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Update on the Next Generation Earthquake Early Warning in SeisComP3

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An effective Earthquake Early Warning (EEW) system has to be evolutionary, updating its alerts as new data becomes available progressively in real-time. Typically, this involves combining different algorithms tailored towards providing alerts for either moderate or large sized earthquakes using either seismic or geodetic data, or a combination of both. A common approach in most algorithms is to rapidly estimate rupture parameters and then use ground motion prediction equations to compute the expected peak ground motion at a target site. For moderate size earthquakes (<M6.5) the potential damage zone is small (up to about 20 km radius) requiring very fast alerts. EEW algorithms that model the fault rupture as a point source and estimate the hypocenter and magnitude starting with the first available seismic P-wave recordings are effective in this case. For larger earthquakes, an appropriate EEW approach should allow source parameter estimates to evolve from fast point source estimates, providing the hypocenter and lower bounds on magnitude, to slower but more accurate estimates of the finite rupture kinematics from seismic and geodetic measurements.

As it also becomes increasingly common to operate several similar algorithms for robustness, effective EEW systems are becoming increasingly complex and difficult to operate and maintain unless implemented within a common real-time processing framework. We show first results of such an evolutionary EEW system implemented within the real-time earthquake monitoring platform SeisComP3, combining point-source algorithms (Gutenberg algorithm: Meier et al. [2015]; Virtual Seismologist: Cua and Heaton [2007]) with a finite rupture algorithm (FinDer: Böse et al., [2012]). Relying on a widely used real-time monitoring platform, such as SeisComP3, facilitates testing and operating new algorithms in real-time in different seismic networks and thus different tectonic regimes. Special focus has also been given to modularity and extensibility of the new system, facilitating the inclusion of additional algorithms but also the portability of algorithms to different real-time monitoring platforms.