Revamping the GFZ Energy Magnitude computation procedure to establish a new service

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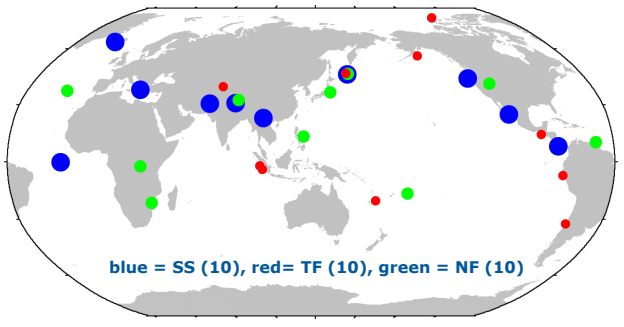
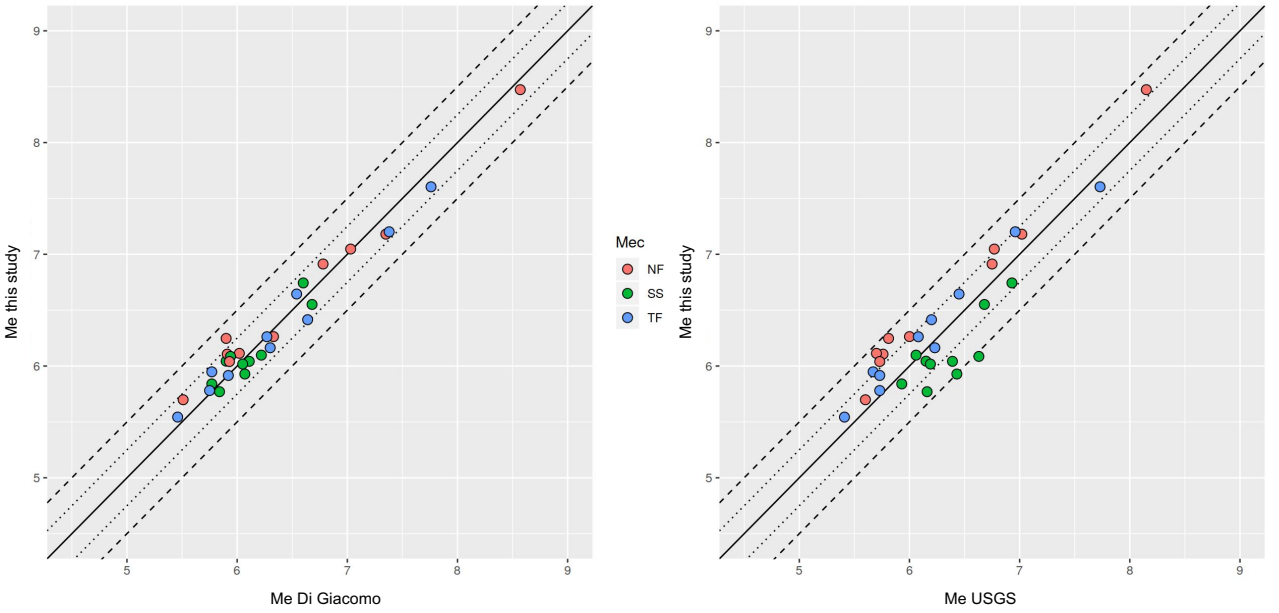
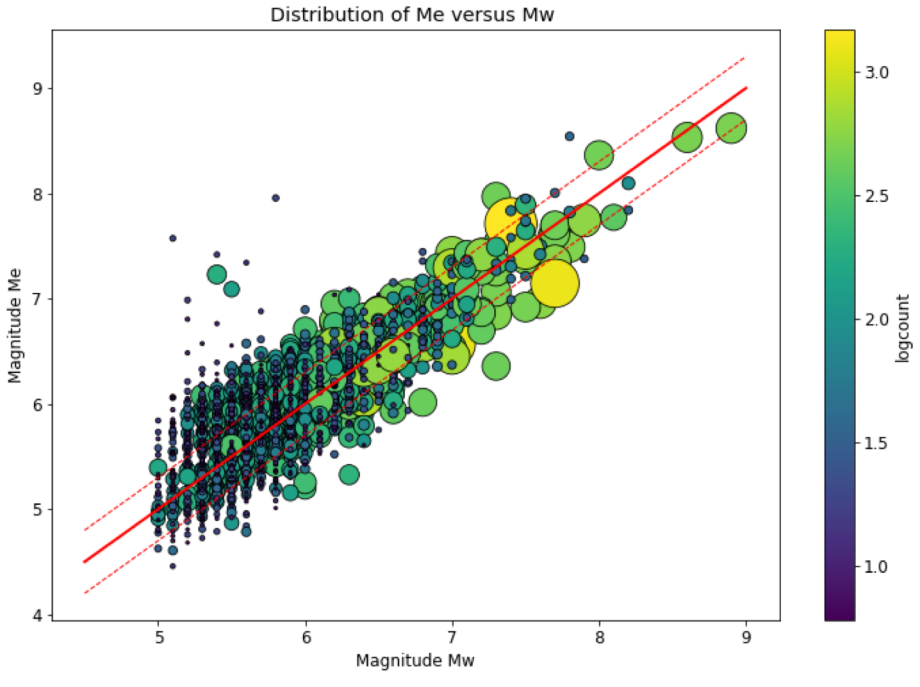
Aiming at introducing a new real-time service providing Me for major earthquakes we envisaged three major steps enabling GEOFON to operate the service.

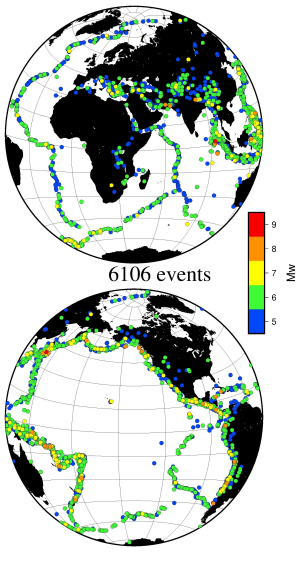
1 Benchmark tests against the procedure proposed by Di Giacomo et al., 2008 using a selected number of common events (30) with common stations after having translated the original code to Python. Data handling relies now on federated data centres (EIDA and IRIS) providing fdsnws-station and -dataselect. The figures below show the spatial distribution of events used and the comparisons between Me computed with the translated code vs the original procedure and vs Me from USGS.

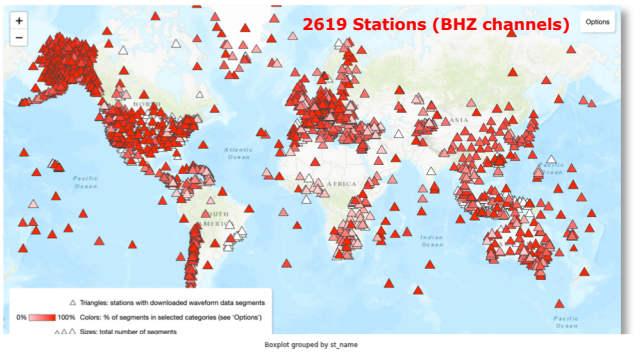


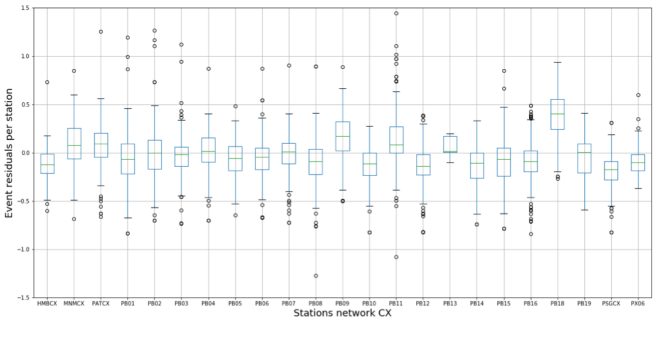


2 Analysis of a data set including all events published in the GEOFON catalogue since 2011 with available moment tensor solution: 6106 Earthquakes; January 2011 - April 2020; 4.6<Mw<8.9; 2619 stations with BHZ channels (145 Open FDSN Networks), >3 millions records. The Figures below show the scaling with Mw for 2538 selected events, the spatial distribution of events and stations used and example of station's residuals distribution for the CX network (IPOC- Chile).









3 In progress: evaluation of site, propagation and radiation pattern effects on magnitude residuals; extension of the distance range down to 5 degrees; extension of the depth range below 75 km. A Beta version of the service is expected by the end of 2020.

References
Di Giacomo, D., Grosser, H., Parolai, S., Bormann, P., and Wang, R. (2008), Rapid determination of Me for strong to great shallow earthquakes, Geophys. Res. Lett., 35, L10308, doi:10.1029/2008GL033505.
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