

‘Overthickening’ of Cretaceous sequences by Igneous Intrusions: Paleogeographic reconstruction of the Norwegian Margin

Fully Funded PhD Project

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Applications: Send CV and Cover Letter to n.schofield@abdn.ac.uk
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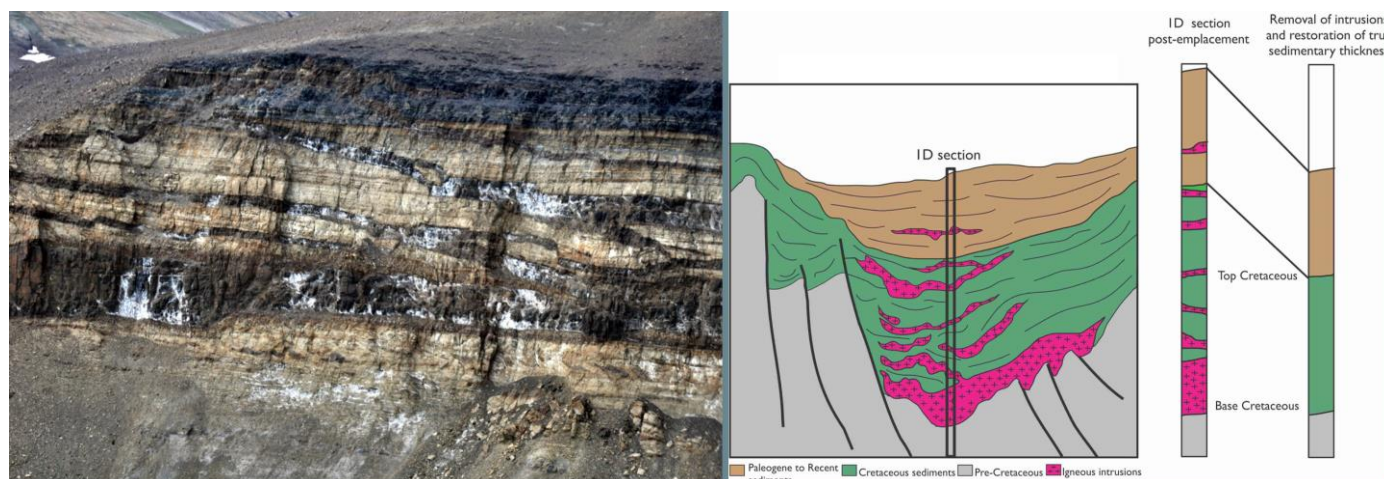


Fig. 1 – Intrusions intruded in clastic sequences in Greenland and concept of overthickening of sedimentary sequences by intrusions (from Mark et al. 2018)

Background

Work by the UoA has highlighted that the true thickness of the Cretaceous sedimentary section along the Atlantic Margin, prior to the mid-late Palaeocene, may have been drastically overestimated, as a large proportion of the current thickness of the Cretaceous sequences, presumed to be all sedimentary, is instead composed of un-imaged primary igneous material in the form end-Cretaceous to Palaeocene aged sill intrusions (see Mark et al. 2018). The total present-day thickness of the Cretaceous is therefore a function of both the Cretaceous sedimentary component *and* a Palaeocene intrusive volcanic component.

This scenario has profound implications for petroleum system modelling, sediment budget calculations and our understanding of the Cretaceous rifting history of the NE Atlantic; because the thickness of intrusions (> 1km in places) needs to be removed in order to correctly represent the true thickness of the Cretaceous sedimentary pile along the Atlantic Margin prior to sill emplacement during the Palaeocene. Work conducted jointly between the University of Aberdeen and industry partners has found that removal of the igneous intrusions can have a drastic effect on our understanding of basin palaeogeography, the timing of source rock maturation and the point of peak oil/gas generation. This new understanding may lead to a better calibration between basin modelling results and the observed phase of fluids in known accumulations, leading to better prediction of fluid type in exploration prospects.

On the Norwegian margin, the differential intrusion thickness needs to be accounted for in order to reconstruct Cretaceous palaeogeography at various time steps. This will be the primary aim of the PhD. It is hoped that basin restoration will generate a much better understanding of reservoir and source rock distribution/quality.

This project is funded by A/S Norske Shell, and the student will be expected to work closely with Shell throughout the course of the project including multiple visits to their office in Stavanger

Field visits (potentially USA, Scotland, Australia) will be undertaken to allow the student to develop a strong appreciation of the nature of intrusions within sedimentary basins and aid in subsurface interpretation.

Student Credentials

The project and student will be based at the University of Aberdeen. The project is open to UK or EU nationals. Unfortunately, non-UK or non-EEA nationals are not eligible to apply for this project due to funding restrictions.

The student will ideally possess an MSc in either Petroleum Geoscience or equivalent. Most importantly, the student should have strong geological interest and inquisitive mind. It is expected that the student should have a strong interest in seismic interpretation, well analysis, volcanology, sedimentology and/or basin analysis. These skillsets will be developed during the project and, therefore, pre-existing mastery is not a pre-requisite. Experience of Petrel is desirable but full training can be given. Strong communication skills and a willingness to adapt, particularly in reference to ongoing engagements with Shell, are important.

Research and training context:

The Department of Geology and Petroleum Geology built up a substantial reputation at providing key geological insights into the Atlantic Margin and other basins globally. The UoA has the biggest Atlantic Margin focused research group in the UK. The student will join a vibrant research group and be based in the dedicated room of the Research Group.

Career Routes

By the end of the PhD, the student will possess a multi-disciplinary skillset enabling them to undertake a range of roles in industry or academia.

Further Reading (Please e-mail for papers copies if you cannot access):

- Mark, N., Schofield, N., Gardiner, D., Holt, L., Grove, C., Watson, D., Alexander, A. & Poore, H. (2018). 'Overthickening' of Sedimentary Sequences by Igneous Intrusions'. *Journal of the Geological Society*; JGS2018-112
<http://dx.doi.org/10.1144/jgs2018-112>
- Mark, N.J., Schofield, N., Pugliese, S., Watson, D., Holford, S., Muirhead, D., Brown, R. & Healy, D. (2017). 'Igneous intrusions in the Faroe Shetland basin and their implications for hydrocarbon exploration: new insights from well and seismic data'. *Marine and Petroleum Geology*.
- Schofield, N., Holford, S., Millett, J., Brown, D., Jolley, D., Passey, S.R., Muirhead, D., Grove, C., Magee, C., Murray, J., Hole, M., Jackson, C.A. & Stevenson, C. (2017). 'Regional Magma Plumbing and emplacement mechanisms of the Faroe-Shetland Sill Complex: Implications for magma transport and petroleum systems within sedimentary basins'. *Basin Research*, vol 29, no. 1, pp. 41-63.
- Schofield, N., Jolley, D., Holford, S., Archer, S., Watson, D., Hartley, A., Howell, J., Muirhead, D., Underhill, J. & Green, P. (2018). Challenges of future exploration within the UK Rockall Basin. in M Bowman & B Levell (eds), *Petroleum Geology of NW Europe: 50 Years of Learning : Proceedings of the 8th Petroleum Geology Conference*. vol. 8, *Petroleum Geology Conference series*, vol. 8, Geological Society of London, Bath, pp. 211-229, 8th Petroleum Geology Conference, London, United Kingdom, 28-30 September.

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