Evaluation of seismic sensor orientations in the full moment tensor inversion results

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Moment Tensor inversions depend on;

Data Quality

Frequency Band

Green Functions

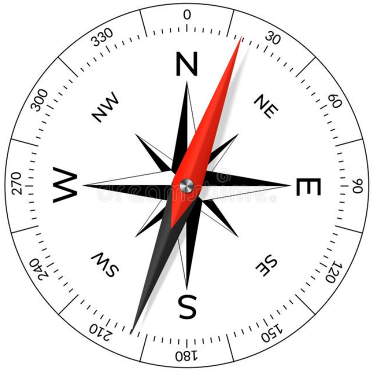
Method

Station Distribution

Station Metadata;

- Correctly oriented sensor components (Most cases horizontal components) with respect to a common reference system (generally the geographical North) (Cesca & Grigoli, (2015); Petersen et al. (2019); Büyükakpınar et al. (2021)).

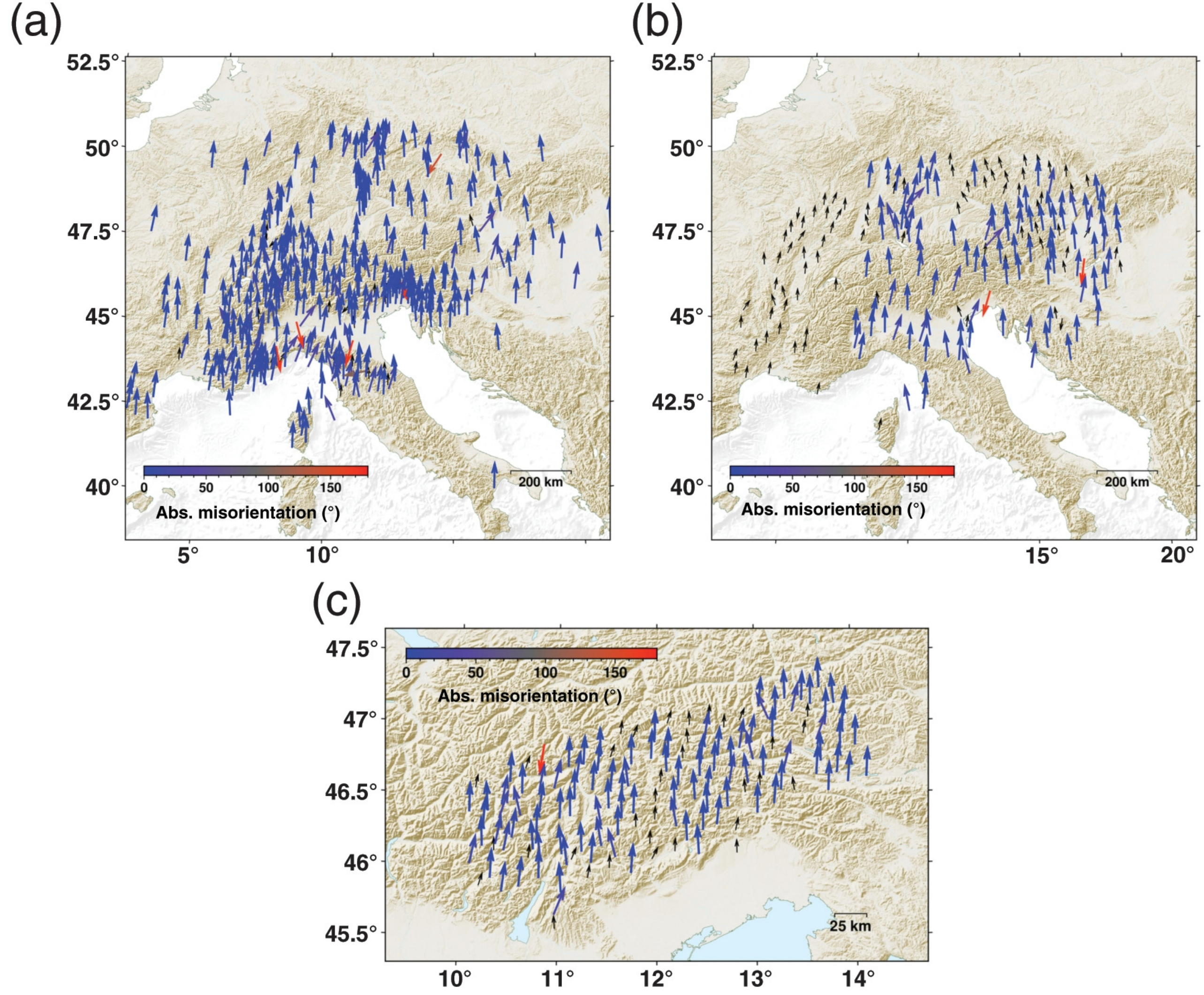
Why MisOrientation:



Error in regions with strong magnetic anomalies (e.g., volcanic areas, earth poles regions, magnetic material in nearby buildings) (Zaldívar et al. 2016; Cesca & Grigoli, (2015); Büyükakpınar et al. (2021).

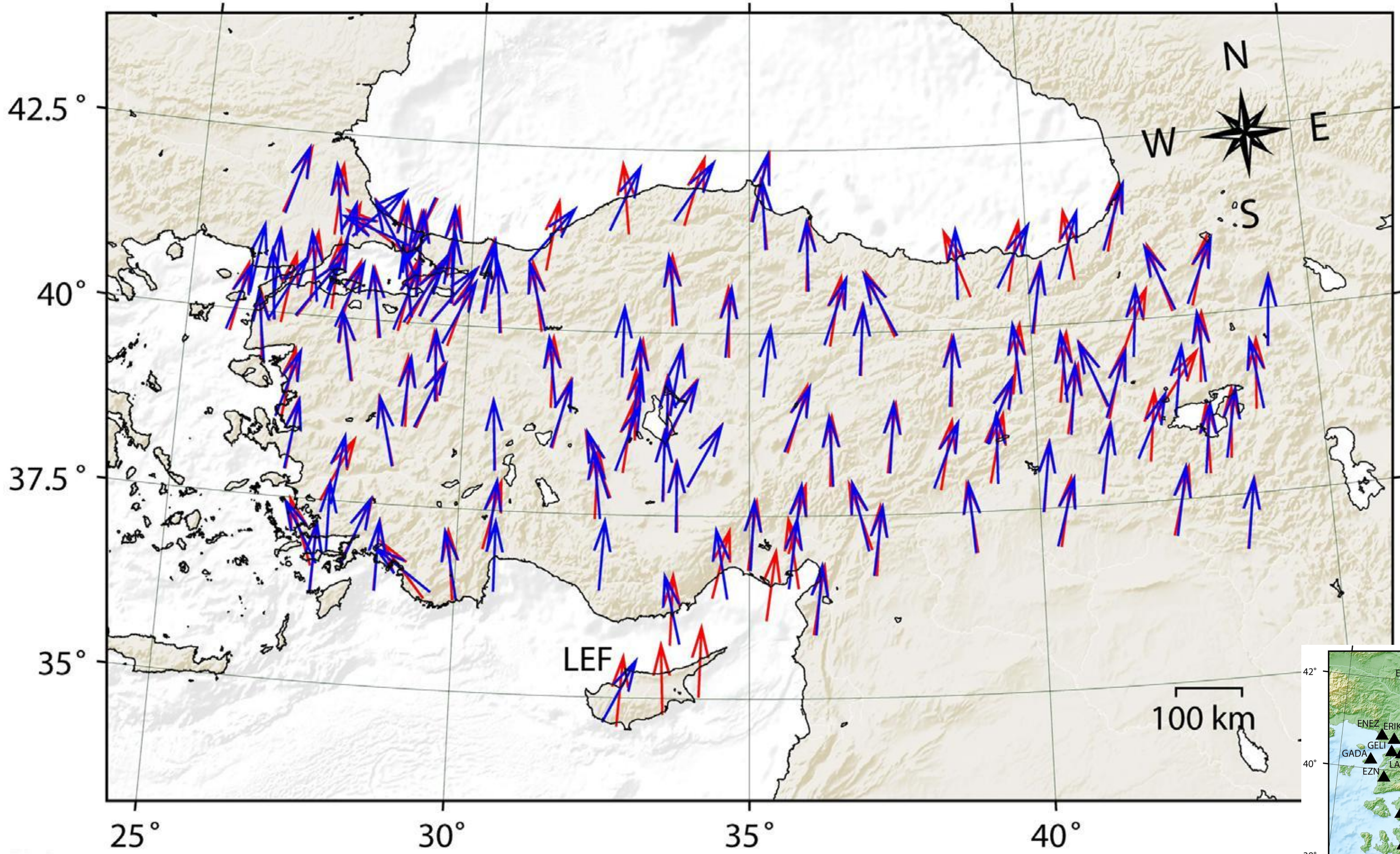
Or, Improper use of the magnetic compass.

AlpArray Seismic Network

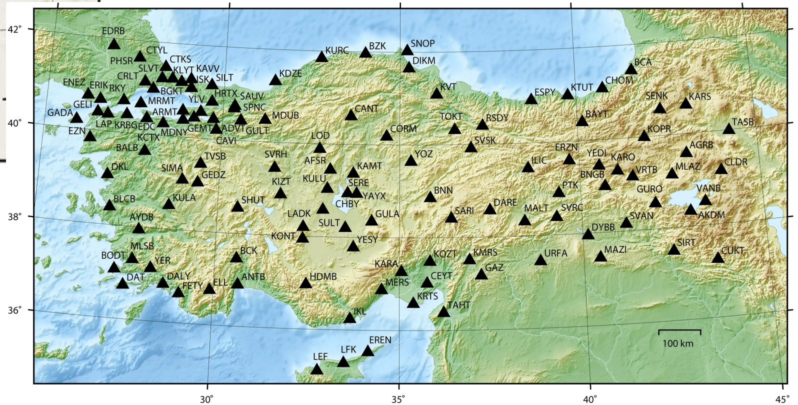


The orientations of the horizontal components of all stations are indicated by the vectors. **Petersen et al. (2019)**

Sensor deviation angles of the KOERI network, Turkey



Büyükakpınar et al. (2021)



Point source inversion;

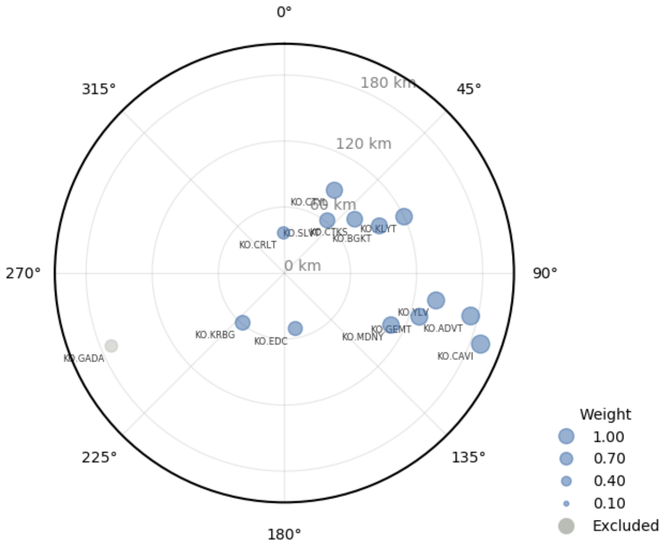
pyrocko.org

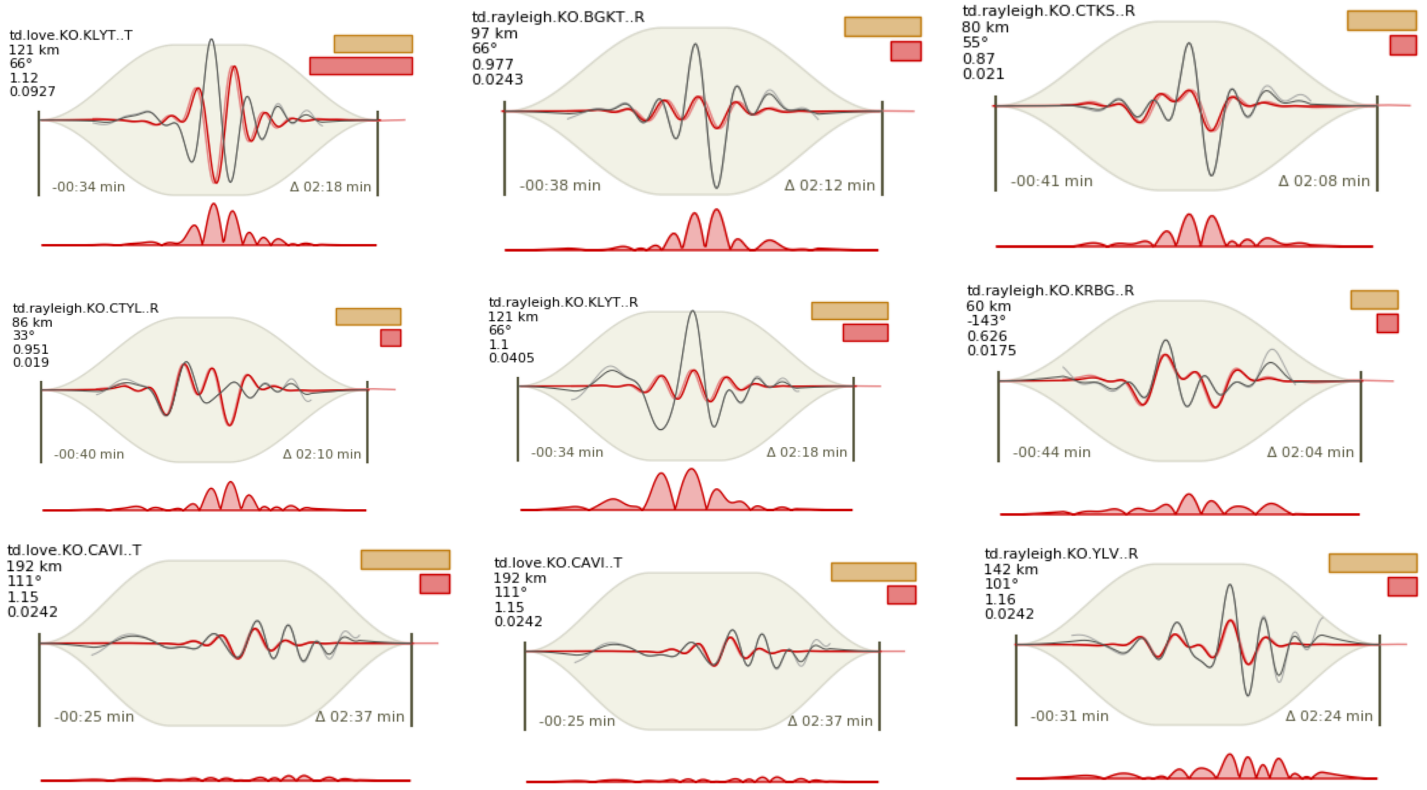
Software for Seismology

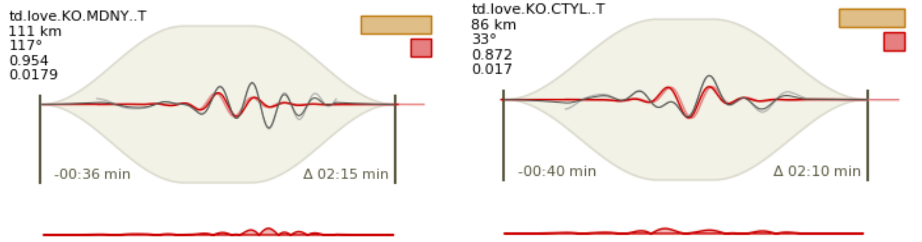
https://pyrocko.org/

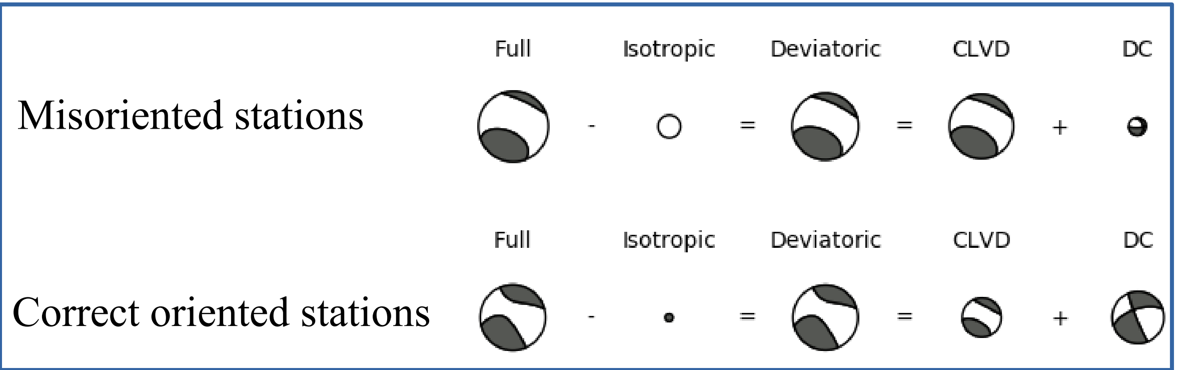
We use a new Bayesian bootstrap-based probabilistic method, **Grond** (Heimann et al. 2018); which presents uncertainties and trade-offs of the model parameters.

An Example From Turkey:

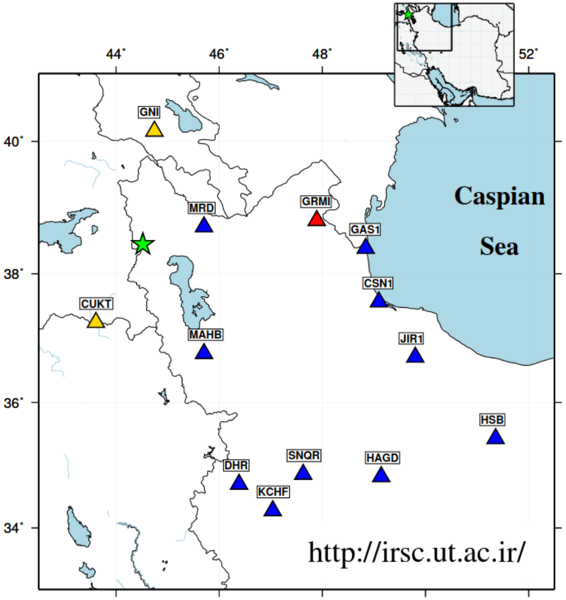




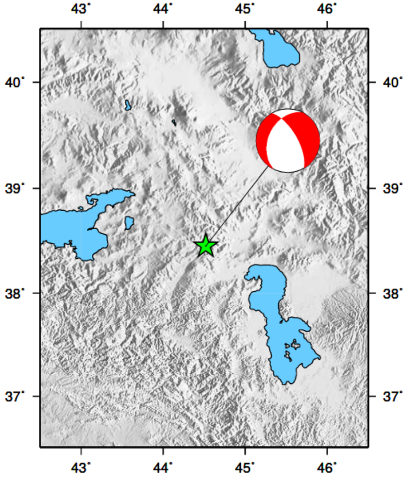


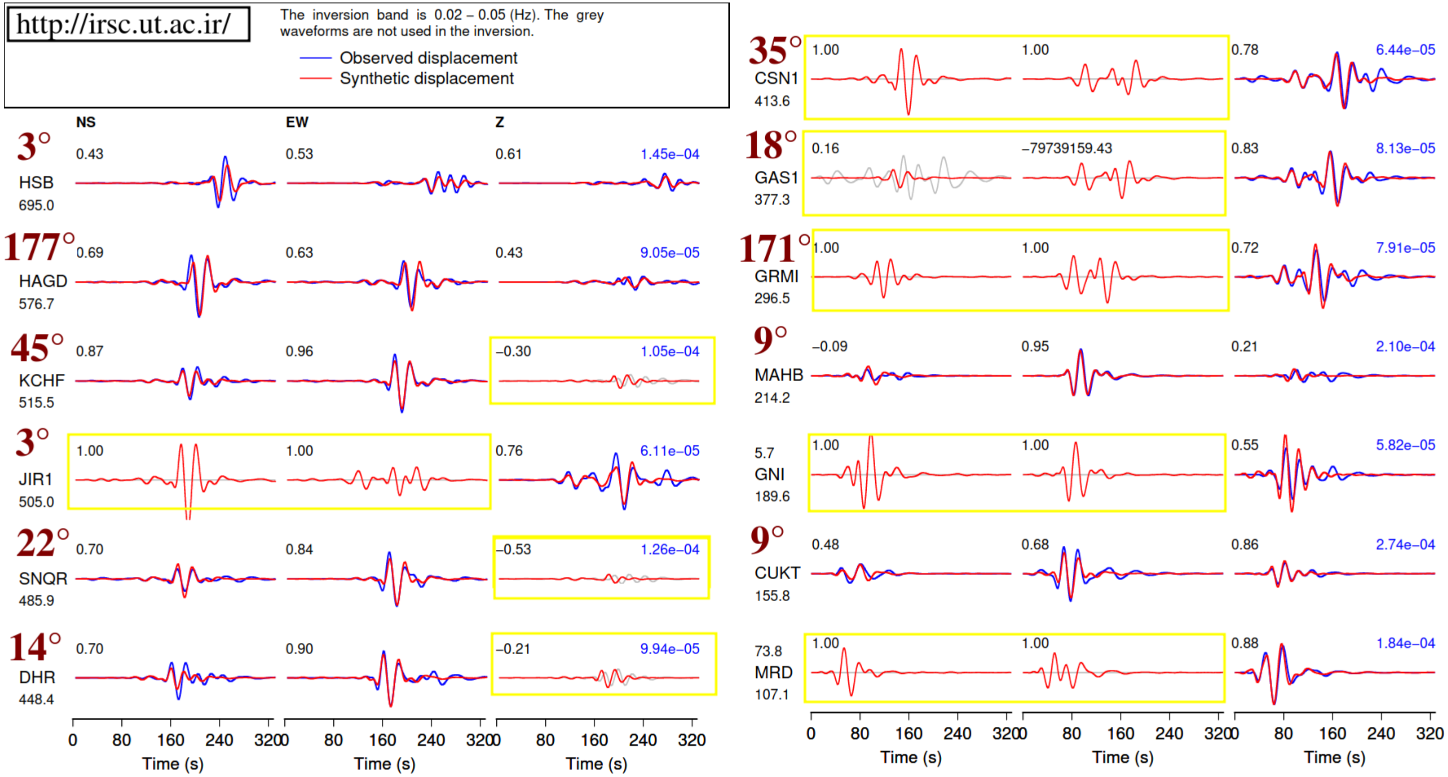


An example of the focal mechanism solution by Iranian Seismological Center



2020-02-23, Mw: 5.7





Misorientation values are from Braunmiller et al. (2020) and Büyükakpınar et al. (2021)

Suggestion:

The evaluation of metadata must be part of data processing in moment tensor inversion in the seismological centers, to report more reliable moment tensor solutions.

- AutoStatsQ: Automated Quality Control Packages for Seismic Networks (Petersen et al. 2019)

- OrientPy: Seismic station orientation tools (Braunmiller et al. 2019; Doran et al. 2017). OrientPy

References:

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