Geophysical Research Abstracts, Vol. 9, 03440, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03440

Event detection for seismic signals recorded at Krakatau volcano using artificial neural networks

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A network of seismic stations is operated at Krakatau Volcano (Indonesia) since 2005. A variety of seismic signal types can be observed in the records of the stations. These include volcano-induced signals such as LP, VT, and tremor-type events as well as signals not originating from the volcano such as regional tectonic earthquakes and transient noise signals. The work presented here aims at the realization of a system that automatically detects and identifies the signals in order to estimate and monitor current activity states of the volcano. An artificial neural network (ANN) approach was chosen for the identification task. A set of parameters were defined, describing waveform and spectrogram properties of events detected by an STA/LTA algorithm. The parameters are fed into an ANN which is, after a training phase, able to generalize input data and identify corresponding event types. The success of the identification depends on the network architecture and training strategy. Several tests have been performed in order to determine an appropriate network layout and training intensity for the given problem. The resulting network shows a good performance. A practical implementation of the system for the volcano observatory routine is sketched.