NORTH AFRICA

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We studied recent earthquakes of the Africa-Eurasia plate boundary in the western Mediterranean using InSAR. The selected large to moderate earthquakes of Mascara (18 August 1994, Mw 5.8), Zemmouri (21 May 2003, Mw 6.8), Ain Temouchent (22 December 1999, Mw 5.7) and Al Hoceima (26 May 1994, Mw 6.0; 24 February 2004, Mw 6.5) belong to a narrow strip in the Tell Atlas and Rif Mountain range of North Africa, parallel to the plate boundary. The earthquake deformation at the surface as characterized in fringes of interferograms and related rupture at depth obtained from elastic models of dislocation are consistent with field observations and late Quaternary tectonics. We studied the SAR images taking into account the ascending and descending positions of the ERS1 and Envisat satellites coupled with detailed digital elevation models from SRTM coverage. Although the difficulty to obtain fringes is higher with moderate magnitudes (Mw<6), and in the case of Ain Temouchent seismic event, the selection of pair images permitted to extract interferograms with a minimum of 2 to 3 fringes across the epicentral region. The correlation with the morphology and seismic rupture at depth is consistent with previously mapped active folds and inferred seismic moment. In the absence of surface faulting and reliable maps of aftershocks distribution, our InSAR results contribute significantly to the identification and characterisation of seismogenic faulting. Furthermore, the seismic moment summation deduced from InSAR is directly comparable to the seismic strain release and rate of convergence as obtained from global model of plate tectonics and local GPS network. The interferograms of recently active fault ruptures also provide with the definition of dormant nearby fault segments that constitute possible sites of future earthquake sources. The InSAR analysis related with moderate to large earthquakes in North Africa becomes a prerequisite for any seismic hazard assessment along the plate boundary.