WP1.1

Objectives

Building procedures to automatically manage and analyze seismic data

Responsible: Raffaele Di Stefano, INGV – CNT

Semi-Automatic Procedure

standard for the analysis of seismic field experiments independently from the target site

- Handling and analysis of a seismic data stream
- Automatic determination of arrival times P and S
  - P polarities
  - reading errors
  - Magnitude

Advantages

high quality, intrinsically homogeneous dataset

quasi real-time data analysis for:

- seismicity distribution
- seismic rate
- b-value
- Vp/Vs ratio
- focal mechanisms
- 3D seismic velocity structure

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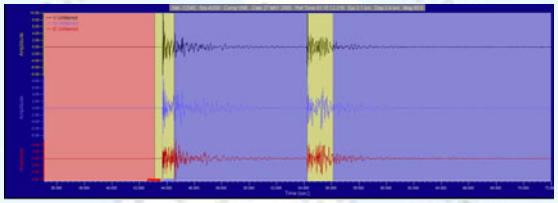
Activities

Package 1: Triggering procedure → Seismic signal identification and association (seismic events definition)

Package 2: MPX & draft locations



MPX Automatic Picking System: upgrading to pick P- and S-waves from 3-C data, based on the combination of advanced adaptive filters, P and S waved detection algorithms, and a phase weighting engine.

1D preliminary locations

Package 3: automatic high precision locations

High precision 1D locations (linear methods)

High precision earthquake locations (non linear methods)

Package 4: automatic data elaboration

Package 5: automatic results update

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Methodologies

Triggering: P and S wavelets identification, by STA/LTA ratio analysis at each station data stream + Single Station SEDL Algorithm
Non-Volcanic Tremor detection algorithm.

Event Detection: a-priori defined time-space coincidence threshold (minimum number of triggers at neighboring stations in a time window

Automatic Picking: the upgraded version of MPX determines P and S onsets, related error estimation, P onsets polarity and the maximum amplitude for the magnitude calculation (M_L).

Weighting Engine → Multi Discriminant Analysis of specific parameters mainly derived from the spectral analysis of the seismic signal and noise around the onsets. The algorithm is calibrated based on the comparison with a representative subset of high quality manual pickings.

Data Analysis and Maps' Production: MPX weighted P and S readings, M_L, and Polarities

High quality Earthquake Locations (Hypoellipse, NNL)
Autmatically Updated Maps of:

- seismicity distribution
- b-value,
- focal mechanisms
- Vp/Vs ratio

WP1.1

Workplannig

Building procedures to automatically manage and analyze seismic data

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1 Year

Setup of Package1:

- seismic data stream handler
- triggering and phase association

Setup of Package 2:

- implementation and integration of the automatic picker MannekenPix
- Automatic picker calibration

2 Year

Setup of Packages 3 and 4:

- high precision locations with standard linear and non-linear location methods, Vp/Vs, b-value, focal mechanisms and 3D structure determination.

Setup of Package 5:

- elaboration results archiving
- frequent automatic update of the results