Ministry of Economic Affairs and Climate Policy

Predicting fault sealing
A collaborative project

Understanding fault sealing is key for understanding reservoir compartmentalization, structural trap integrity and hydrocarbon migration pathways. Existing fault seal evaluation tools (e.g. based on Shale Gouge Ratio) are mostly based on empirical methods, but data suggests these methods are not applicable to Upper Rotliegend fault rocks. EBN has launched a project together with the University of Strathclyde to allow operators to better understand and predict fault sealing capacity.

Project deliverables:
- A catalogue of areas and fields where fault sealing has been observed
- A database with fault geometry and fabric properties
- A workflow to better predict the risk and level of fault sealing

Fault sealing catalogue

A collection of examples of fault sealing allows:
- to analyze fault sealing aspects in a spatial geological context,
- correlation of fault geometry and fabric to deposition, burial and tectonic history.

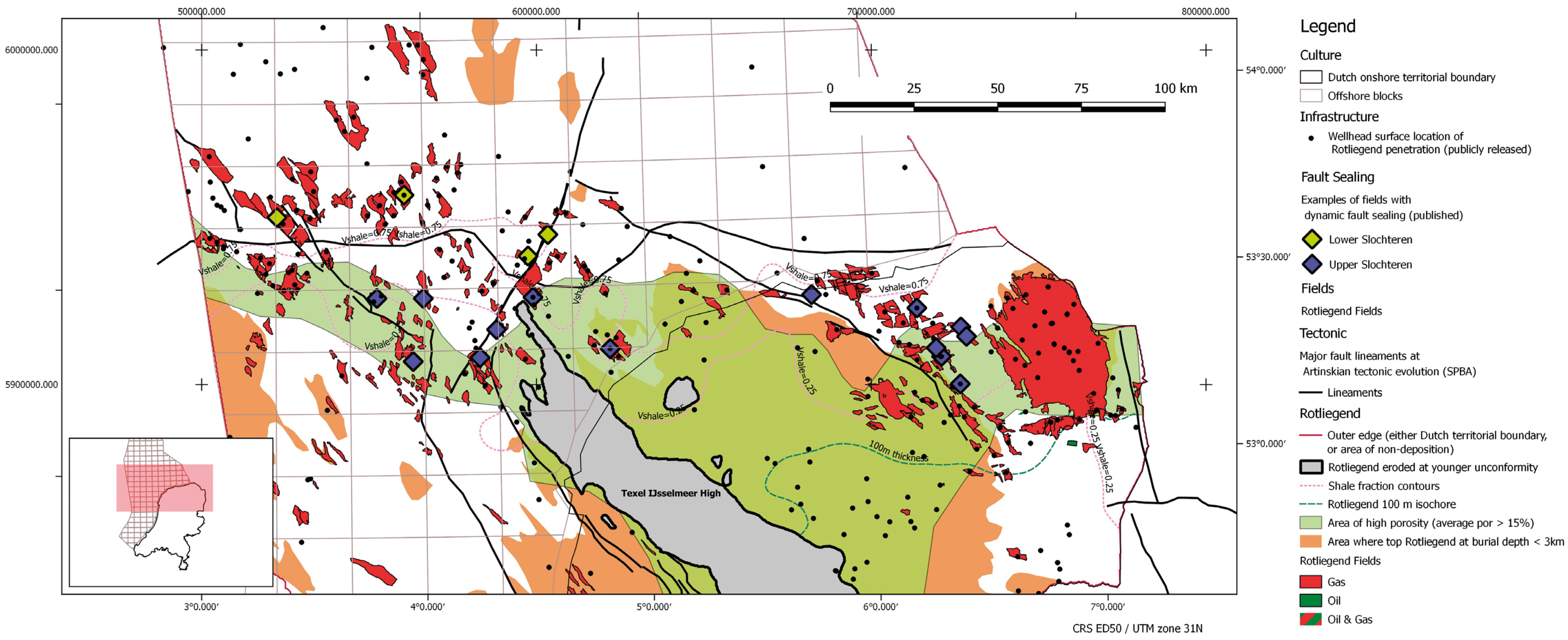

Figure 1. Catalogue - Rotliegend fields. Sealing faults in relation to general (paleo)geography.

Fault properties

Special core analyses have been carried out on selected core and outcrop samples from Rotliegend rock. This allows the following observations:
- Cataclasites are the dominant fault rock type present.
- Little correlation observed between permeability of faults and other rock properties such as host rock permeability or shale content.

Figure 2. Examples of cataclastic faults in hand specimen. (Zeilstra et al., 2007)

Therefore common property transformation functions based on shale content are likely not valid for Permian rocks. EBN aims to deliver fit-for-purpose fault rock property transformation functions.

These functions will be validated against actual field data provided by operators.

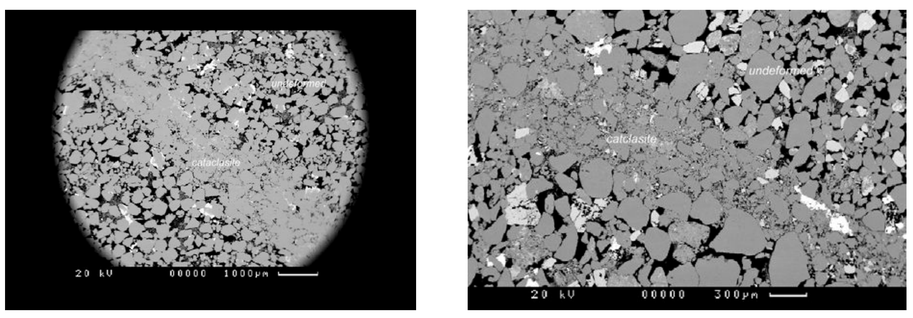

Figure 3. Very low magnification BSE micrographs of a cataclastic fault rock and its host sandstone. (Zeilstra et al., 2007)

Fault geometry and property prediction

At the University of Strathclyde a workflow has been developed which aims to identify fault fabric based on outcrop analogues.

The collection of key parameters such as burial depth, host rock clay content, sand and shale bed thickness, fault geometry will allow for comparing fault rock type and associated sealing potential to outcrop based fault data.

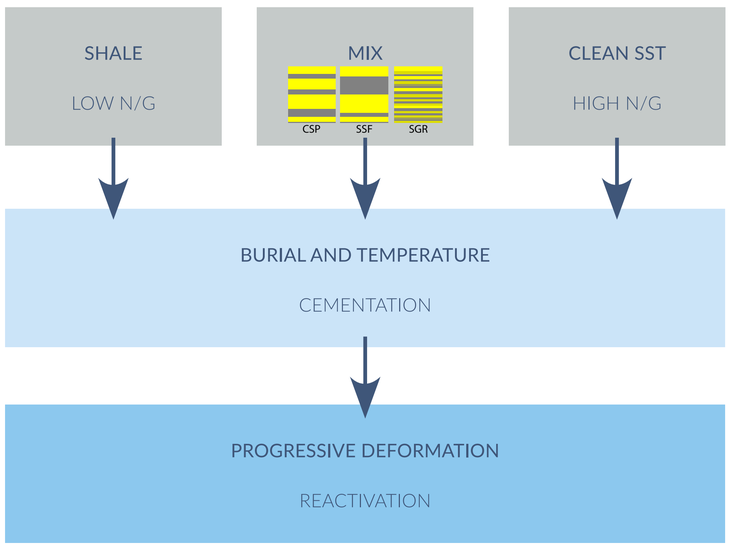

Figure 4. Flowchart to aid in process-based characterization of fault sealing and permeability, based on outcrop studies. Kremer et al, 2016

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