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Statistical Models to Forecast Induced Seismicity in CO2 Storage

Gina-Maria Geffers, Chaoyi Wang, Christopher S. Sherman, and Kayla A. Kroll
Lawrence Livermore National Laboratory, Livermore, CA, USA

Induced seismicity related to industrial operations including carbon storage, geothermal energy, hydraulic fracturing or wastewater disposal has become increasingly common over the last 15 years. To continue these operations with minimal impact on sites, populations and economic conditions of the operation, it is crucial to better understand the mechanisms that control induced earthquakes and the occurrence of these in both space and time.

This research focuses on enhancing statistical forecasts (using the seismogenic index model and ETAS), specifically for CO2 storage applications. This forecasting is essential for estimating the hazards associated with the operational life cycle of these sites. Additionally, based on these forecasts, we explore operational management strategies, aimed at providing real-time feedback and suggestions to operators. All model calibrations were performed using data from the Illinois Basin Decatur Project – a pilot CO2 storage initiative with injection performed from 2011 to 2014. The resulting forecasts are included within an ensemble forecast within the open-source Operational Forecasting of Induced Seismicity (ORION) toolkit.

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