



Evaluating the Jurassic play using the GEODE Atlas

Ryazanian (TMS-3) of the Terschelling Basin

Aart-Peter van den Berg van Saparoea (EBN)









Acknowledgements





Team:

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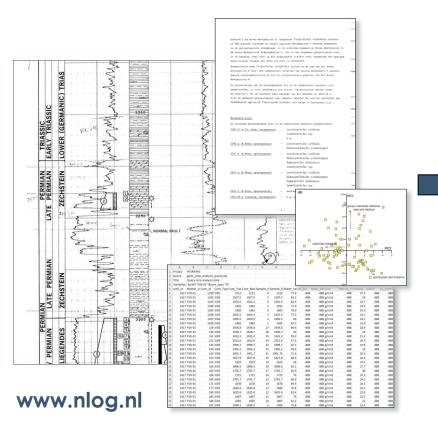
Sjoukje de Vries (EBN)





GEODE Atlas programme

From data to information and knowledge



Reservoir screening

> 280 datasets/maps

Seal assessment

> 120 datasets/maps

Faults

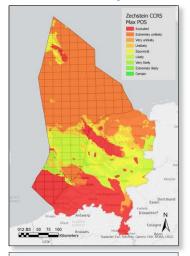
> 20 datasets/maps

Nationwide basin model

> 80 datasets/maps



CCRS map

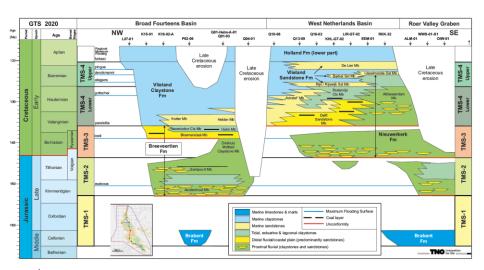


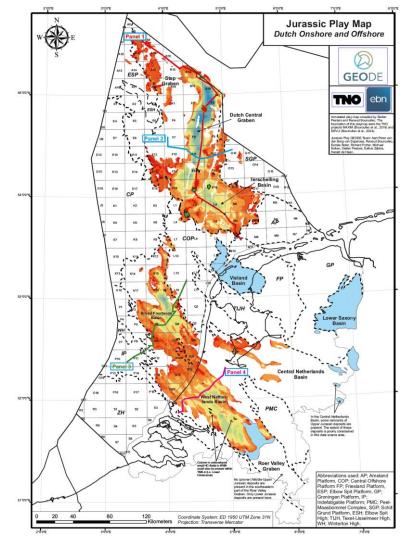
Risk maps

> 150 maps

GEODE Jurassic 2025

- Updated and expanded 2021 version
- Includes DeVIi study
 - Biostratigraphy
 - Sequence stratigraphic framework
 - Seismic interpretation







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To view the play specific maps and data, click on one of the banners below or navigate to Play data on the top of the page.









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Interactive map

Quick navigation **⊗** 820 ↔ Legend Standard mapview Play 4 - Jurassic Layer Legend Well Analysis √ Play 4 - Jurassic **Well Penetrations** Well Analysis Unevaluated Unclear/Unknown Penetrations Absent Post Drill Beneath TD Classification > Shows Full Section penetrated Faulted out Post drill well evaluations > CCRS Jurassic CCRS Max POS Data (Well & Seismic) Excluded General Layers Aggregated Composite Common Risk Segment map for the Extremely unlikely entire Jurassic play (combination of play 4a. TMS-3, 4b. TMS-Very unlikely 2, 4c. TMS-1 Upper and 4d. TMS-1 Lower). ∨ Boreholes Unlikely Boreholes Well summary 90 Likely Search (e.g. wells, blocks) Very likely Best well do classification Extremely likely > Infrastructure Certain > Fields Esri, TomTom, Garmin, FAO, NOAA, USGS Powered by Esri > Spatial reservations 4. Jurassic 4b. TMS-2 4c. TMS-1 Upper 4d. TMS-1 Lower

Play data ▼

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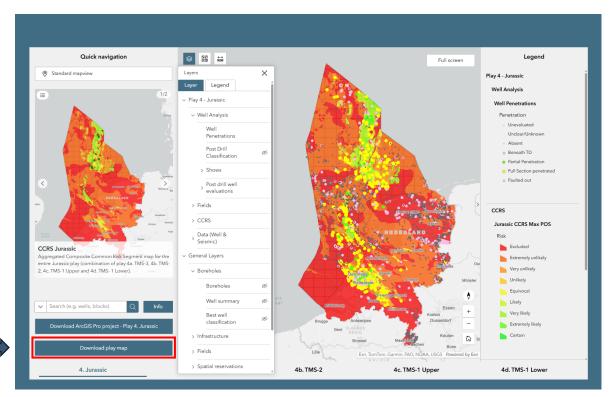
Play data +

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- Interactive map
- Annotated Play Map













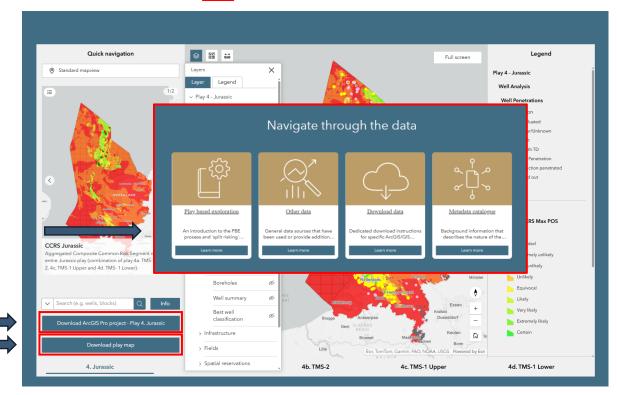


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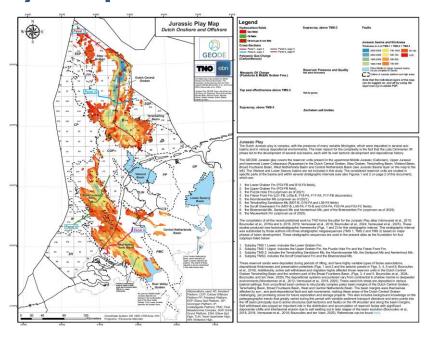
- Interactive map
- Annotated Play Map
- Download GIS data







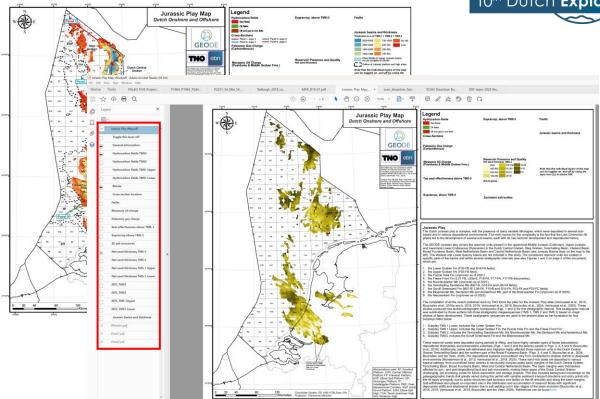
- Introduction
- Summary
- Reference







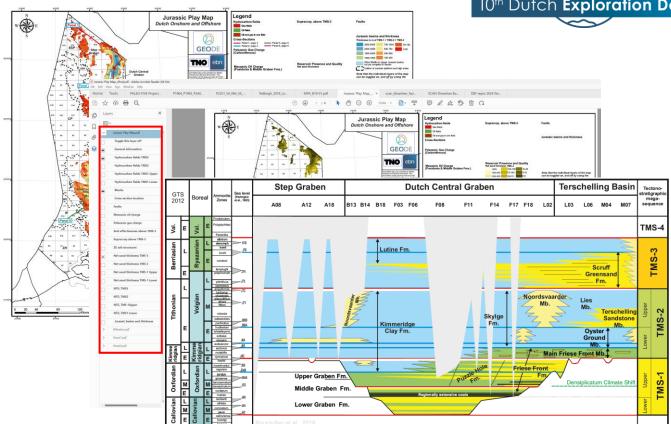
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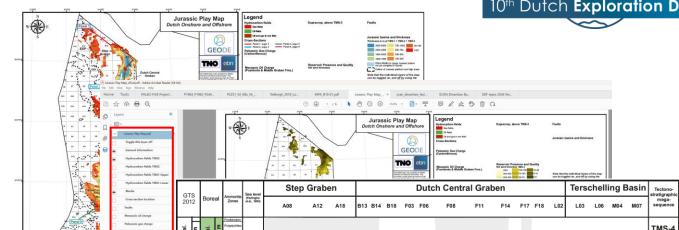
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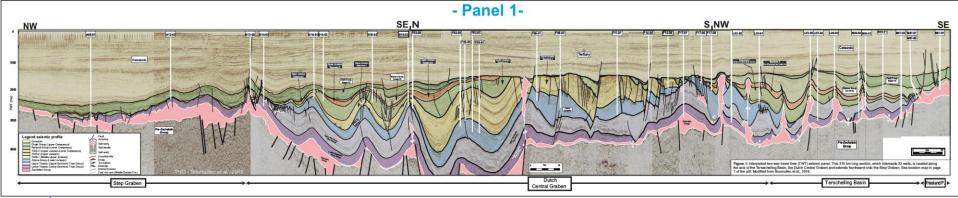


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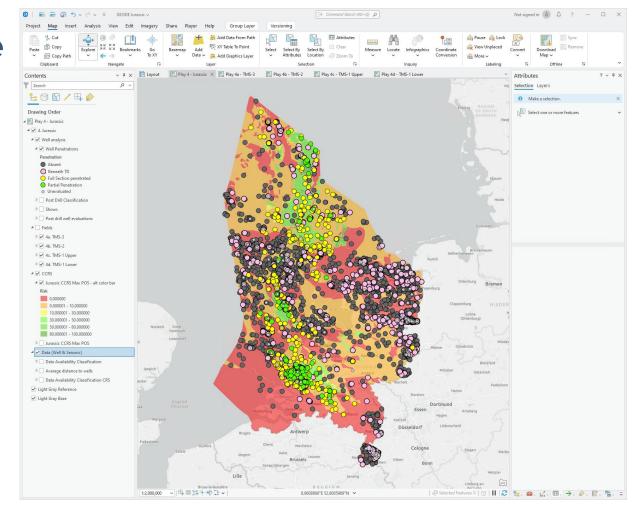




Example use case – GIS project

- Download ready to go
 ArcGIS project
 or shapefiles for use in QGIS,

 Petrel etc.
- Integrate your own data
- Modify as required



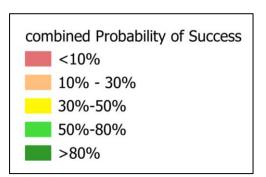


Example use case – CCRS map Jurassic Play

Jurassic rift basins

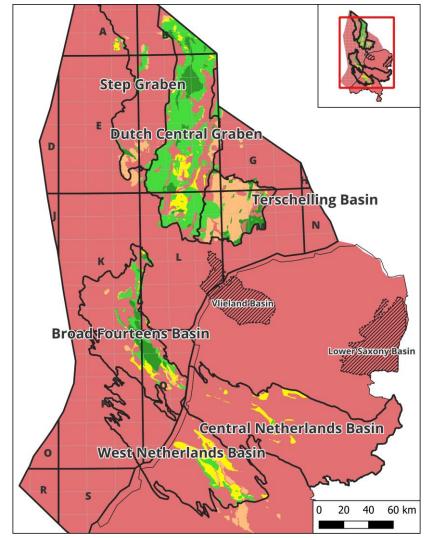
Composite Common Risk-Segment map

Some onshore basins not included (yet)



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- Dutch Central Graben: high success rate and many accidental discoveries.
- Terschelling Basin: challenging but has seen a few commercial discoveries.
- Broad Fourteens Basin: no targeted wells and one discovery. <u>Underexplored</u>.
- West Netherlands Basin: numerous discoveries but no commercial successes, despite targeted effort.

Step Graben Dutch Central Graben Terschelling Basin combined Probability of Success 30%-50% 50%-80% >80% wells Broad Fourteens Basin Jurassic target other target discovery development Central Netherlands Basin West Netherlands Basin

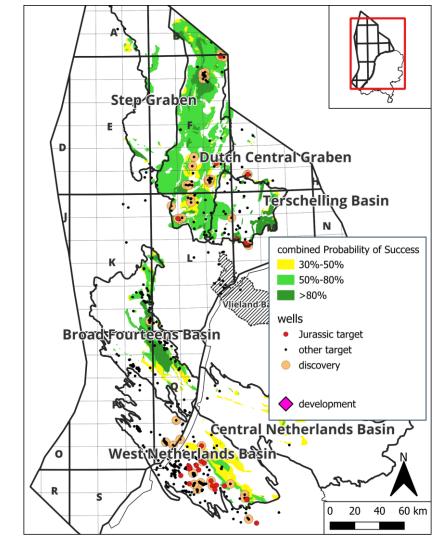


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Example use case -

Exploration history Terschelling Basin

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G14

Terschelling Basin

20

30 km

10

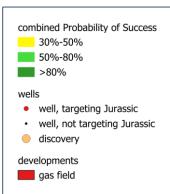
G13

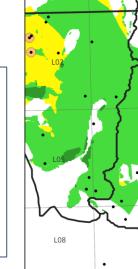
M07-B

₹•G16-A

Dutch Central Graben

- Terschelling Basin is challenging
- High success rate targeted wells
- Both discoveries developed





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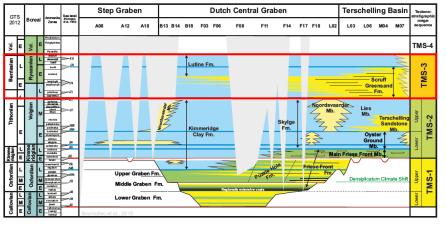
Example use-case: focus on Terschelling Basin, TMS-3

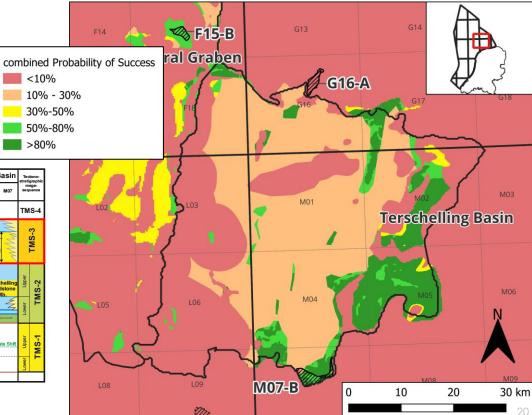
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TMS-3, Ryazanian (Lower Cretaceous)

CCRS map

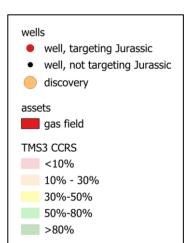




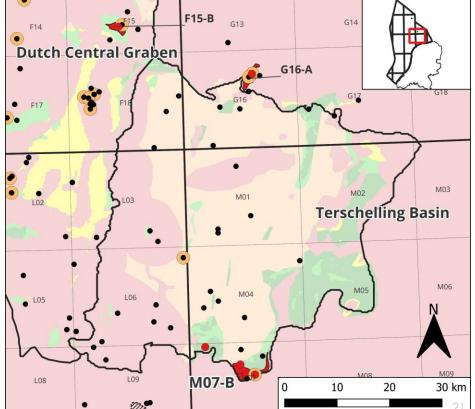
Example use-case: well results

High success rate targeted wells (2/3)

Both discoveries developed







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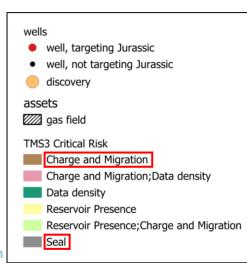
Example use case – weakest element

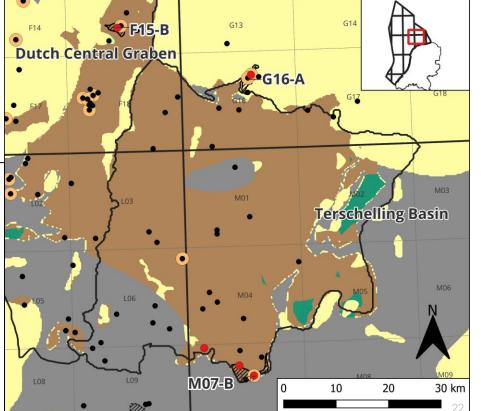
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What is the most likely cause of failure?

- Charge and migration
- Top seal

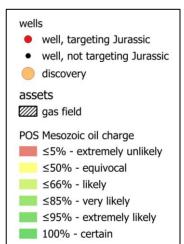




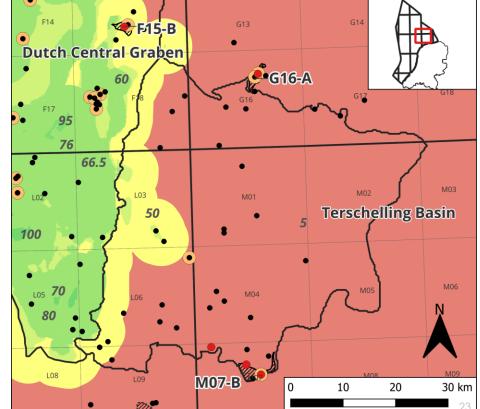
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POS Mesozoic oil/gas expulsion: 5%





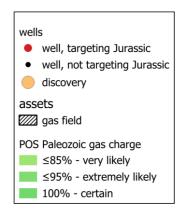


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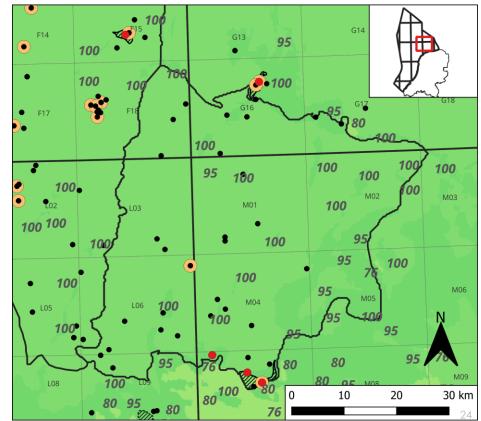


POS Mesozoic oil/gas expulsion: 5%

POS Paleozoic gas expulsion: 95%









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POS Mesozoic oil/gas expulsion: 5%

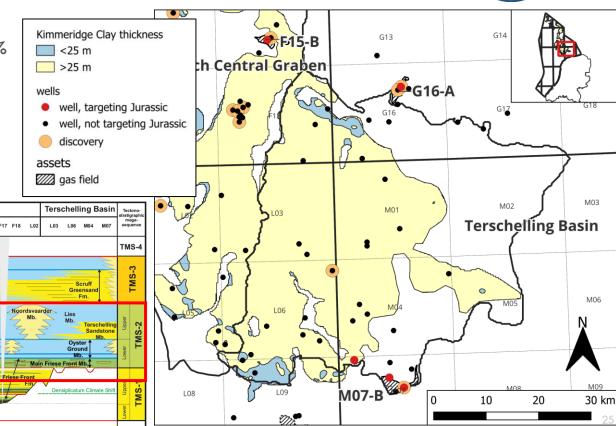
Dutch Central Graben

Lutine Fm.

POS Paleozoic gas expulsion: 95%

Step Graben

Lower Graben Fm.

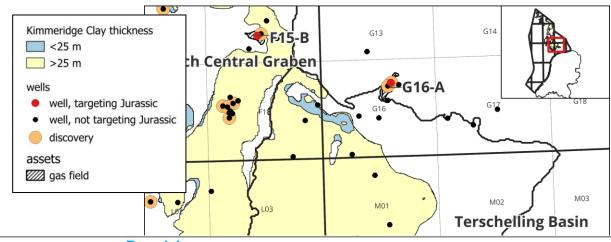


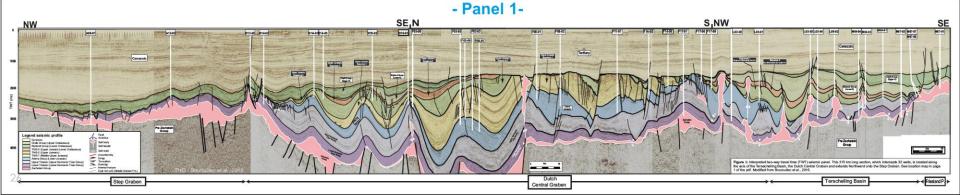
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POS Mesozoic oil/gas expulsion: 5%

POS Paleozoic gas expulsion: 95%





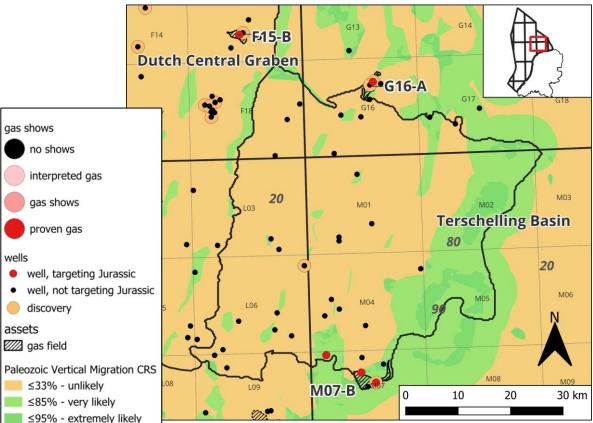
POS Mesozoic oil/gas expulsion: 5%

POS Paleozoic gas expulsion: 95%

POS vertical migration: 20% - 90%;

most significant risk





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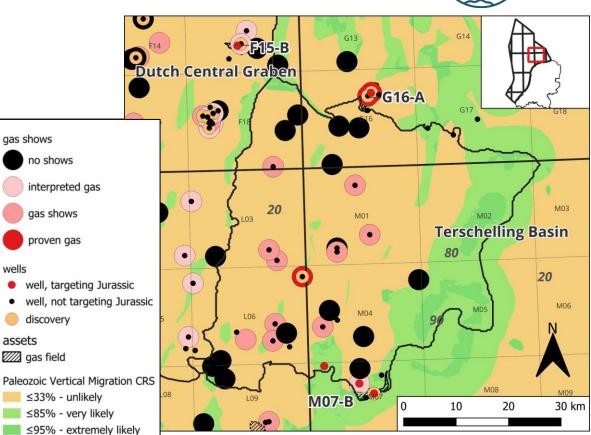
POS Mesozoic oil/gas expulsion: 5%

POS Paleozoic gas expulsion: 95%

POS vertical migration: 20% - 90%;

most significant risk

NB: gas shows are for entire Jurassic!



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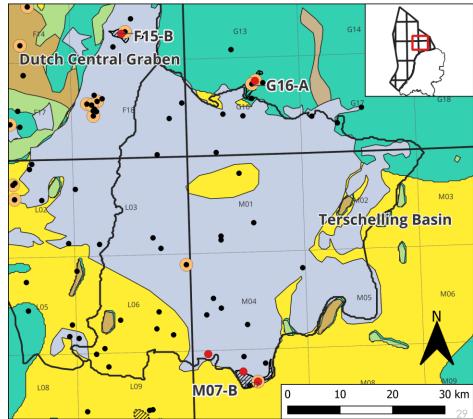
Example use case – seal POS

Lutine Formation – POS top seal: 100%

Kotter/Helder Members – POS top seal: **0%**

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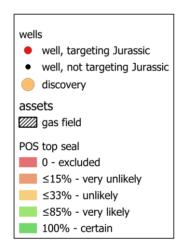




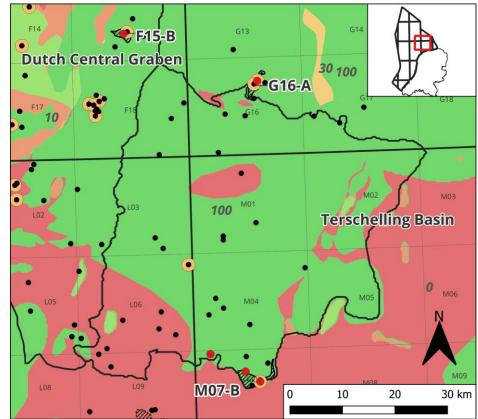
Example use case – seal POS

Lutine Formation – POS top seal: 100%

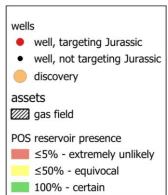
Kotter/Helder Members – POS top seal: 0%



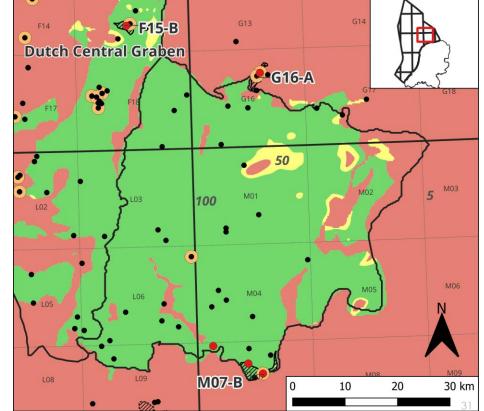




Reservoir presence POS 100% over most of the Terschelling basin





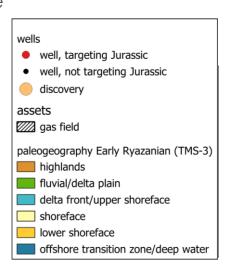


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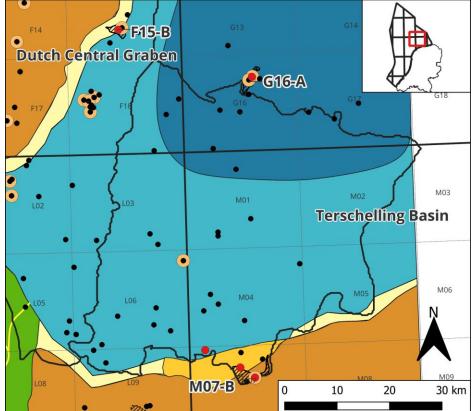


Reservoir presence POS 100% over most of the Terschelling basin

Primarily shallow marine sediments (results from TNO MAXIM study)





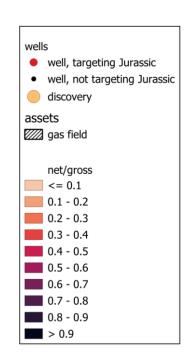


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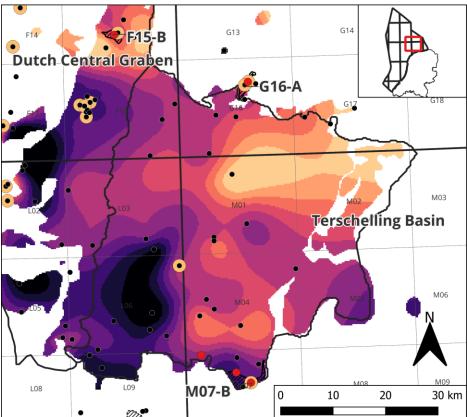


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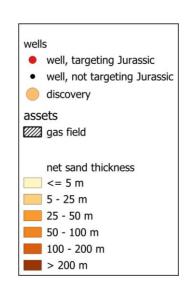




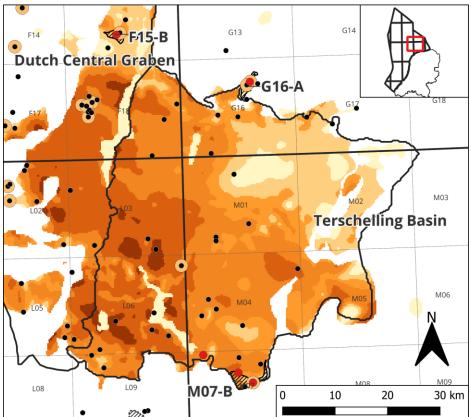
Reservoir presence POS 100% over most of the Terschelling basin

Primarily shallow marine sediments (results from TNO MAXIM study)

Clear proximal-distal trends reservoir quality







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Example use case – conclusions Terschelling basin



- Terschelling Basin dominated by Paleozoic gas
- Migration is a key risk
- Top seal absent in some locations, but excellent over most of the basin
- Reservoir quality likely to be best in W and SW of the basin on a regional scale

Where to focus detailed screening work?

- Local migration pathways Paleozoic gas
- Potential stacked reservoirs sealed by Lower Cretaceous
- Reservoir quality as exemplified by the M07-B field



How to use the GEODE Atlas effectively



- Download GIS data
- Create your own project, integrate with your own data
- GEODE Atlas is valid on a regional scale,
 fit for screening and regional context of play segments and prospects
- Local details may deviate strongly, prospect evaluation requires additional work on much smaller scale

Conclusions Jurassic Play

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Thank you for your attention