Maximizing Recording Efficiency of ICEARRAY Using Common-triggering

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Traditional arrays using a central recording facility and dedicated communications channels to continuously record data are expensive to deploy and maintain. A lower cost alternative is to install a network of low-cost stand-alone instruments, each operating in a 'triggered recording' mode with local storage and near-real-time generic communications. Natural and cultural conditions generally result in varying background noise levels across the sites of a given network. Therefore, event detection and recording should be optimized to produce complete data sets, even for frequent small and local earthquakes, without creating masses of spurious records at individual nodes. We achieve this by employing a tuned "common-triggering" (CT) scheme, effectively converting a network of isolated instruments into an array. Selected instruments are configured to send trigger notification messages over the Internet to one or more central hubs, each running a CT detection algorithm. Within the CT detection algorithm, each received trigger notification message results in a preset number of 'votes' being added to a tally. The number of votes being added depends on the known triggering quality of the node sending the alert package. Whenever a preset number of votes are received within a moving time window, a global trigger command is issued to all instruments within the network.

The CT scheme was implemented for the ICEARRAY [1], the first small-aperture, strong-motion array in Iceland, consisting of 14 CUSP-3Clp broadband, triaxial, strong-motion accelerographs equipped with GPS based timing and perpetual GPRS Internet communications. The recordings of the 29 May 2008 Ölfus earthquake [2,3] show that the CT-scheme maximizes the array's efficiency in recording real events while minimizing the analyst's efforts in reviewing data. This system markedly improves the usefulness of a network of stand-alone instruments by converting them into an array with little or no additional cost and allows sites with marginal triggering suitability to be effectively incorporated as slave instruments [4].

References

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