The role of heterogeneity in controlling the geomechanical behaviour of sandstone reservoirs

Dr Johannes Miocic

DeepNL Stakeholder meeting

04\textsuperscript{th} of June 2021
About me

2006-2011
Diploma Geology
University of Jena

2012-2016
PhD Geology
University of Edinburgh

2017-2020
Assistant Professor for Sedimentology
University of Freiburg

since 01/2021
Assistant Professor for Geo-Energy
University of Groningen
About me

- Jena: Reservoir quality & diagenesis
- Edinburgh: CO₂ storage site security, fault leakage
- Freiburg: Fault leakage, geothermal energy
- Groningen: Petrography & reservoir compaction
Reservoir compaction at the Groningen gas field

Pijnenburg et al., 2019
Reservoir compaction at the Groningen gas field

Can reservoir compaction and subsidence be predicted?

Pijnenburg et al., 2019
Potential controls on reservoir compaction

- GIP
- Porosity
- Packing
- Pressure changes
- Composition
- Clay coatings

Hol et al., 2018; Pijnenburg et al., 2018, 2019a,b
Potential controls on reservoir compaction

Hol et al., 2018; Pijnenburg et al., 2018, 2019a,b
Potential controls on reservoir compaction

The quality of predictive models depends on the availability and quality of a petrographic model

Hol et al., 2018; Pijnenburg et al., 2018, 2019a,b
Goals of the project

1. Quantify the spatial variability of sandstone reservoir petrography in the Groningen gas field and its vicinity
   - Optical microscopy
   - Scanning-electron microscopy
   - X-Ray diffraction
Goals of the project

1. Quantify the spatial variability of sandstone reservoir petrography in the Groningen gas field and its vicinity

2. Identify controls of petrographic variability and develop a predictive petrographic model for upscaling

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\text{Petrography}(x, y, z) = f(\text{sedimentology, fluid & temperature history, stratigraphy, structural setting, depth, ...})
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https://opm-project.org/
Goals of the project

1. Quantify the spatial variability of sandstone reservoir petrography in the Groningen gas field and its vicinity

2. Identify controls of petrographic variability and develop a predictive petrographic model for upscaling

3. Analyse the impact of petrographic heterogeneity on the geomechanical behaviour

Pijnenburg et al., 2018
The research project will

- Quantify and predict reservoir heterogeneity of the Groningen gas field & surroundings
- Analyse the impact of petrographic heterogeneity on geomechanical properties of the reservoir sandstone

Improve the knowledge of subsurface response to subsurface exploitation / utilisation
Thank you for your attention!