

The impact of different seismic location strategies onto the threshold overcoming imposed by the Italian guidelines for monitoring subsurface activities: a challenging test phase at the Cavone oil field (northern Italy)

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Seismicity induced by hydrocarbon exploitation is increasingly drawing the attention of the scientific community since even moderate magnitude seismic events potentially occur causing damage.

After the debated case of the destructive Emilia 2012 earthquakes, the Italian Ministry of Economic Development (MiSE) issued the “guidelines for monitoring mining subsurface activities for hydrocarbons exploitation, re-injection and storage activities” (ILG), still in a testing non-operative phase, which for the first time for Italy try to establish operational protocols to keep safety standards within the hydrocarbon reservoir management.

In this contribution we discuss such reactive protocols regarding the seismicity threshold imposed for hydrocarbon extraction facilities where fluid reinjection is ongoing. In particular, we analyze the Cavone oilfield, retrospectively considering the 2012 seismic sequence that struck part of the exploitation area. We address how the choice of velocity models and seismic location strategies in general impact on the earthquake parameters that are required by protocols, exploiting the multiple seismic catalogues available in literature for this area.

Results show that hypocentral uncertainties strongly affect the application of the traffic light system of the ILG, generating proper or un-proper warnings. Our analysis also highlights the importance of accounting for local geological complexity in the seismicity location strategy.

Following the feedback of this analysis at the Cavone oilfield, we finally discuss about the correct design of seismic networks in areas of hydrocarbon exploitation in order to correctly attend the requirements of rigid monitoring protocol such as the Italian ILG.