3D geomechanical modelling of induced seismicity: simulated finite-source to moment tensor inversion

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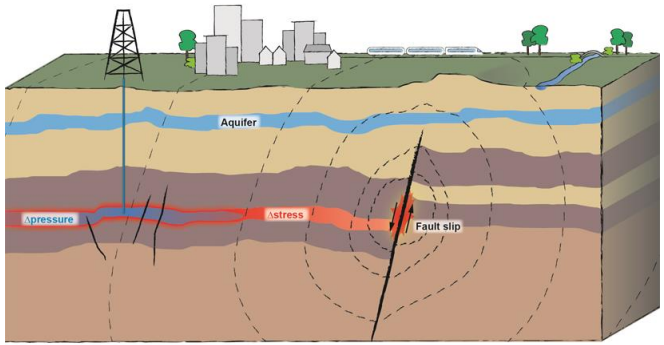
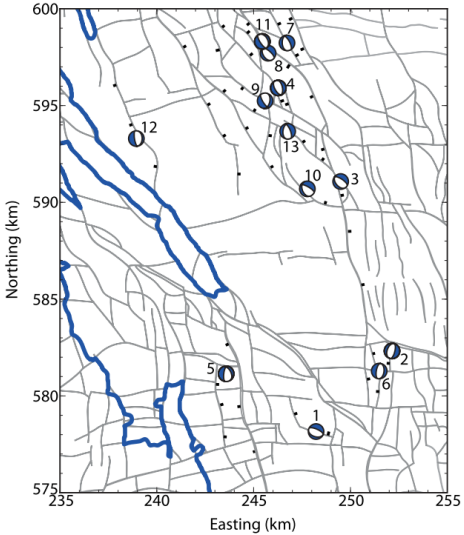
Production-Induced Earthquakes

Source Geomechanics



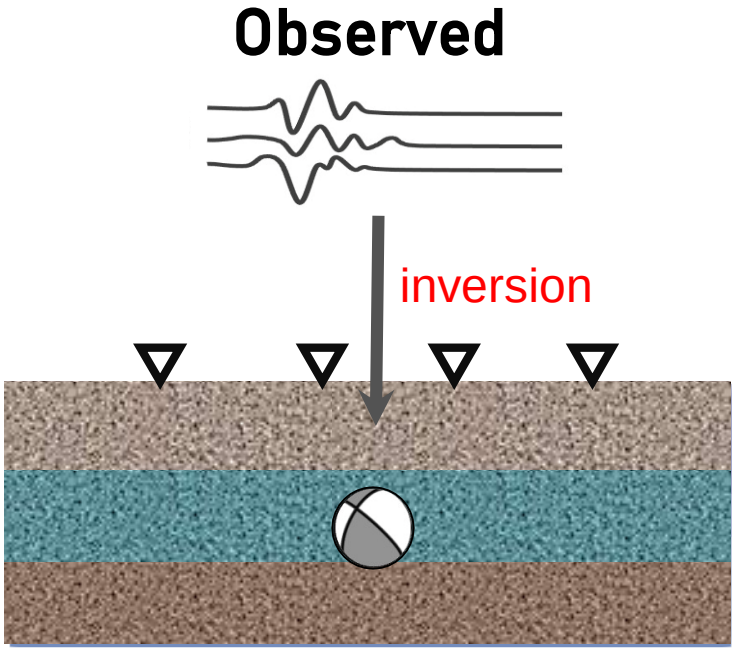
Müller, et al. (2021)

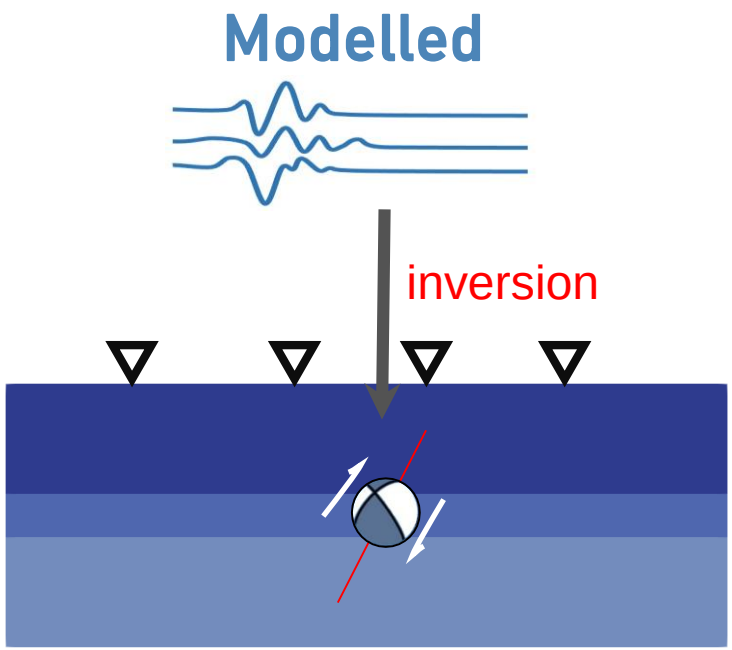
Moment Tensor Inversion



Dost, et al. (2020)

Surface seismic observations to constrain better the geomechanical modelling of induced seismicity





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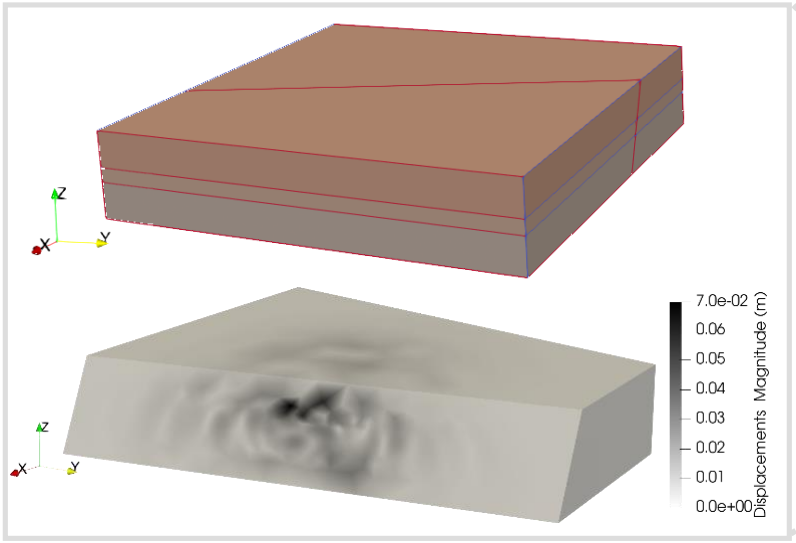
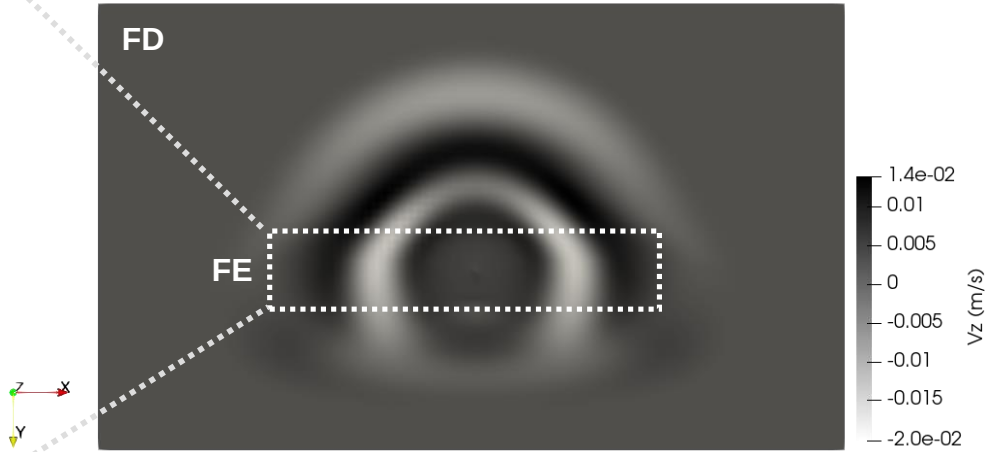
3D geomechanical simulation and wavefield simulation

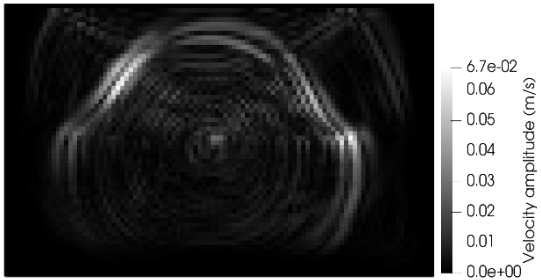
Dynamic fault slip

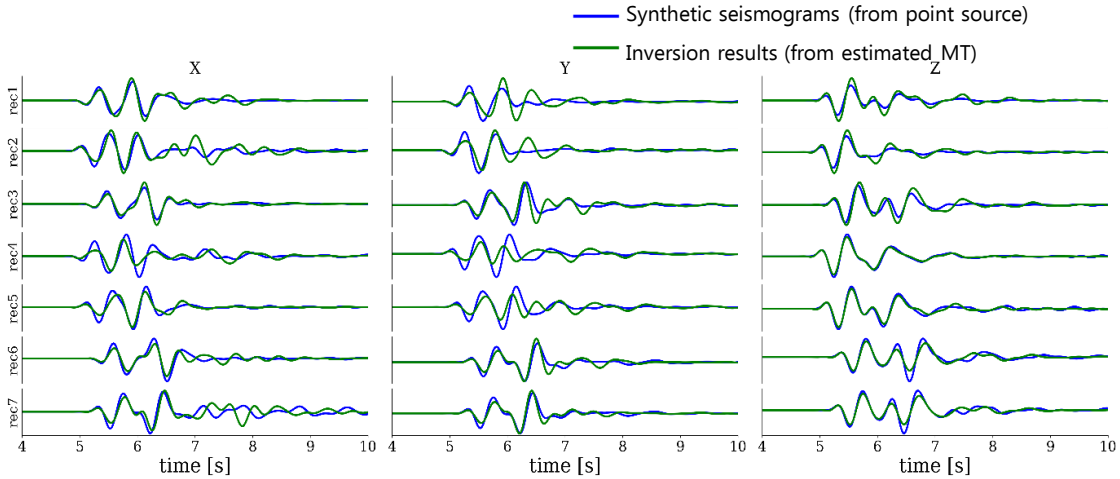


FE-FD coupling

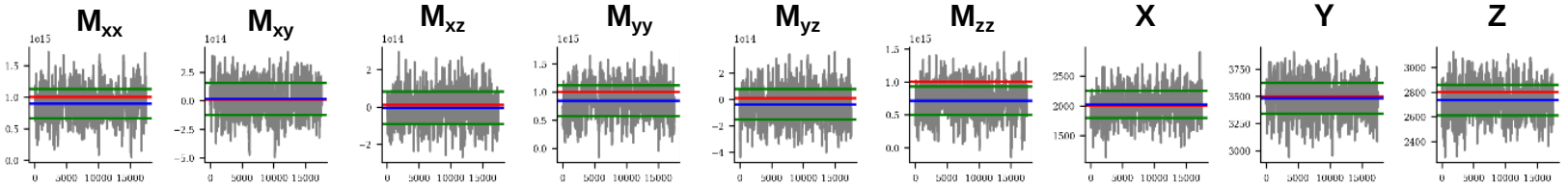


Moment tensor inversion: simulated point-source waveforms as input

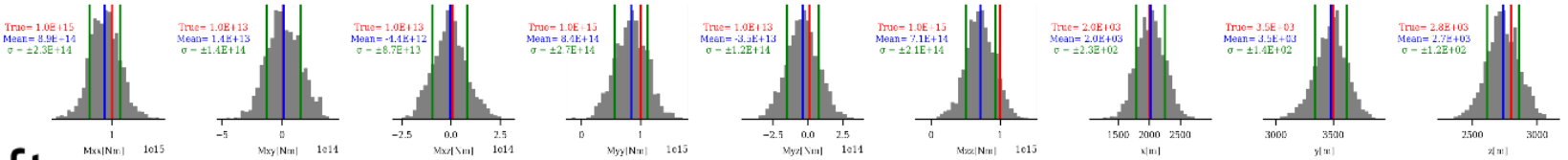




Solution Parameters



Solution Distribution



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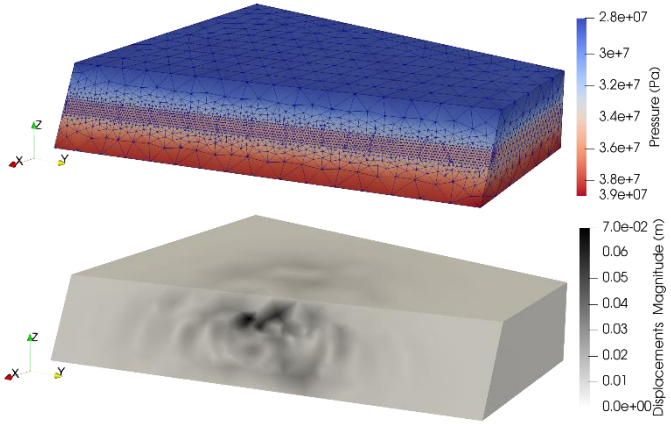
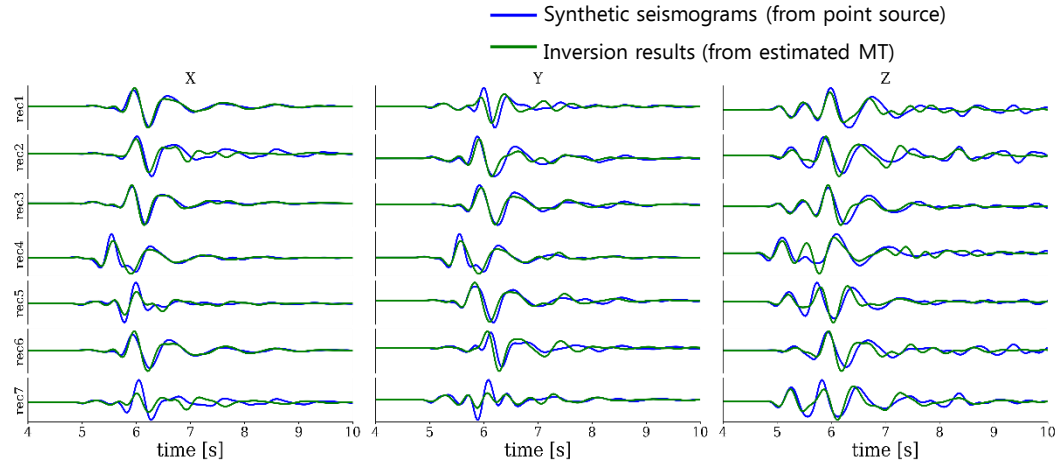
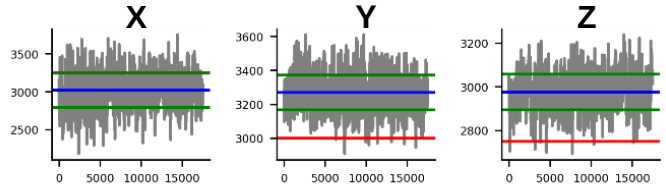
Moment Tensor Inversion: waveforms due to finite faulting as input (geomechanical simulation of induced seismicity)



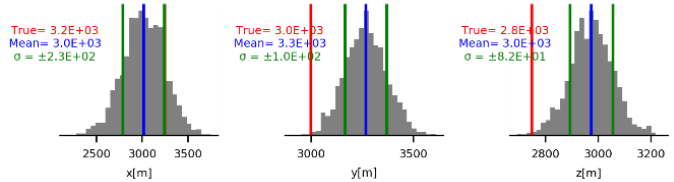
Finite source: dynamic fault slip

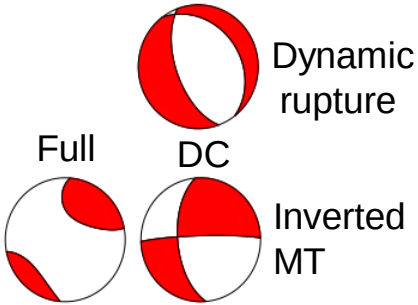


Solution Parameters



Solution Distribution





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Conclusions

- We explored a new possibility to constrain the geomechanical modelling of production-induced earthquakes using surface-seismic observations.

- The inverted point-source representation is in good agreement with the correct fault strike and dip for the low-frequency (1 – 3 Hz) surface-seismic data, but rake is less accurately reconstructed.

We are now testing the approach on the 2018 Zeerijp M_L 3.4 earthquake in Groningen using realistic underground structures.

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