Monitoring an Underground Gas Storage in a Seismic Area: The Case of Collalto (Northeastern Italy)

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Italy has about 15 sites devoted to underground gas storage (UGS) activity. All sites are on-shore and use depleted natural gas reservoirs. UGS is crucial for the Italian energetic policy, in order to support gas demand fluctuations and to guarantee strategic supply for extraordinary demand. Being Italy heavily exposed to natural seismicity, these activities often are opposed by part of the local population, the possibility to trigger earthquakes exists, and the possible interaction with existing seismogenic faults must be accurately monitored. As recognised by the Italian Guidelines for monitoring published in 2014, high-sensitivity seismic monitoring allows recognising the occurrence of induced seismicity at the early stage, and intervening in case of seismicity anomalies.

The Collalto gas storage is located in NE Italy, on the foothills of Southern Alps, and exploits a depleted natural gas reservoir 1.5 km deep. The activity is managed by Edison Stoccaggio S.p.A. since 1994. The gas storage is monitored by OGS through the Collalto Seismic Network (RSC) since 2012, as imposed by local and national administrators, when the company requested to inject gas up to 160 bars (*i.e.* the original pressure). RSC consists of 10 stations deployed at increasing distance from the reservoir and equipped with borehole broadband sensors and surface accelerometers.

In more than 5 years, RSC has detected and located a thousand of microearthquakes, also with negative magnitude. The high-quality monitoring is demonstrated by a completeness magnitude of about 0 in a 20 km wide area around the reservoir. The located seismicity is not correlated with injection/extraction operations either in time or in space, as shown by pore-pressure diffusion modeling. On the other hand, the 3D seismicity pattern depicts the deep geometry of the Alpine compressive front, reveals the activity of the local thrusts, and suggests the natural origin of all events.