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A FULLY AUTOMATED IMPLEMENTATION OF THE MBC MAGNITUDE FOR A REAL-TIME SYSTEM

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It has been known that the magnitude of very large earthquakes is underestimated by the conventional magnitude estimators like mb or ML. The lack of a quick reliable magnitude estimate in the minutes following a large event may decrease the efficiency to give timely alerts to zones at risk. For earthquakes with Mw(HRV) between about 6 and 8, the broad-band, body-wave magnitude mB is a good proxy of Mw(HRV) (Bormann and Saul, 2008). However, for larger events, the magnitude is still often underestimated considerably.

Bormann and Saul (2009) presented a method to calculate the cumulative mBc magnitude and tested it by post-processing the data of many large earthquakes, proving its robustness and potential. However, the method still needed to be run in a real-time, automated environment.

Within EU project NERA, we implemented the method presented by Bormann and Saul (2009) to calculate the mBc magnitude in a real-time system. In parallel, our implementation also calculates the event rupture duration using all streams with sufficient signal-to-noise ratio in the frequency band 1-3 Hz. The calculation of both magnitude and duration, is started as soon as the first record is received. Updated values of both are provided at regular intervals.

We tested our implementation with very large events from the last years by simulating a real-time operation, therefore, reproducing the chronological steps after the event. We evaluated the evolution of the magnitude and duration taking into account when the data was available. From our results we can infer that after some minutes, a reliable estimation of mBc magnitude and the event duration can be obtained. A comparison with other methods (for instance, Hara (2007)) regarding robustness and precision is presented besides time lines for some major earthquakes of the recent years.

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