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# Seismic network design for the monitoring of natural gas reservoir of "Sant'Andrea" (Treviso, Northern Italy)

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The natural gas reservoir of "Sant'Andrea" (Treviso, Northen Italy), falls within the hydrocarbon exploitation concession named "Casa Tonetto", conferred by the Italian Ministry of Economic Development (MiSE-DGS-UNMIG) to Apennine Energy S.p.A. on July 2015. The concession involves an area of 4.5 km2, located in the province of Treviso, in the municipalities of Nervesa della Battaglia, Spresiano and Susegana. The exploration activities carried out by Apennine Energy in this area allowed to identify a methane gas field for which it was decided to proceed with production activities , using the well named "Sant'Andrea 1 dir ST" (SA1dST).
On March 2015, however, in order to release the agreement for the conferment of the concession by the Ministry of Economic Development, the Regional Council of Veneto indicated a set of binding limitations for the implementation of exploitation activities. In particular, it was required to evaluate if the planned production activities can induce seismic events, citing the recent document of the Ministry of Economic Development: "Indirizzi e linee guida per il monitoraggio della sismicità, delle deformazioni del suolo e delle pressioni di poro nell'ambito delle attività antropiche" (MiSE-DGS-UNMIG, 2014).
This work presents the results obtained by the INGV team in order to assess the feasibility of a monitoring microseismic network able to guarantee an adequate level of detection of seismic events, occurring in the neighborhood of the reservoir. In particular, considered the depth and the areal extension of the deposit, we defined a monitoring crustal volume of 8.0 x 8.0 x 5.0 km3, centered on the position of the well SA1dST. Moreover, due to the limited mineral potential of the reservoir (about 84 MSm3), we considered the possibility to detect and locate seismic events with local magnitude, ML, of at least 1.0 unit, within the above defined crustal volume. In order to establish the detection threshold of the network, we used point source simulations of earthquakes characterized by different values of magnitude and distance. For each installation site, the power spectrum of the simulated earthquake was compared with the observed power spectrum of ambient seismic noise. Data recorded by a seismic station installed in the area, were employed to calibrate the simulation parameters. Point source simulations were carried out for seismic sources placed in 625 equally-spaced points of 3 regular grids, located within the monitored volume at 2.0, 3.5 and 5.0 km depth. The levels at 2.0 and 5.0 km coincide with the depth of the "Sant'Andrea" gas field and with the bottom of the monitored volume, respectively.