

## **REAL TIME MICROSEISMIC MONITORING DEDICATED TO FORECAST COLLAPSE HAZARDS INDUCED BY BRINE PRODUCTION**

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### **Abstract**

The study deals with salt deposits from Solvay sites, located in Italy, in Tuscany. Exploitation started in 1912 and, very early, Solvay was equipped with seismic monitoring services.

Since 1992, Magnitude has been in charge of microseismic monitoring the Buriano site to analyze microseismic activity linked to brine production.

Magnitude's experience linked to a unique database on microseismicity induced by leaching and post-leaching activities, allows to match brine production with microseismic records.

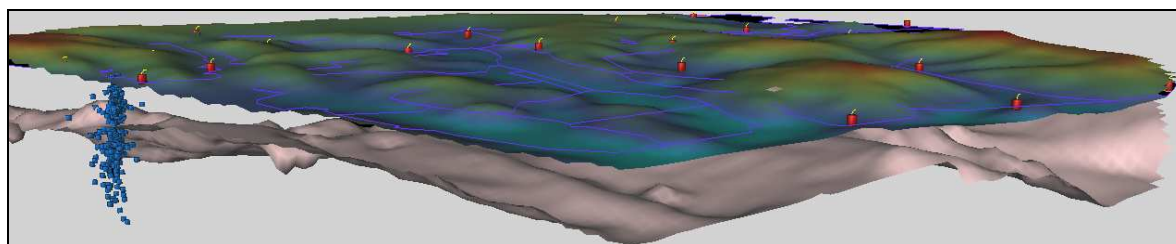
Magnitude keeps setting up innovating and performing tools in order to prevent impulsive and uncontrolled collapses. Since June 2006 a software has therefore been implemented on an on-site computer to automatically localize microseismic events induced by leaching activities. Real time monitoring and good location accuracy offer an essential help to the decision for the staff on-site.

The main advantages of the automatic event location are the ability to locate low energy events that can't be localized manually, and to provide a real-time forecast of sinkhole and subsidence hazards above production zones.

This all-automatic system allowed to forecast the sink-hole collapse that occurred on April, 24th 2007, an impulsive and fast-spreading phenomenon. By first emitting alert warnings three weeks before, and then, by following up microseismic activity in real-time, all means were implemented to control and predict the collapse, and thus safety measures could be taken early enough.

This paper presents the analysis and assessment of sinkhole and subsidence hazards, in terms of severity and occurrence probability. Taking advantage of this innovative approach linked to a good knowledge of microseismicity induced by leaching activities, we will study the effective feed-back of such an experience, which allows a forecasting and characterization of collapse phenomena induced by salt leaching in a production zone.

This method is also suitable for other applications, such as following up on caprock integrity. The long term monitoring study is used to improve the production strategy, and to prove that no residual microseismic activity is occurring in the abandoned zones likely to be rehabilitated.



**3D location of microseismicity induced by sink hole**

**Key words:** Sink-hole collapse, Instrumentation and monitoring, Seismic.