

The Beni-Ilmane Seismic Sequence of May 2010: Seismic Sources and Stress Tensor Calculations

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A moderate earthquake with a moment magnitude of M_w 5.5 struck the Sub-Bibanique region of eastern Algeria on 14 May 2010, killing three persons, injuring hundreds of others, and causing moderate damages in the epicentral area, mainly in the villages of Beni-Ilmane and Samma. The focal mechanism of the seismic source for the first shock, obtained by near-field waveform modelling, exhibits left-lateral strike-slip faulting with the first nodal plane oriented at $N345^\circ$, and right-lateral strike-slip faulting with the second nodal plane oriented at $N254^\circ$. A second earthquake that struck the region on 16 May 2010, with a moment magnitude of M_w 5.1, was located 9 km SW of the first earthquake. The focal mechanism obtained by waveform modelling showed reverse faulting with nodal planes oriented NE–SW ($N25^\circ$ and $N250^\circ$). A third earthquake that struck the region on 23 May 2010, with a moment magnitude of M_w 5.2, was located 7 km S of the first shock. The obtained focal mechanism showed a left-lateral strike-slip plane oriented at $N12^\circ$ and a right-lateral strike-slip plane oriented at $N257^\circ$. Field investigations combined with geological and seismotectonic analyses indicate that the three earthquake shocks were generated by activity on three distinct faults. The second and third shocks were generated on faults oriented WSW–ENE and NNE–SSW, respectively. The regional stress tensor calculated in the region gives an orientation of $N340^\circ$ for the most compressive component (σ_1) which is close to the horizontal, with a stress shape factor indicating either a compressional or a strike-slip regime.