



InSAR Observations of the M 6.5 2004 and the M 6.0 1994 Al Hoceima, Morocco earthquakes

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The Al-Hoceima Region, Morocco is situated at the junction between the Rif Mountain Belt and the submarine Alboran Rige. On February 24th 2004 a Mw 6.5 earthquake killed over 600 people with 40,000 made homeless. On May 26th 1994, a Mw 6.0 earthquake occurred in a very similar location causing great damage and two deaths. Initial seismological observations of both earthquakes indicated left-lateral faults with strikes of ~ 20 degrees or right lateral faults with strikes of ~ 110 degrees. No surface rupture was produced by either event, but aftershock locations and mapped earthquake fissures favour a NNE-SSW fault orientation (El Alami et al, 1998, Jabour et al, 2004).

Four ENVISAT ASAR acquisitions were used to construct two independent interferograms for the 2004 earthquake and a pair of ERS SAR acquisitions were used to produce a coseismic interferogram for the 1994 earthquake. The sparsely vegetated eastern and coastal areas of the interferograms are coherent over the ~ 1 year timespan of the 2004 interferograms, but the densely vegetated inland areas are incoherent. Three lobes of deformation can be seen in the interferograms with a peak-to-peak line-of-sight displacement of ~ 22 cm (8 fringes).

The 2004 co-seismic displacements are modelled using slip on a rectangular dislocation in an elastic half space (Okada, 1985). Initially, we use a uniform slip model with a single rectangular dislocation to estimate source parameters. Early tests show that, due to poor coherence near the fault trace, a priori information is required to avoid instabilities in the inversion process. Aftershock locations from the 1994 earthquake (Ait Brahim, 2004) are used to fix the maximum fault depth at 18km. A range of models with variable slip:length ratios on NS and EW orientated planes are tested and compared with constraints on fault geometry from seismic bodywave modelling.

Preliminary results favour a NNE-SSW orientated fault plane with a dip of ~ 70 degrees and slip buried at a depth of 2-3 km below the surface.