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Evaluation of Real-Time and Off-Line Performance of the Virtual Seismologist Earthquake Early Warning Algorithm in Switzerland

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The Virtual Seismologist (VS) method is a Bayesian approach to regional network-based earthquake early warning (EEW) originally formulated by Cua and Heaton (2007). Implementation of VS into real-time EEW codes has been an on-going effort of the Swiss Seismological Service at ETH Zürich since 2006, with support from ETH Zürich, various European projects, and the United States Geological Survey (USGS). VS is one of three EEW algorithms that form the basis of the California Integrated Seismic Network (CISN) ShakeAlert system, a USGS-funded prototype end-to-end EEW system that could potentially be implemented in California. In Europe, VS is currently operating as a real-time test system in Switzerland. As part of the on-going EU project REAKT (Strategies and Tools for Real-Time Earthquake Risk Reduction), VS installations in southern Italy, western Greece, Istanbul, Romania, and Iceland are planned or underway.

In Switzerland, VS has been running in real-time on stations monitored by the Swiss Seismological Service (including stations from Austria, France, Germany, and Italy) since 2010. While originally based on the Earthworm system it has recently been ported to the SeisComp3 system. Besides taking advantage of SeisComp3's picking and phase association capabilities it greatly simplifies the potential installation of VS at networks in particular those already running SeisComp3.

We present the architecture of the new SeisComp3 based version and compare its results from off-line tests with the real-time performance of VS in Switzerland over the past two years. We further show that the empirical relationships used by VS to estimate magnitudes and ground motion, originally derived from southern California data, perform well in Switzerland.