

# Geology of the 5/22-1 exploration well, Rockall Trough, offshore NW Ireland: the role of break-up magmatism on trap development and reservoir quality

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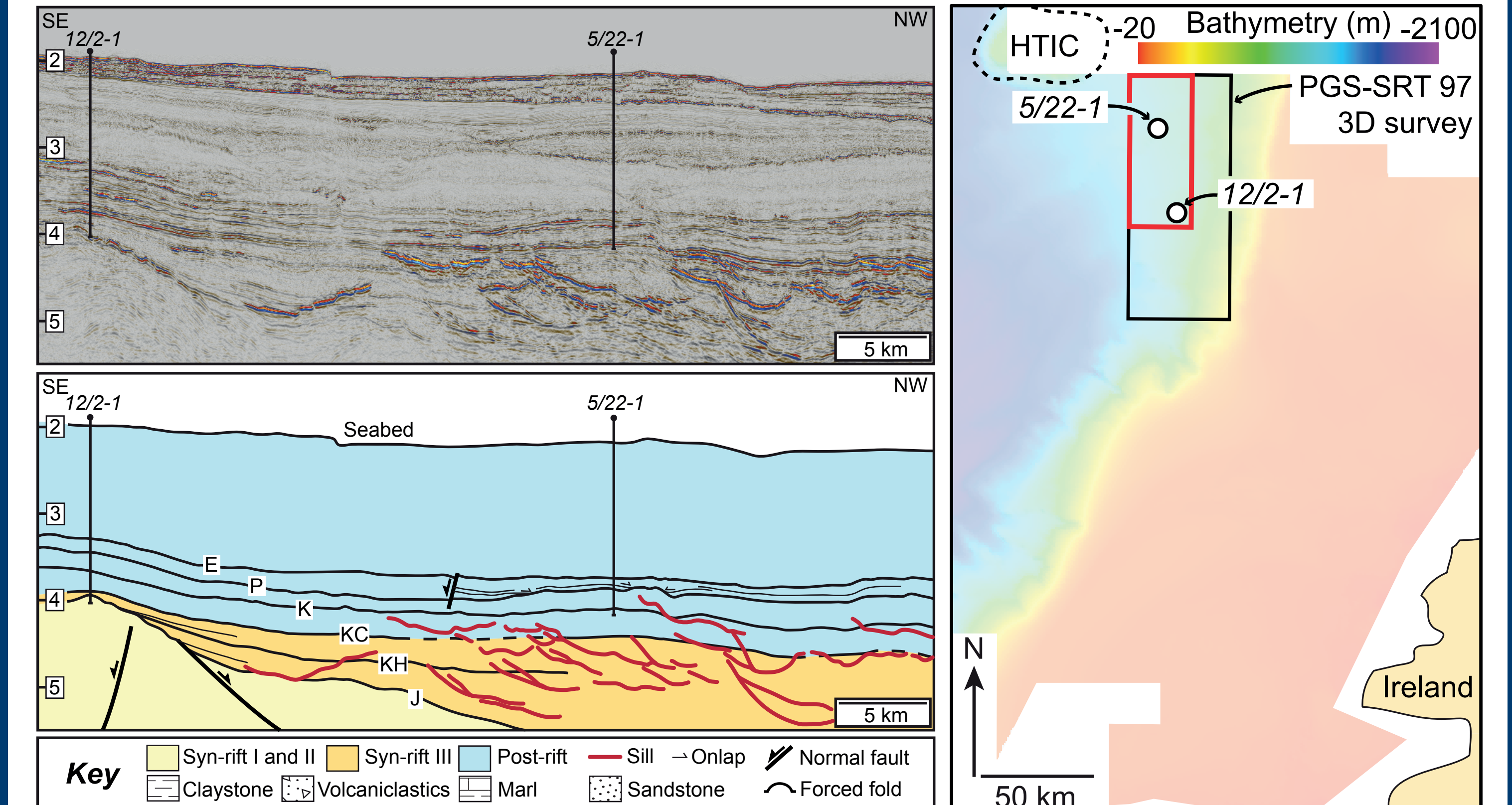
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## 1) Introduction



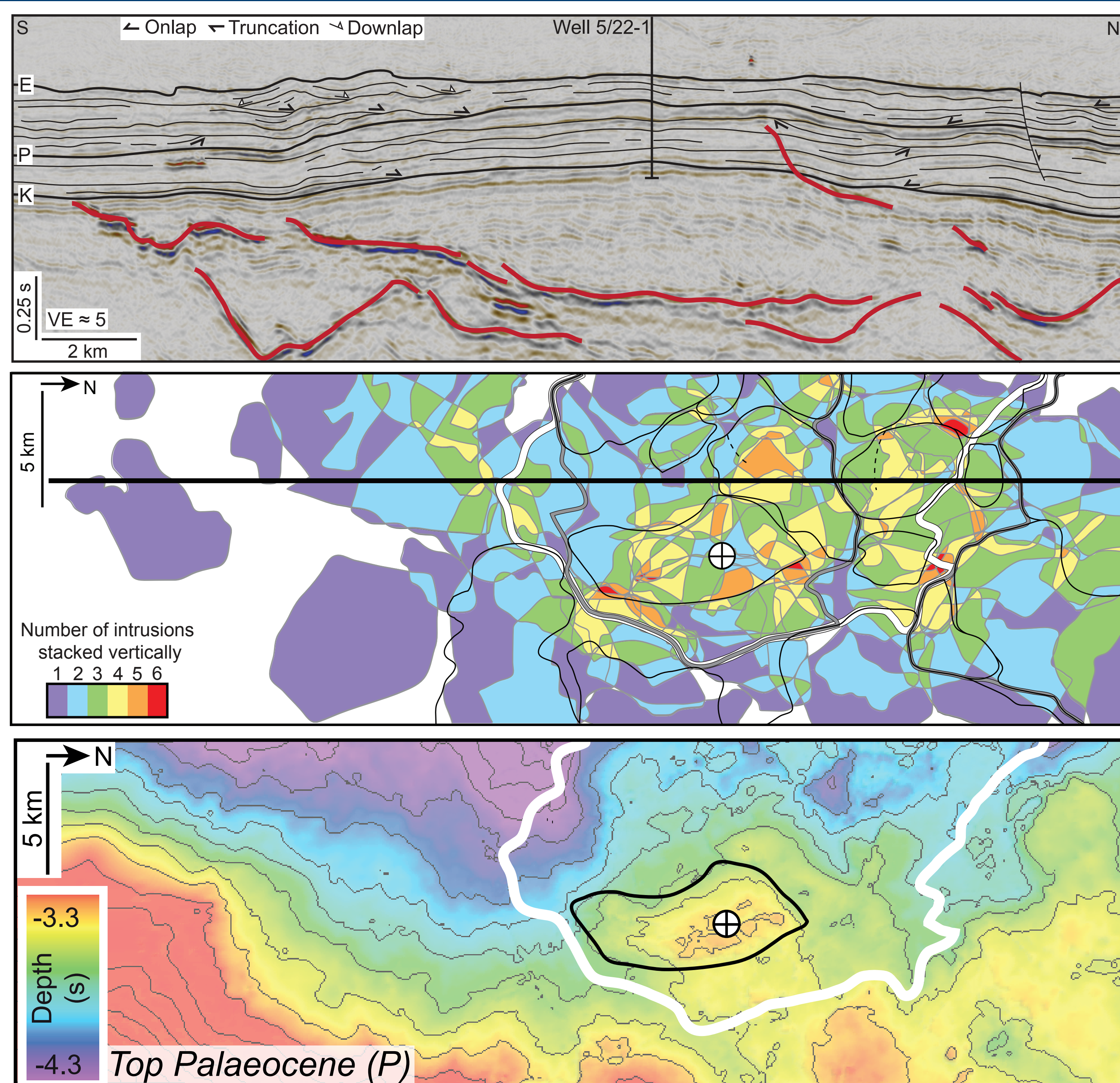
- Breakup-related melt can interact with basin structure and stratigraphy and cause: (1) physical compartmentalisation of reservoir rock; (2) fluid-related degradation of reservoir quality; (3) barriers or baffles between source and reservoir rock; (4) modification of fault hydraulic properties; (5) formation of traps; and (6) maturation of source rock (**see above**)
- In this poster we discuss the geology of exploration well 5/22-1, drilled in 2001 in the eastern Irish Rockall Basin by Enterprise and partners. In particular we focus on the role that break-up related magmatism had on trap development and reservoir quality, two important elements of the petroleum system
- The prognosis for well 5/22-1 was thick, high-quality reservoir in the Lower and Upper Palaeocene intervals...(**see right**)

## 2) Study Area and Dataset



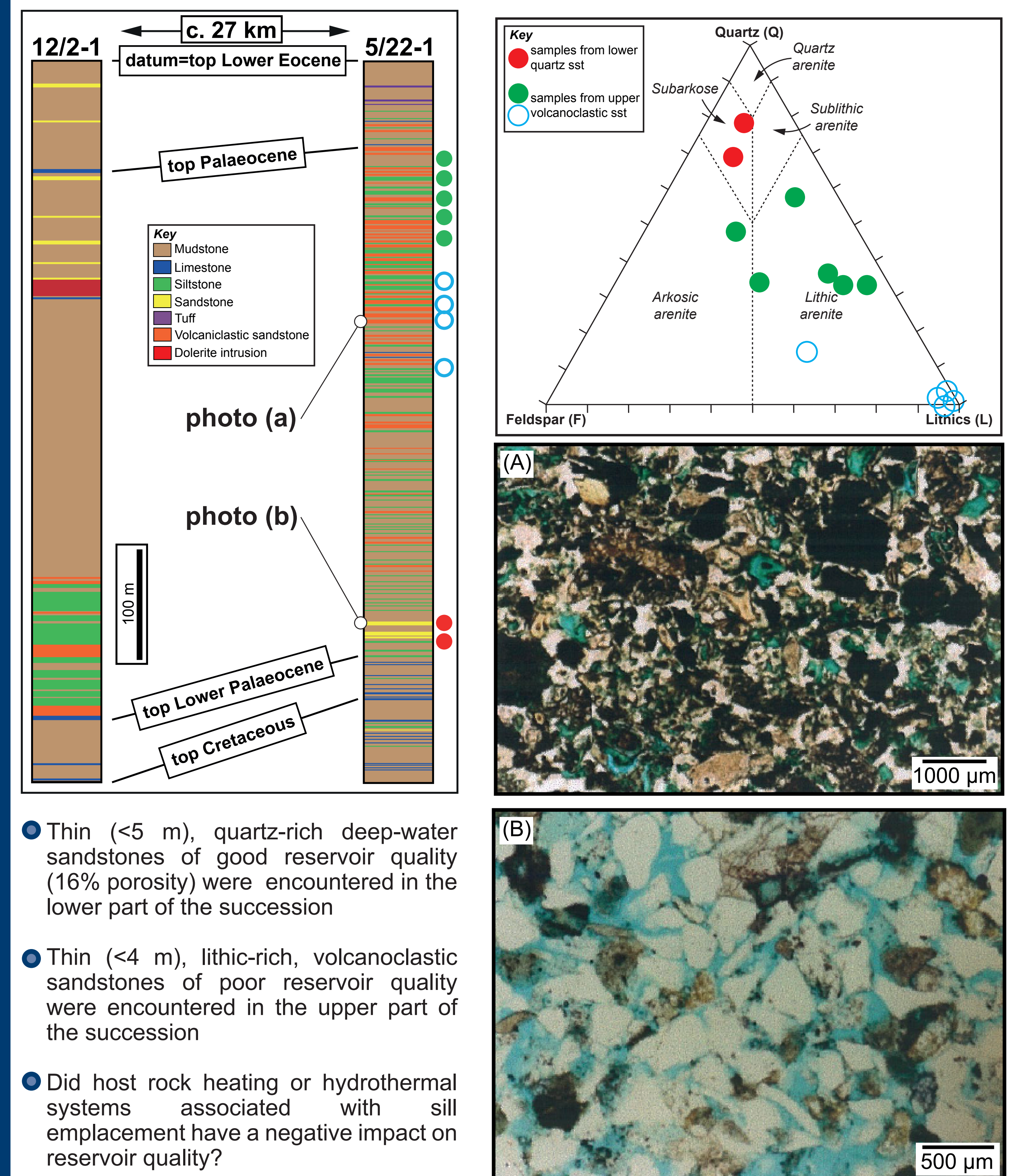
- The study area is located in the eastern Irish Rockall Basin, offshore NW Ireland
- c. 2400 km<sup>2</sup> 3D seismic; two wells (5/22-1 and 12/2-1 (Dooish); AFTA, VR and fluid inclusion data

## 3) Trap Geomery, Size, Origin and Age



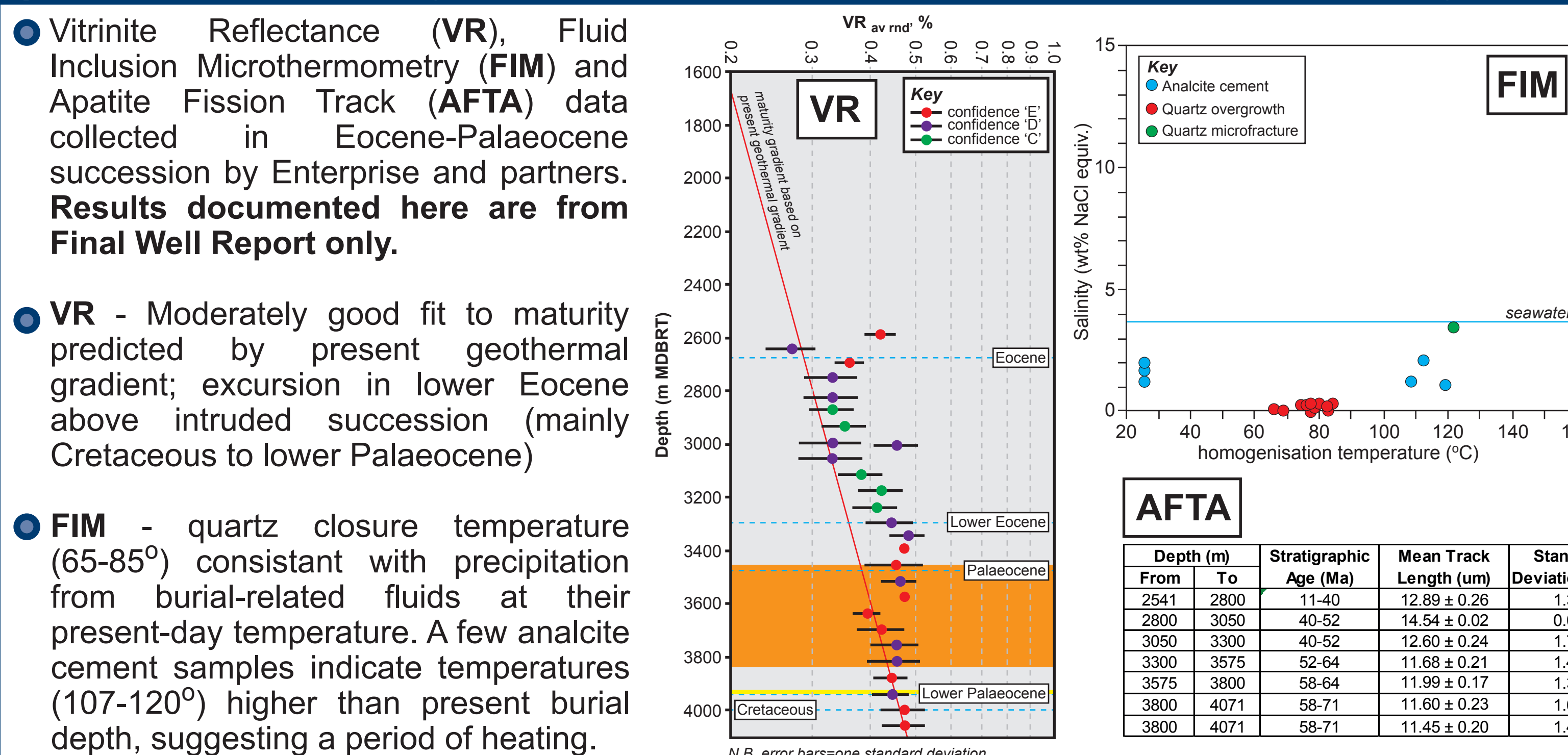
- A four-way dip closure is developed at the top Palaeocene
- The closure has an area of 52-77 km, a relief (i.e. column height) of 80-110 m
- Sills are most densely stacked directly beneath the borehole
- The trap is a igneous intrusion-induced forced fold (see poster by Magee and Jackson)
- What impact might these sills have on reservoir quality? (see right)

## 4) Reservoir Quality and Continuity



- Thin (<5 m), quartz-rich deep-water sandstones of good reservoir quality (16% porosity) were encountered in the lower part of the succession
- Thin (<4 m), lithic-rich, volcaniclastic sandstones of poor reservoir quality were encountered in the upper part of the succession
- Did host rock heating or hydrothermal systems associated with sill emplacement have a negative impact on reservoir quality?

## 5) Thermal History and Potential Role on Reservoir Quality



- Vitrinite Reflectance (VR), Fluid Inclusion Microthermometry (FIM) and Apatite Fission Track (AFTA) data collected in Eocene-Palaeocene succession by Enterprise and partners. Results documented here are from Final Well Report only.
- VR - Moderately good fit to maturity predicted by present geothermal gradient; excursion in lower Eocene above intruded succession (mainly Cretaceous to lower Palaeocene)
- FIM - quartz closure temperature (65-85°) consistent with precipitation from burial-related fluids at their present-day temperature. A few analcite cement samples indicate temperatures (107-120°) higher than present burial depth, suggesting a period of heating.

- AFTA - Measured<predicted track lengths suggestive of elevated palaeotemperatures? Could track lengths be inherited from source area?
- VR, AFTA and FIM data provide inconclusive evidence for sill-induced transient heating event of the Palaeocene-Eocene
- Upper reservoir was likely poor prior to sill emplacement

## 5) Conclusions and Future Work

- Igneous intrusion-induced forced folding can generate potential hydrocarbon traps; **future work to focus on mapping of additional closures**
- Co-genetic magmatism may result in the deposition of poor-quality reservoir; **future work to focus on provenance analysis of Palaeocene and Eocene deep-water sandstones and analysis of regional and local syn-depositional basin geometry and sediment dispersal to locate areas of good reservoir**
- Sill-induced heating may have locally affected the reservoir; **future work to focus on establishing the long-term thermal evolution and of the basin and further analysis of VR, FIM and AFTA data**
- Thick sub-target igneous bodies may have hampered upward migration of hydrocarbons into trap; **future work to focus on mapping of sills adjacent to Errigal, Dooish and West Dooish wells and study of analogues to establish sill permeability**