EGU22-8517, updated on 16 Aug 2022
https://doi.org/10.5194/egusphere-egu22-8517
EGU General Assembly 2022

Monitoring microseismicity with SeisComP and a local 3D velocity model

Camilla Rossi[1], Chiara Cocorullo[1], and Francesco Grigoli[2]
[1]Seismix s.r.l., Palermo, Italy (c.rossi@seismix.it, c.cocorullo@seismix.it)
[2]Department of Earth Sciences, University of Pisa, Pisa, Italy (francesco.grigoli@unipi.it)

Microseismic monitoring plays a fundamental role for the risk assessment and management of industrial activities related to the exploitation of georesources. In such application, microseismic monitoring is performed in real-time.

One of the most widely distributed and used tools for seismic monitoring is SeisComP, a software package for automatic data acquisition and processing in real-time or during post-processing developed by the German Research for Geosciences (GFZ).

In this work, we show how SeisComP can be optimized for real-time data-processing for microseismic monitoring of an Underground Gas Storage field in Northern Italy.

We analysed 2-years of continuous seismic data recorded by a network composed of 15 (surface and borehole) stations. In order to improve the accuracy of earthquakes location, after processing seismic data in real-time, we used Joint Hypocentral Inversion techniques to compute a 1D velocity model (both for P and S waves) for the surrounding area of gas storage field. Then, we extracted a P 3D velocity model at reservoir scale, based on the migration velocity from a 3D seismic reflection survey. The Vp model is then converted to Vs by using an average Vp/Vs value extracted from the 1D velocity model and well-logs.

Finally, we compared the different velocities models by analysing earthquakes location obtained with each model.

For the events located in the inner area, our comparison shows a systematic location improvement (both in terms of RMS and waveform coherence) with the 3D model. For events outside that area, the optimized 1D model performs better than the initial model (both in terms of RMS and waveform coherence). Our processing routine for this seismic network is the first application in Italy where a 3D velocity model is fully integrated within the real-time microseismic monitoring operations, as suggested by the Italian Guideline for Microseismicity Monitoring on Industrial activities.