Geophysical Research Abstracts
Vol. 15, EGU2013-13044, 2013
EGU General Assembly 2013

Refinement and testing of the probabilistic event detection, association, and location algorithm

Timothy Draelos (1), Sanford Ballard (1), Christopher Young (1), and Ronald Brogan (2)
(1) Sandia National Laboratories (tjdrael@sandia.gov), (2) ENSCO (brogan.ronald@ensco.com)

We present results of testing of the latest version of our Probabilistic Event Detection, Association, and Location algorithm (PEDAL). As before, in our method, the Earth is discretized into a dense 3D grid of 427,265 nodes, extended to 4D by the addition of a time dimension. Given a set of seismic observations (arrival time, horizontal slowness, and azimuth), a 'fitness' value is calculated at each grid node, assuming that each observation was generated by a refracted P wave. The node with peak fitness value is accepted as a hypothetical seismic event location, subject to some peak criteria and minimal fitness value. Once we have identified the peak, we solve for the corresponding origin time and then associate individual arrivals with the event, considering many different phases.

In the new method, we have made several improvements: 1) we incorporate a prior probability of signal detection for each station; 2) we do association in two stages, P first, then later phases; 3) after the P phase association, we calculate an mb and perform association with secondary phases based on magnitude, depth, and distance from event to station. We tested the new version on a 2-week period of time that has been processed by the IDC and that have also been carefully examined by an analyst to identify all legitimate events. A sophisticated bulletin review algorithm is used to compare PEDAL results to both the automatically-generated IDC SEL3 event list, a product of the Global Associator (GA) software, and the analyst-reviewed LEB. We show that our latest version of PEDAL significantly improves our processing results.