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## **Re-assessment of micro-seismicity in a salt dome in the North of the Netherlands.**

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**SMRI Spring 2024 Technical Conference  
22-23 April 2024  
Krakow, Poland**

## Re-assessment of micro seismicity in a salt dome in the North of the Netherlands

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### Abstract

In a salt dome in the North of The Netherlands 12 caverns are leached, of which 6 caverns are currently still producing brine. In 2017, a first seismic event was recorded, but it was still unclear if this was related to the cavern field, or the nearby gas production of the Groningen field. Furthermore, seismicity inside the salt body was not expected at that time, given the assumption of pure plastic behavior. At the request of the Dutch State Supervision of the Mines (SSM) six micro-seismic stations were installed above the salt dome since. This network has been in operation since 2018 and had recorded about 200 microseismic events (average magnitude ~0.2). This research aims to reassess the seismicity that has been recorded thus far, and better understand its origin, cause, and the uncertainties. Seismic data is re-handpicked and localized using a hypocenter method from the Royal Netherlands Meteorological Institute (KNMI). Initial results show significant differences between the localization of the operator and our results. It is expected that the velocity model, the seismic picks, and the localization model have an influence on the ultimate location of the events. The relative importance of these three factors and its implications for understanding induced seismicity at salt caverns will be shown. To further understand induced seismicity from salt cavern leaching and cyclic storage operations simulation models are constructed, that incorporate the basic salt formation characteristics, salt cavern operational conditions, and structural features. These models also account for over-burden and side-burden, coupled with a seismogenic source model to compute seismic activity development in response to deformation evolution. This first order approach aims to analyze and identify the mechanisms behind the induced seismicity, essential for scaling up UHS prospects in the Netherlands in the future.

**Key words:** rock salt, gas storage, salt caverns, cavern abandonment, rock mechanics