EGU21-15814, updated on 05 Jul 2022
https://doi.org/10.5194/egusphere-egu21-15814
EGU General Assembly 2021

Implicit geological modeling for the Einstein Telescope (Meuse-Rhine Euroregion)

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Expectations for geological models for underground characterization rise with complex engineering tasks. In this project we examine a target area as a potential site for the gravitational-wave observatory “Einstein Telescope” in the Meuse-Rhine Euroregion (Netherlands, Belgium, Germany). The Einstein Telescope will be the world’s most sensitive observatory of its kind. It consists of a triangular shaped facility connected by 10 km long arms in 200-300 m depth. A high accuracy 3-D structural geological model is required to constrain the best position of the Einstein Telescope with geophysical and geotechnical methods.

We use an implicit modeling approach based on surface points and orientation data for modeling. This data is extracted from seismic surveys and well logs available in the region. The application of probabilistic methods in this workflow allows to propagate uncertainty of the input data into a resulting model suite, allowing to define a measure of uncertainty for the final model. Specific local difficulties that were encountered during the modelling process, including data management, the representation of complex fault networks and scaling issues will be discussed.

We will show 3-D geological models for the Meuse-Rhine Eurogregion to significantly improve our geological understanding of the target area. This improved understanding is crucial for finding the optimal position for the Einstein Telescope. Data is managed using the open-source library *GemGIS*. Models are created using the open-source library *GemPy*.