Sensitivity Tests Performed on Low Frequency Seismic LFS Data

acquired in the Central North Sea to Delineate Hydrocarbon Deposits

By Dr Roy Bitrus

Tenzor GEO
Subsea Microseismic Technology

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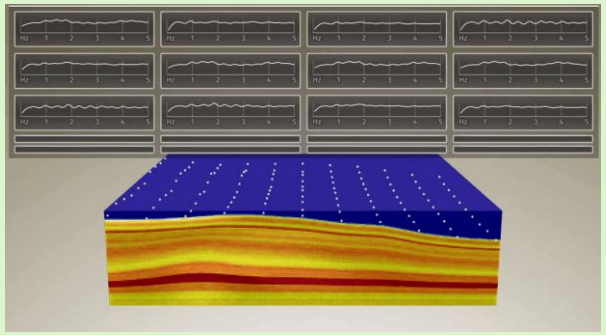
Organiser Supported by PESGB

Introduction – About LFS (Low Frequency Seismic)

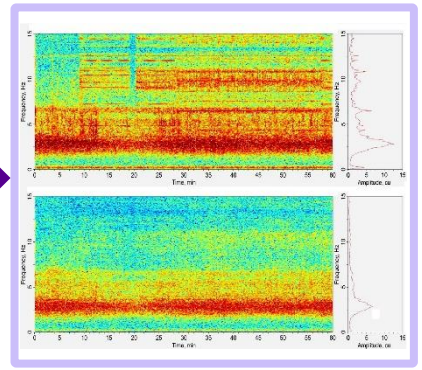
Low frequency seismic sounding (LFS) technology is based on analysing spectral properties of low frequency between 0 – 10Hz of natural background seismic that changes above oil and gas deposits.

Design and acquisition

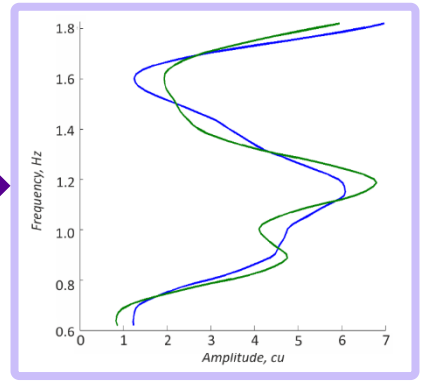
Full waveform numerical simulation 3D or 1D.



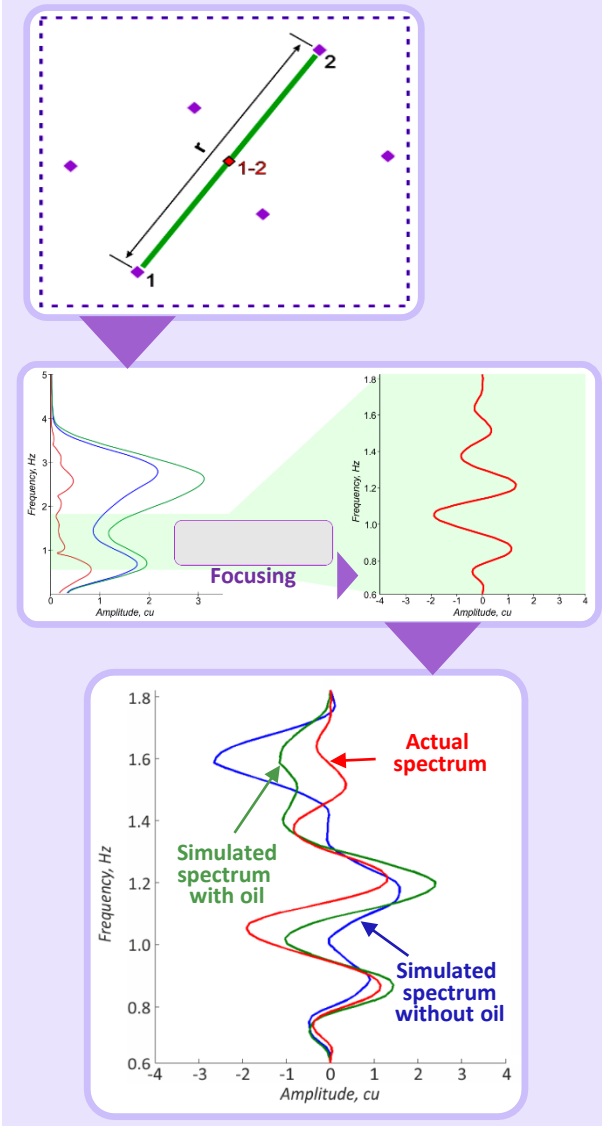
Quasi-harmonic noise filtering



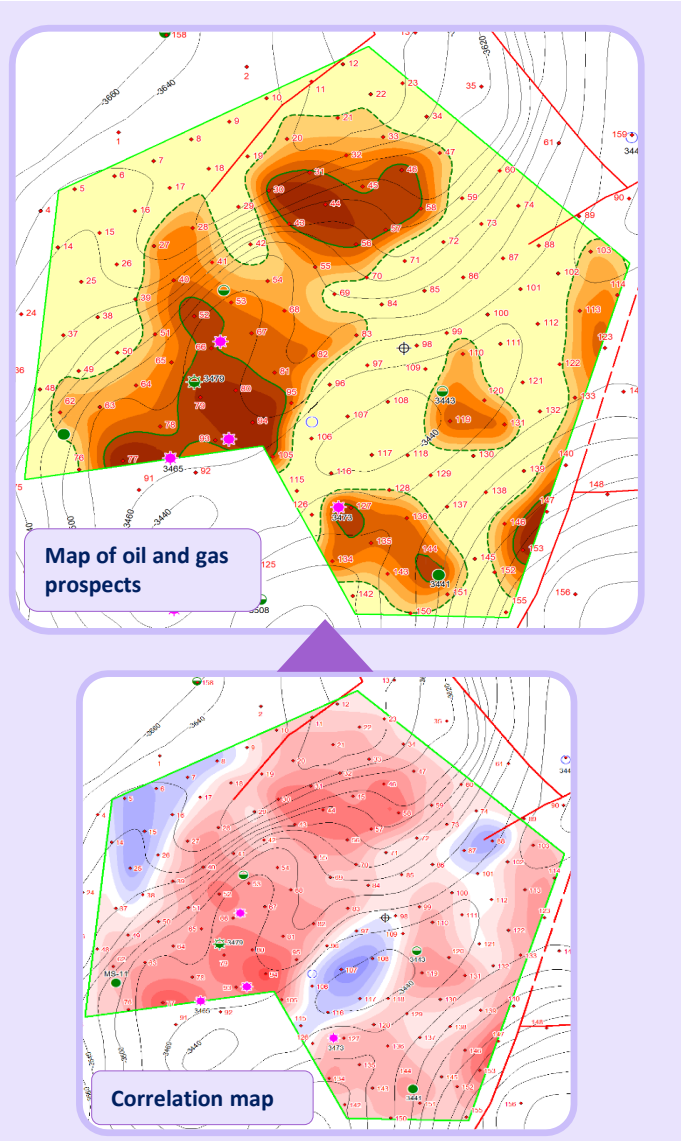
Simulated spectra



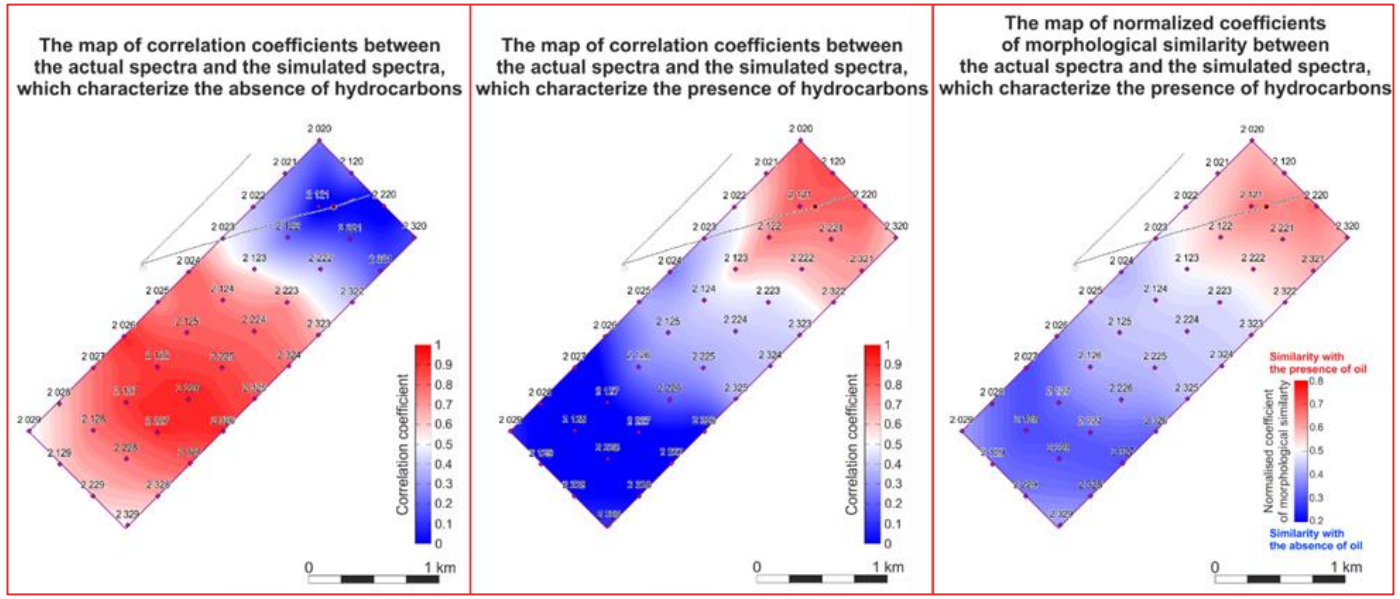
Processing



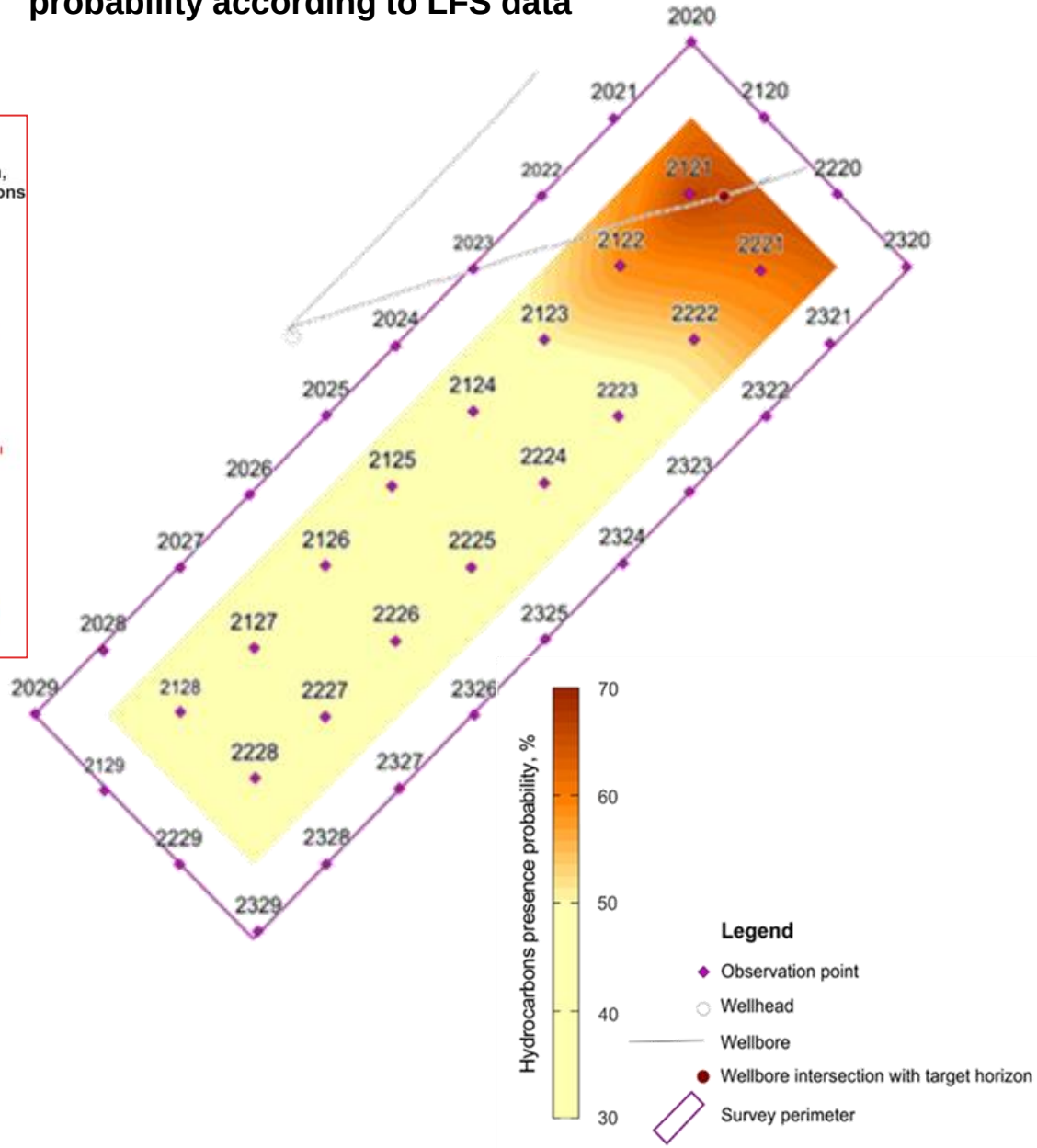
Outcomes



LFS Data From the UKCS



Map of hydrocarbons presence probability according to LFS data



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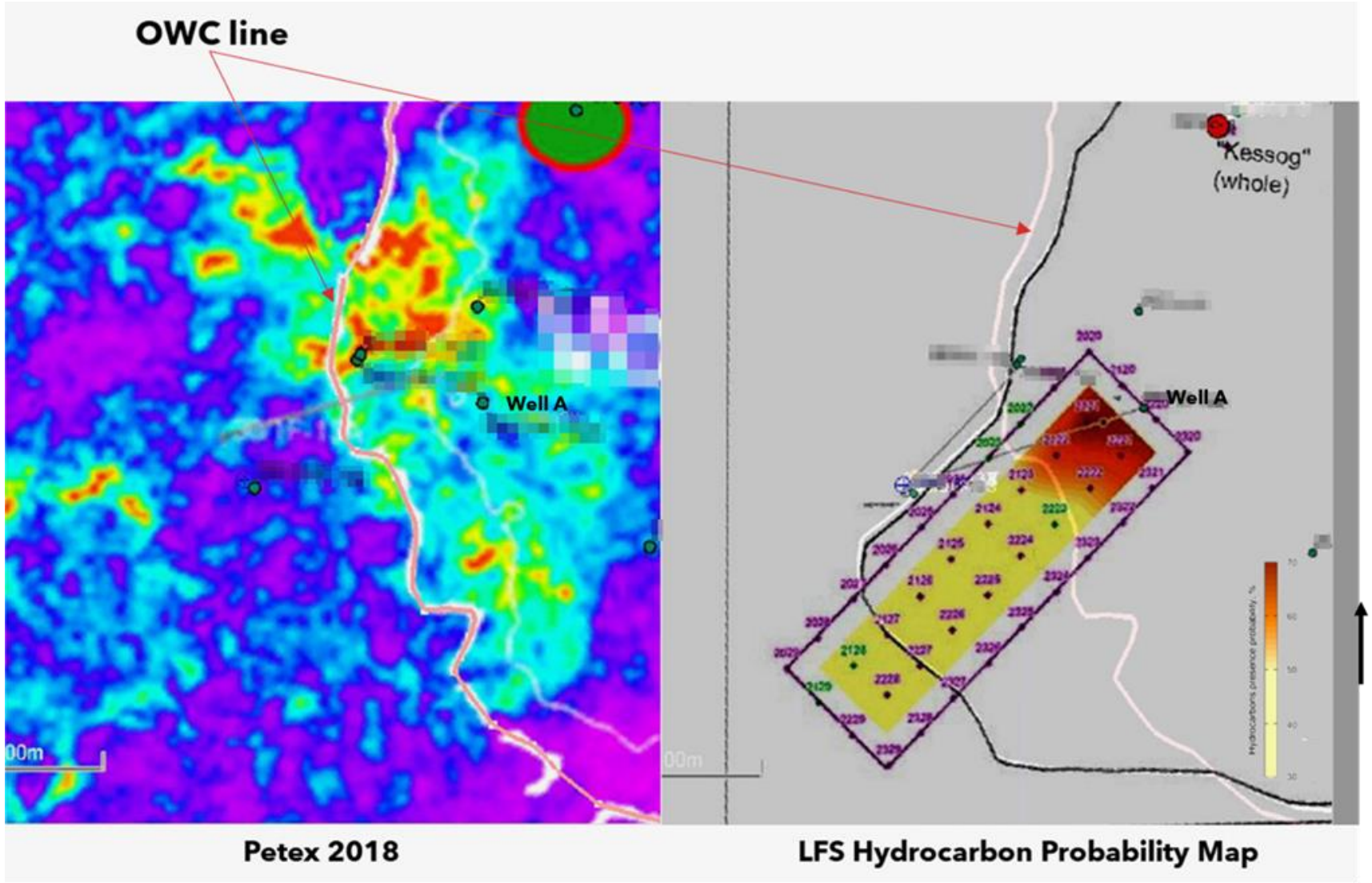
Sensitivity Tests on the UKCS LFS Data

Perform sensitivity tests on base case model of the target field

Primary Aim:
Test at what point the OWC correspondence is broken or the misfits are too large



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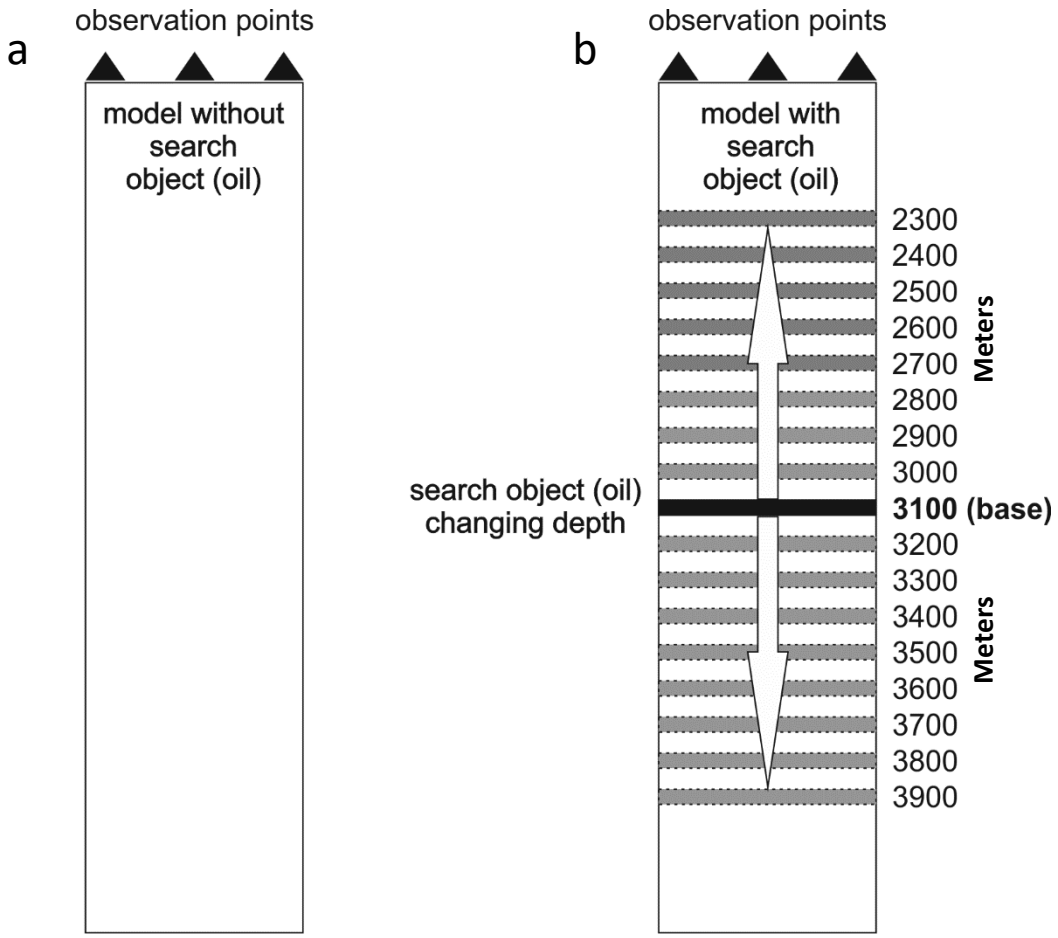
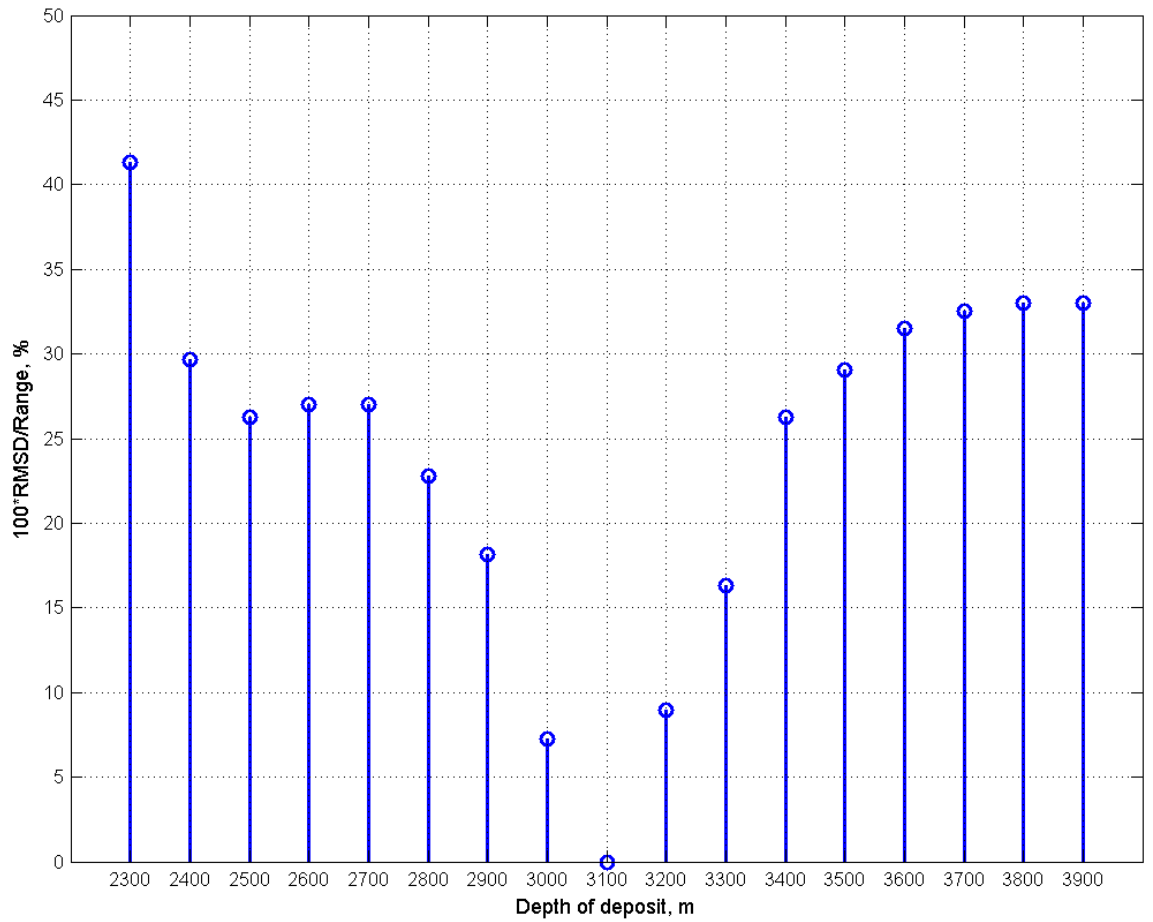
Test 1: Test the vertical sensitivity of the data acquired in the field

Objective: To evaluate how the hydrocarbons probability map will change if a studied deposit is located at a different depth than assumed depth of the deposit.





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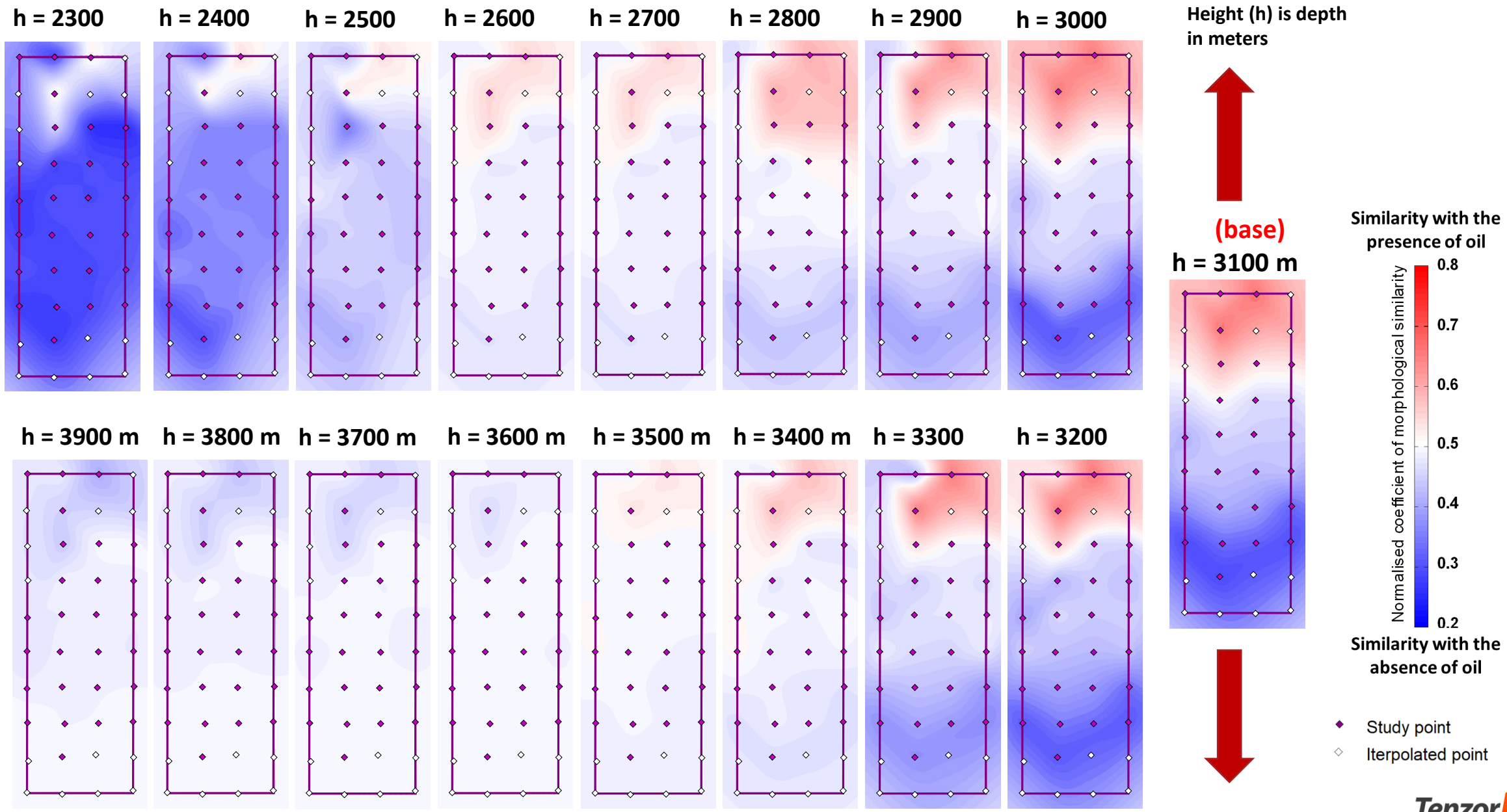

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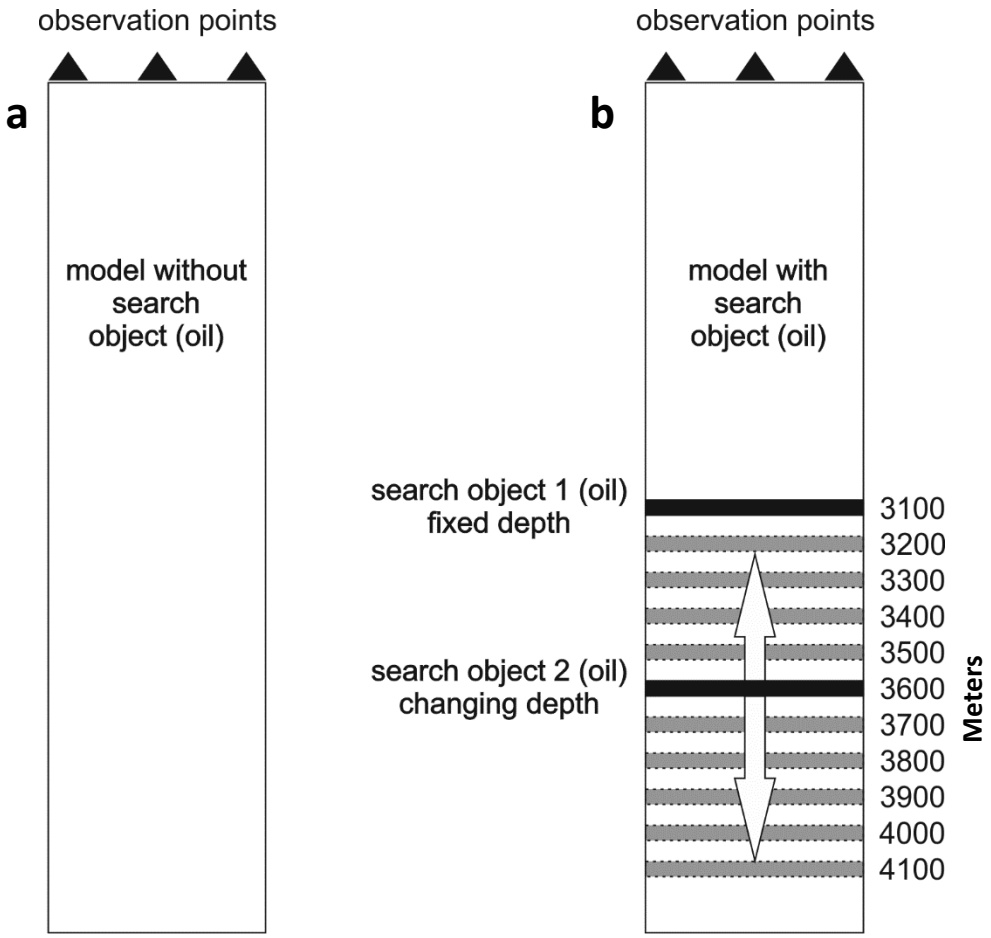
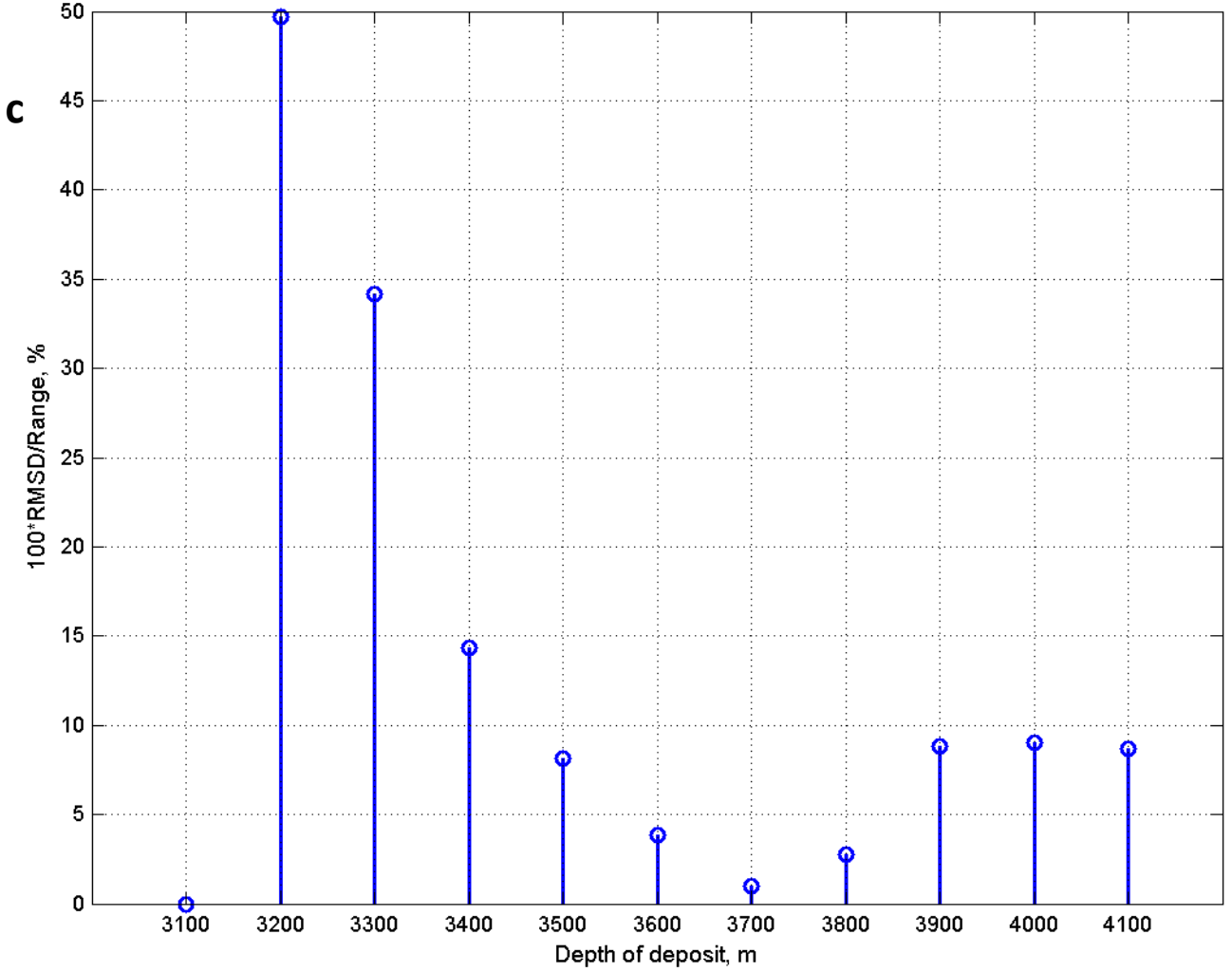
Test 2: Insert other oil-bearing reservoirs deeper in the section and re-calculate misfit and the effect the random hydrocarbon probability layer will have on the known result.

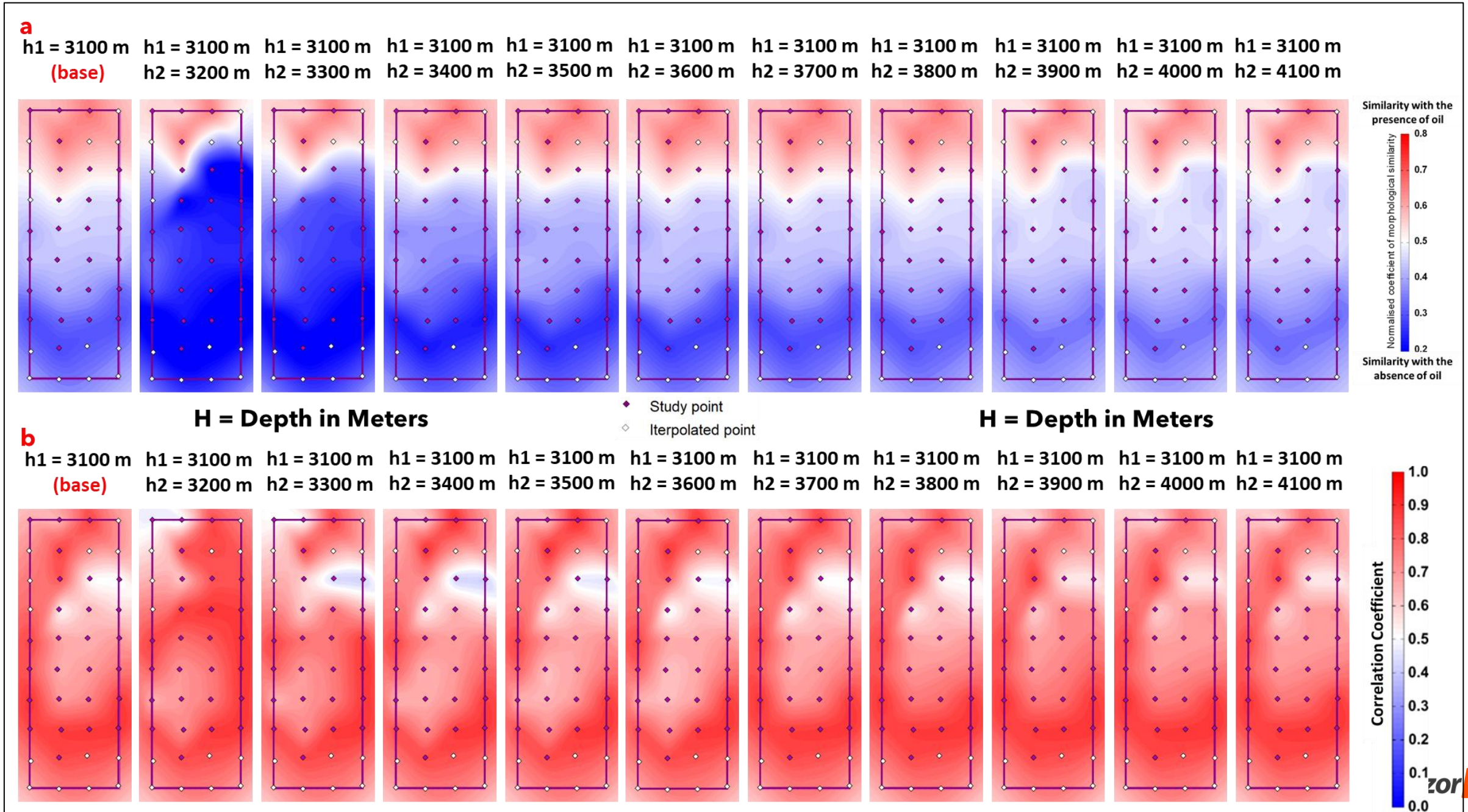
Objective: The main objective here is to confirm the sensitivity of the resulting hydrocarbons probability map to the presence of a possible “unknown” hydrocarbon reservoir below the target hydrocarbon horizon.

Stage 1





Test 2: Insert other oil-bearing reservoirs deeper in the section and re-calculate misfit and hydrocarbon probability



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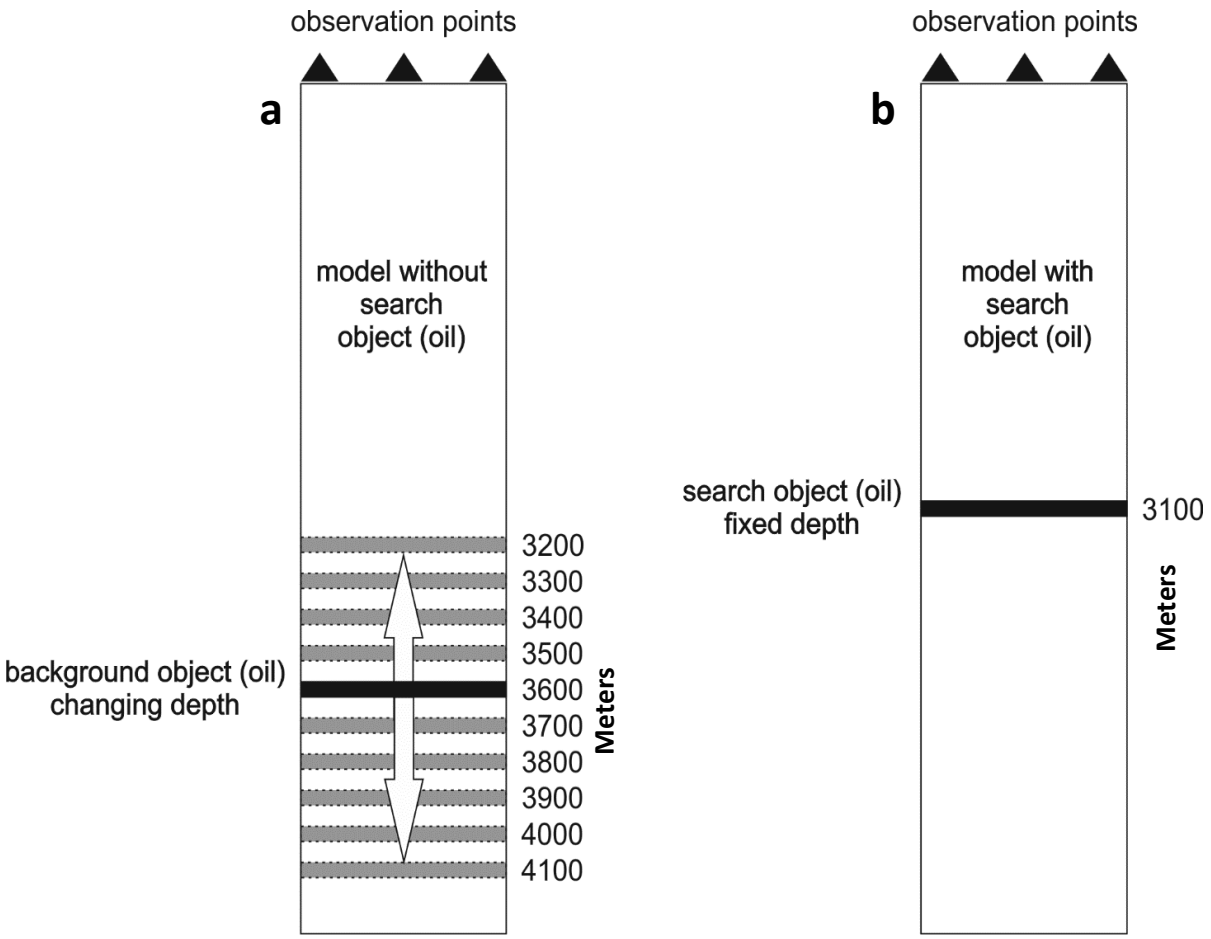

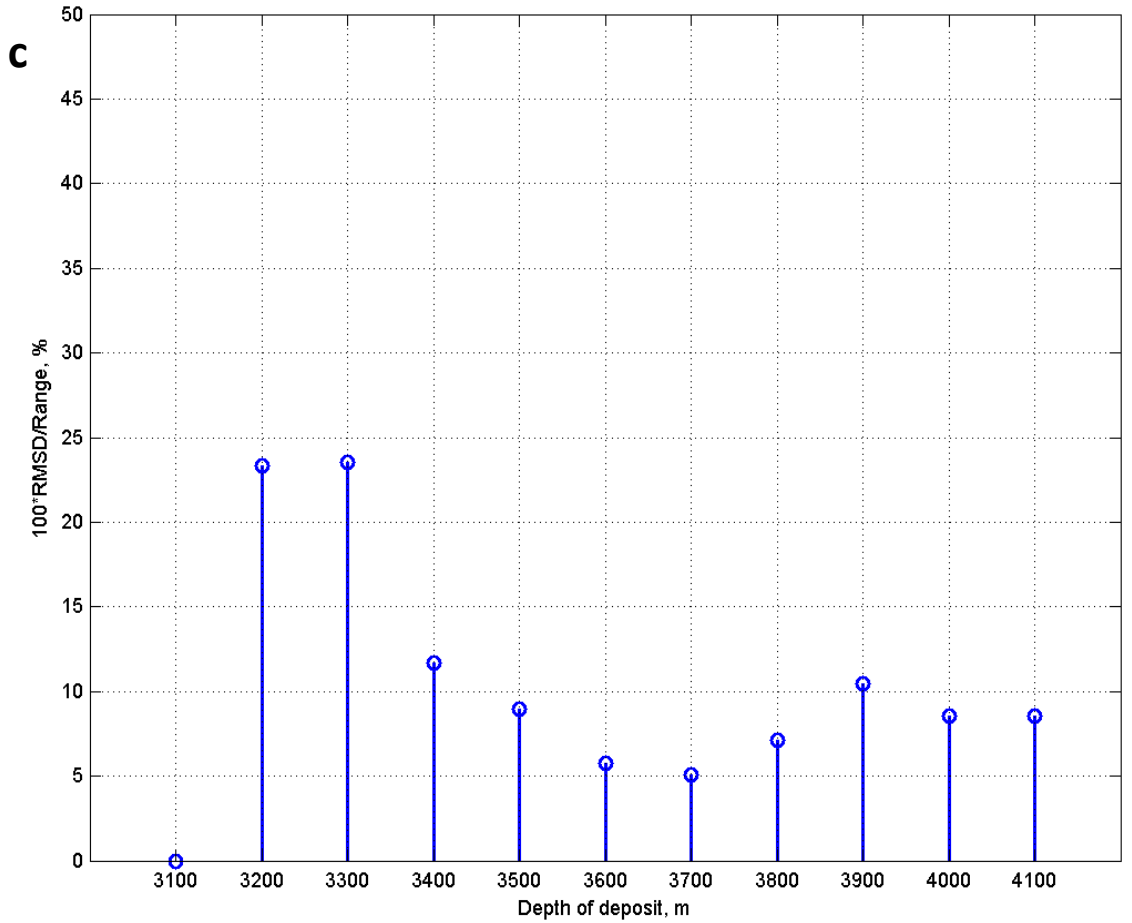

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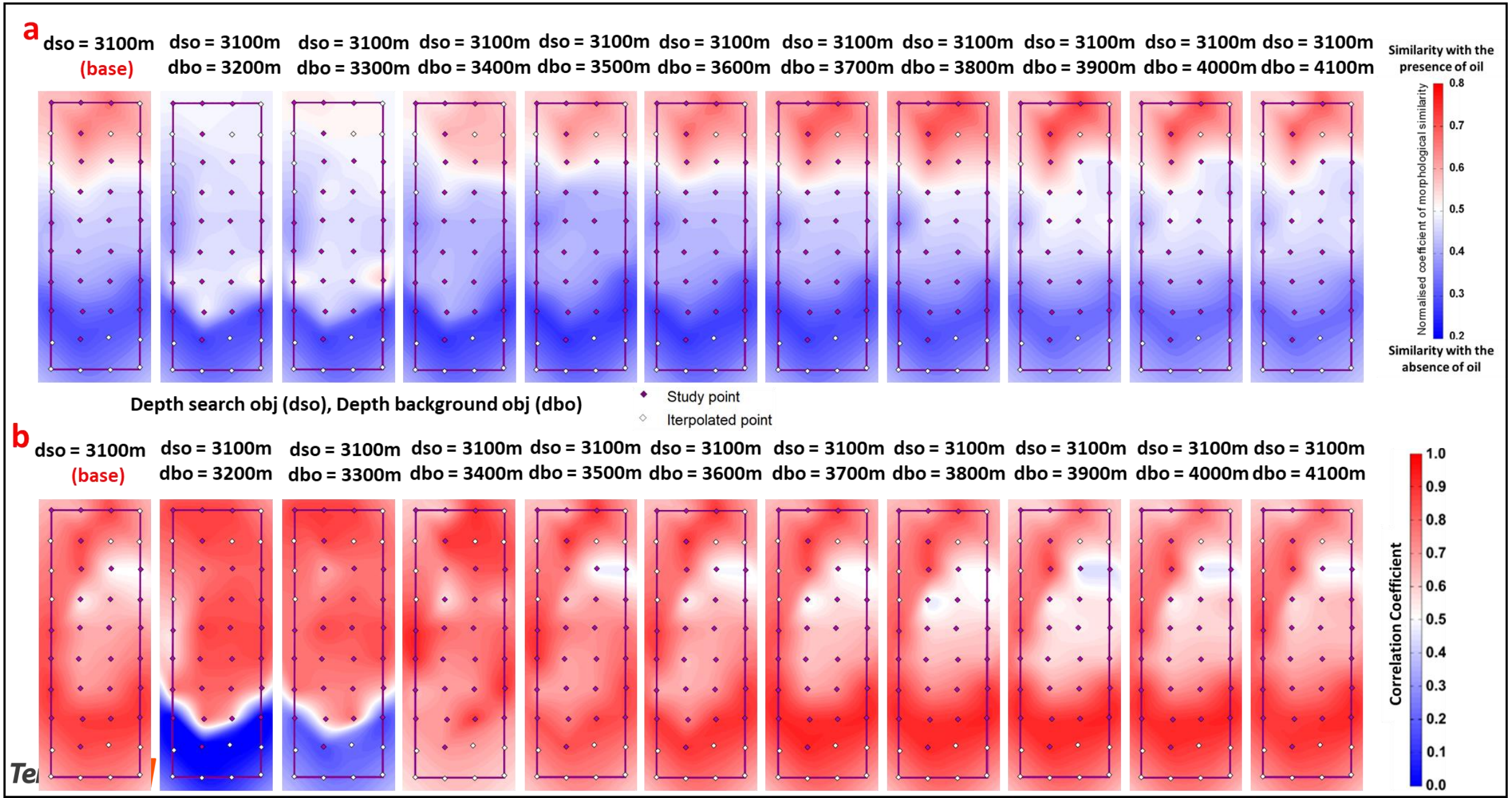
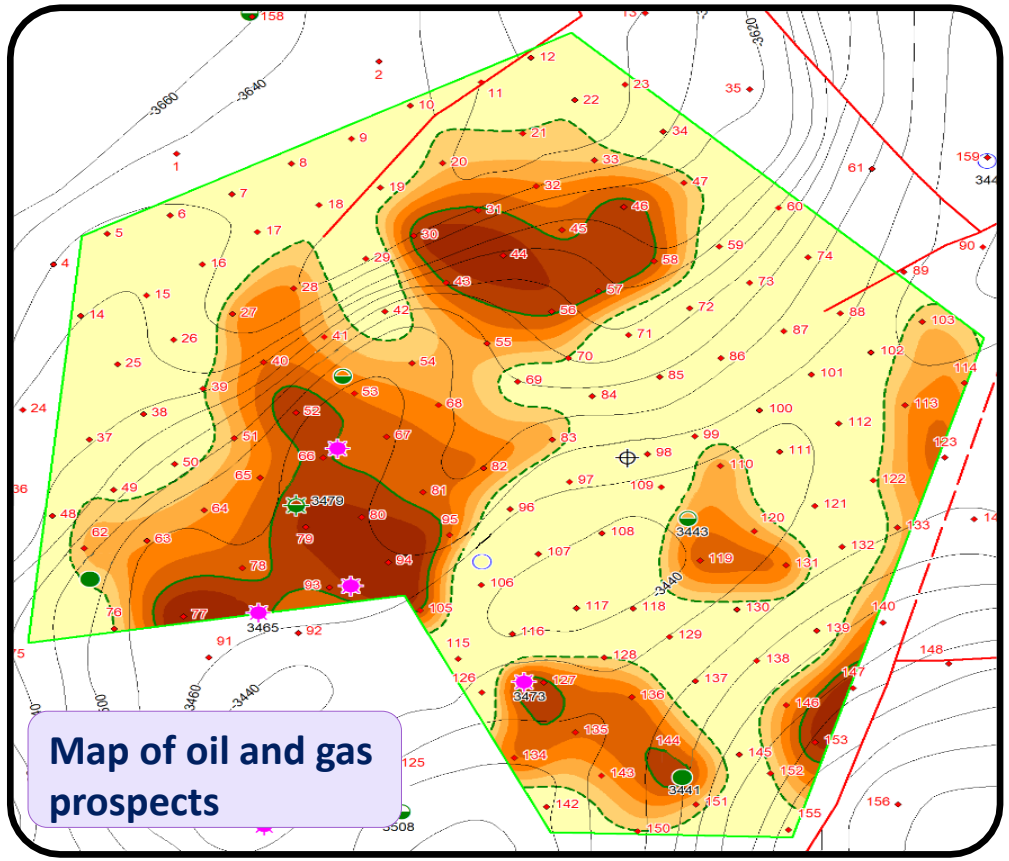


Conclusion

LFS technology uses natural low-frequency (0.1 – 10Hz) of vertically propagated P-waves and applying the sensitivity analysis on the acquired data gives an indication of the vertical resolution of the resulting data and its application in visualising the hydrocarbon potential of a reservoir.



- **Environmental Friendly**
- **Vertical Sensitivity**
- **Integrate with seismic to derisk drilling**
- **Improve visualisation of the subsurface to replenish reserves**
- **Model has vertical sensitivity to help locate new and existing reservoirs.**

For more info refer to publication:
Bitrus et al., 2023; Sensitivity Tests Performed on Low Frequency Seismic LFS Data acquired in the Central North Sea to Delineate Hydrocarbon Deposits, First Break Vol 41, Issue 4, April 2023, p 71 – 77. DOI: https://doi.org/10.3997/1365-2397.fb2023027

QUESTIONS

GET IN TOUCH
Dr Roy Bitrus
T: +44 (0)7854859911
E: roy.bitrus@tenzorgeo.co.uk