

An Automated Moment Magnitude (M_w) and Focal Mechanism for the Algerian Digital Seismic Network (ADSN)

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Automatically generated focal mechanisms solutions and moment magnitude M_w have recently (Since 2013) been added to the real time products produced by the Algerian Digital seismic Network (ADSN). The focal mechanisms and the moment magnitude M_w are both computed within minutes for all Algerian (local) earthquakes that trigger the ADSN with local magnitude $M_l > 3.5$. Waveform inversion (FMNEAR-method) was performed to determine the focal mechanism (FM) and moment magnitude (M_w), employing the near-source records (FMNEAR) method (Delouis, 2014). For small to moderate events ($M < 5.8$), the earthquake is represented by a purely double couple point source. The inversion combines two grid search steps (on the strike and dip parameters of the FM), whilst the source time function and the rake (slip angle) are determined by simulated annealing runs. The criterion for selecting a solution is based on a normalised root mean square (RMS) misfit function:

$$RMS = \text{SQRT} [\Sigma(\text{obs} - \text{cal})^2 / \Sigma(\text{obs})^2]$$
, where SQRT is the square root, over all data points from the seismograms. The FMNEAR method explores the focal depth and provides the optimal depth from the waveform modelling. Filtering parameters (minimum and maximum frequencies) can be adapted automatically and individually for each component of the seismograms (N, E, or Z). Accordingly, the high-pass (i.e. low-cut) frequency (f_{min}) is identified as the frequency at which the acceleration spectrum maintains a positive near-constant slope up to the plateau area near the corner frequency. The low-pass (i.e. high-cut) frequency (f_{max}) is basically two to four times the f_{min} value; it is constrained by the magnitude and distance, and by comparing the signal/noise amplitude ratio in the spectral domain. We thus derive the boundary frequencies f_{min} and f_{max} , which define the filtering band-pass for individual components (N, E, and Z). In this poster we present focal mechanisms and moment magnitude M_w of moderate earthquakes occurred in Algeria computed automatically using FMNEAR method recorded from 2013 until now.