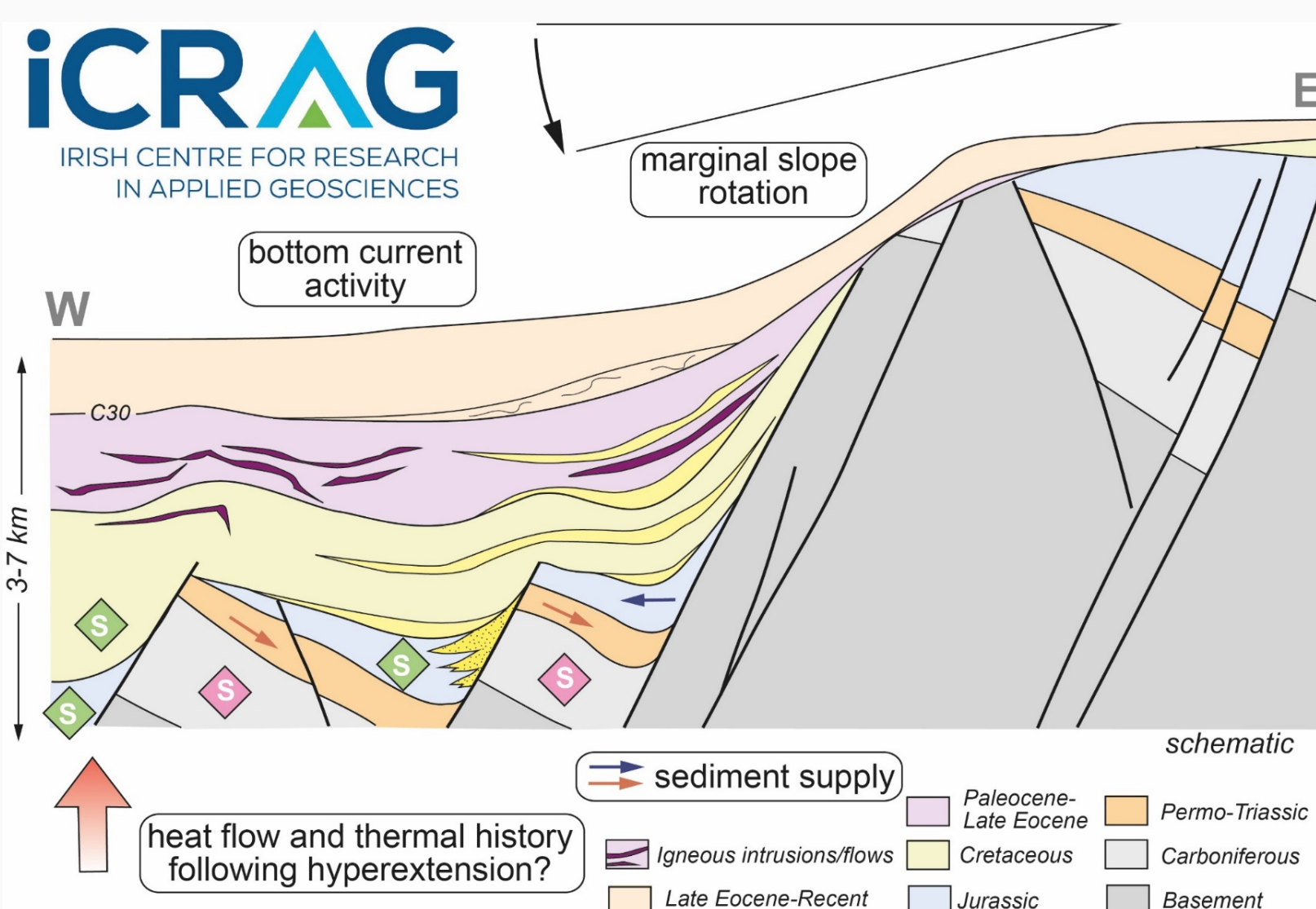


## Hydrocarbon Research at iCRAG

iCRAG is a newly formed national centre for applied geoscience research in Ireland, performing research which is linked to a broad range of application areas and industries. The Centre's research programme consists of four cohesive topics or 'spokes' in the areas of groundwater, hydrocarbons, marine geoscience and raw materials, which are built around four enabling technology and equipment based 'platforms' which focus on geophysical sensing and imaging, geochemistry, 3D geological modelling and public perception and understanding. Whilst the research will be conducted in several so-called Targeted Projects, the research programme will be multi-disciplinary in nature, promoting the development of across-spoke and inter-project technical linkages.

This poster focusses on our hydrocarbons research 'spoke', briefly outlining our research aims and listing the recently initiated PhD and Post-Doc projects on the broad range of topics linked to offshore hydrocarbons.

PI	Project title	PhD/PD
Shane Tyrrell (NUIG)	Development of novel sediment tracers: validation and application of conventional and new provenance proxies	PD
Shane Tyrrell (NUIG)	Development of novel sediment tracers: investigating the primary controls on reservoir sandstone quality	PhD
Peter Haughton (UCD)	Crustal and sedimentary architecture of hyperextended basins	PD
Conrad Childs (UCD)	The kinematics of fault systems in offshore Ireland – implications for fault related trapping and leakage	PD
Peter Haughton (UCD)	Controls on clay distribution at bed-level in deep-water sandstones and implications for permeability and hydrocarbon drainage	PhD
David Chew (TCD)	Determining the Mesozoic–Cenozoic thermal history of the Irish offshore basins and the Irish mainland	PD
Peter Haughton (UCD)	Characterisation of deep-water stratigraphic traps developed across the syn-rift to post-rift transition in Atlantic-margin basins	PhD
Conrad Childs (UCD)	Structural and kinematic analysis of the Celtic Sea basins - exploring links between evolution and traps	PhD
Tom Manzcocchi (UCD)	Hierarchical compression-based reservoir modelling conditioned to seismic and well data	PhD
Tom Manzcocchi (UCD)	Hierarchical sedimentary characterisation and modelling of submarine channels	PhD
Michael Max (UCD)	Commercialization of Natural Gas Hydrate: geological attributes, environmental factors, and new exploration and production technology	PD
Peter Haughton (UCD)	Development of Clare Subsurface Training Centre and securing the long-term future of Clare-based applied geoscience training	PD



## Hydrocarbons Spoke (TP4)

## TP4.1

## Sediment tracking

- new provenance tracers
- modern sand dispersal and mixing
- sediment volumes/partitioning
- recycling
- impact on RQ

## TP4.2

## Basin evolution/petroleum systems

- early rift architecture/young rifts
- fault characterisation and structural evolution
- stratigraphic onlaps and traps
- hyperextended basins and their fills
- stratigraphy at the continental-oceanic transition
- thermal history/migration modelling

## TP4.3

## Modelling and imaging

- hierarchical depositional modelling
- well and seismic conditioning
- software development
- reservoir monitoring using OBC/OBS

## TP4.4

## Unconventionals

- gas hydrates

## TP4.5

## Training and outreach

- development of Clare training resource
- public engagement

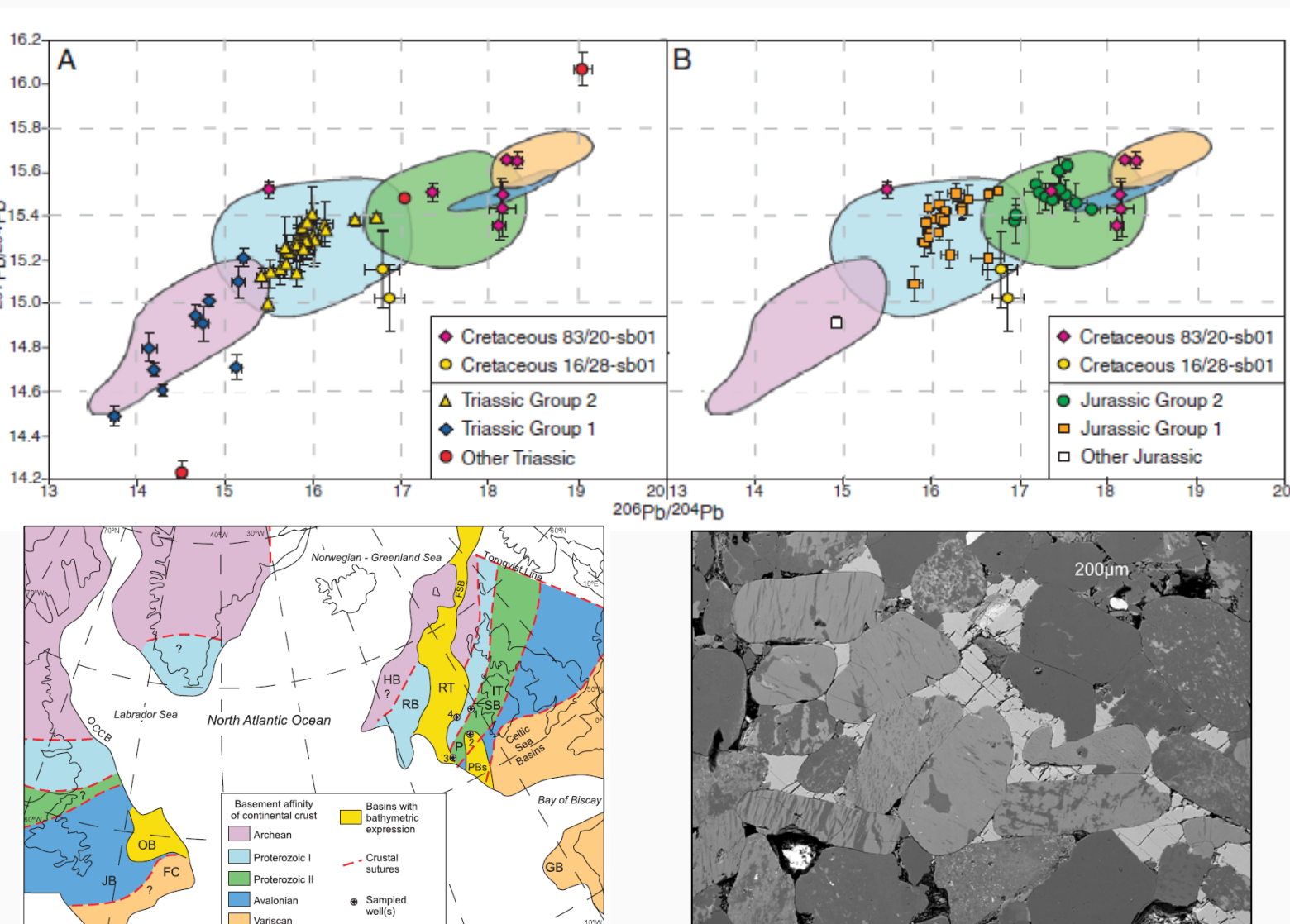
## 5 Targeted Projects

1. Sediment tracking: investigating provenance tracers, modern sand dispersal and mixing, sediment volumes, partitioning and recycling, and implications for reservoir quality.
2. Basin evolution and petroleum systems: involving the investigation of early rift architecture, structural evolution and traps, stratigraphic onlaps and traps, hyperextended basins and their fills, stratigraphic evolution at continental-oceanic transition and thermal history/migration modelling.
3. Reservoir modelling and software development: involving reservoir modelling and imaging, including stratigraphic modelling, well/seismic conditioning and reservoir monitoring.
4. Unconventional hydrocarbons.
5. Global Subsurface Training Centre in Clare.

## Project TP4.1: Sediment tracking

Development of sediment tracking techniques for the oil and gas exploration industry and associated predictive tools for reservoir sandstone distribution and quality, issues which help define the exploration potential of sedimentary basins, including offshore Ireland.

## Feldspar provenance and implications for reservoir quality

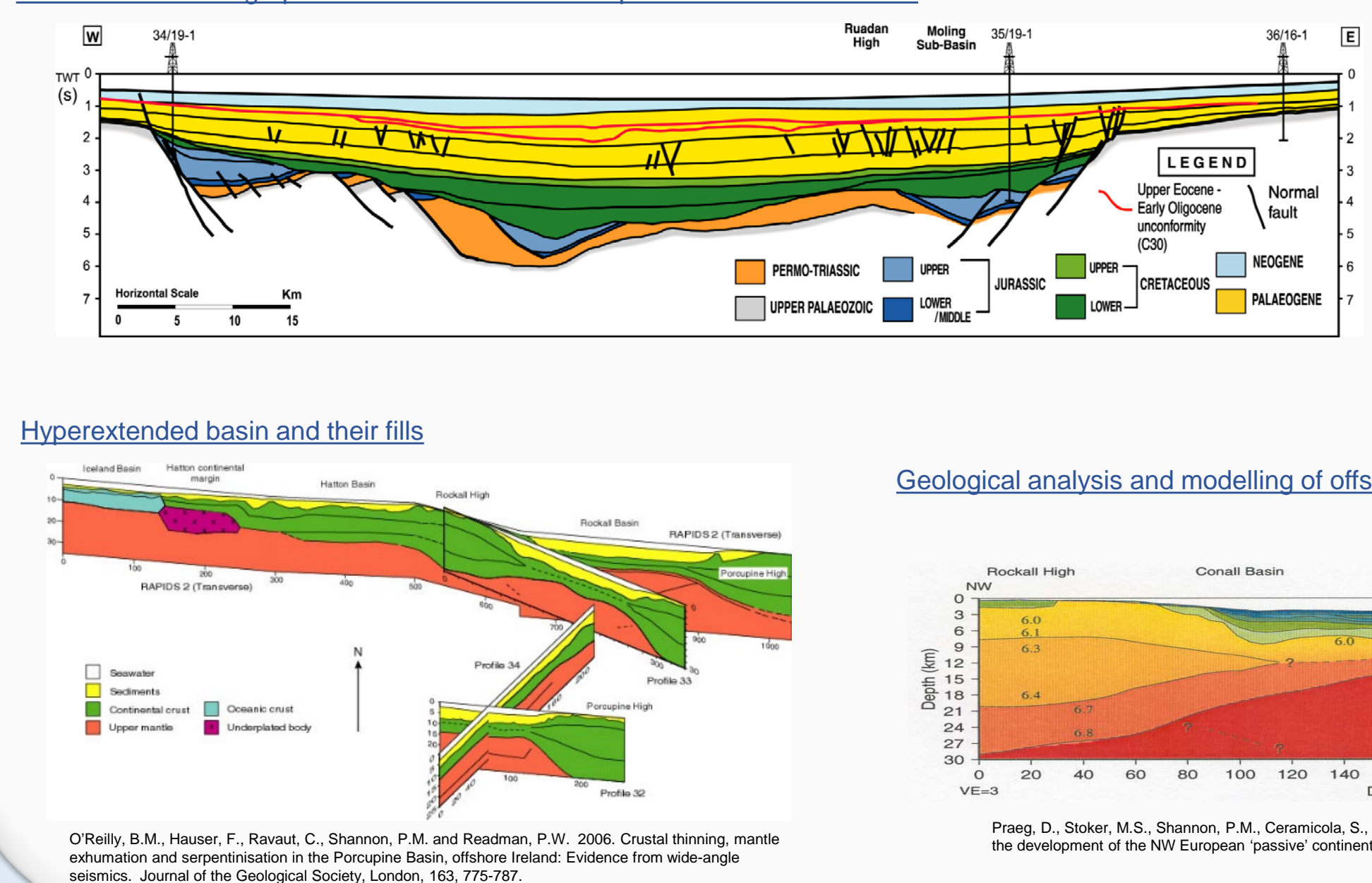


Tyrrell, S., Haughton, P. & Daly, J.S. 2007. Drainage reorganization during breakup of Pangaea revealed by in-situ isotopic analysis of detrital K-feldspar. *Geology*, 35, 971-974.

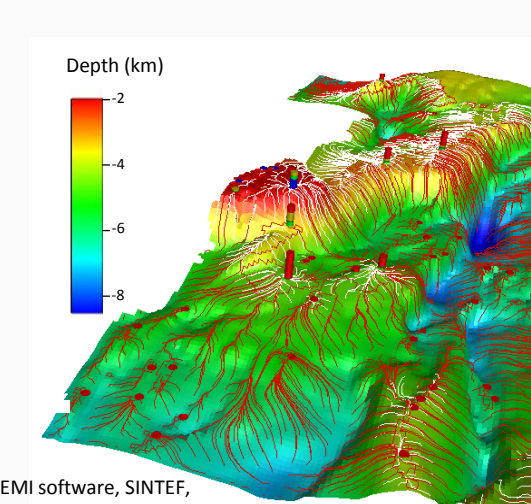
## Project TP4.2: Basin evolution and petroleum systems

Improved understanding of the evolution of reservoir and trap architecture in sedimentary basins from early rift to hyperextended passive margins, providing better predictive capability for prospectivity, thereby de-risking and helping to attract foreign exploration investment to Ireland.

## Structural and stratigraphic evolution and related traps of Irish offshore basins

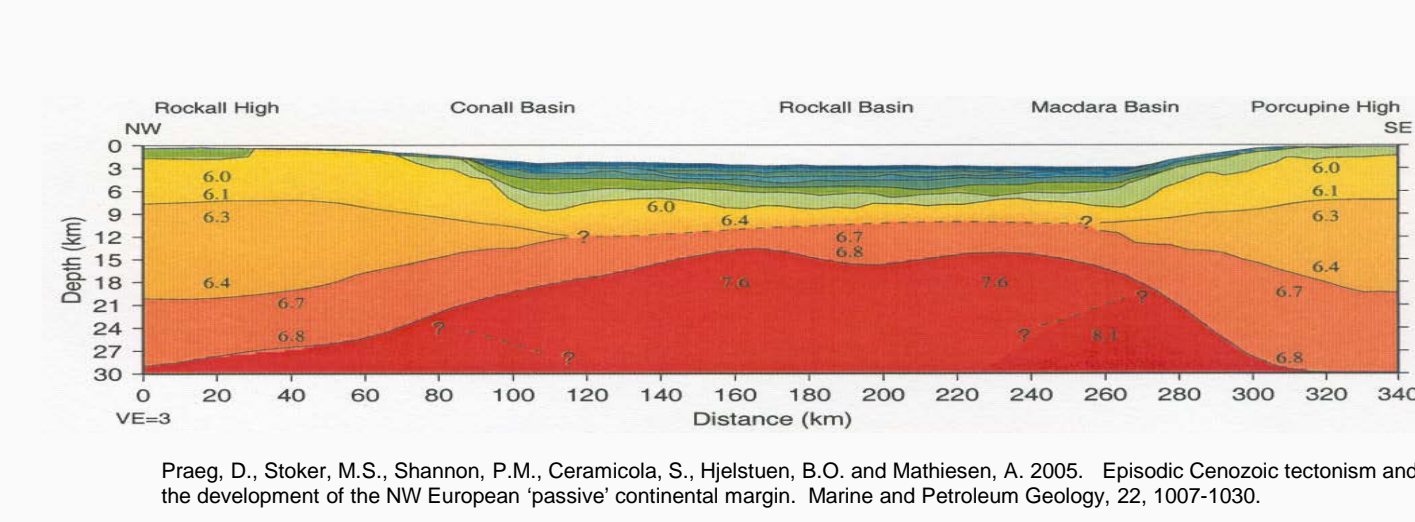


## Thermal history/migration modelling



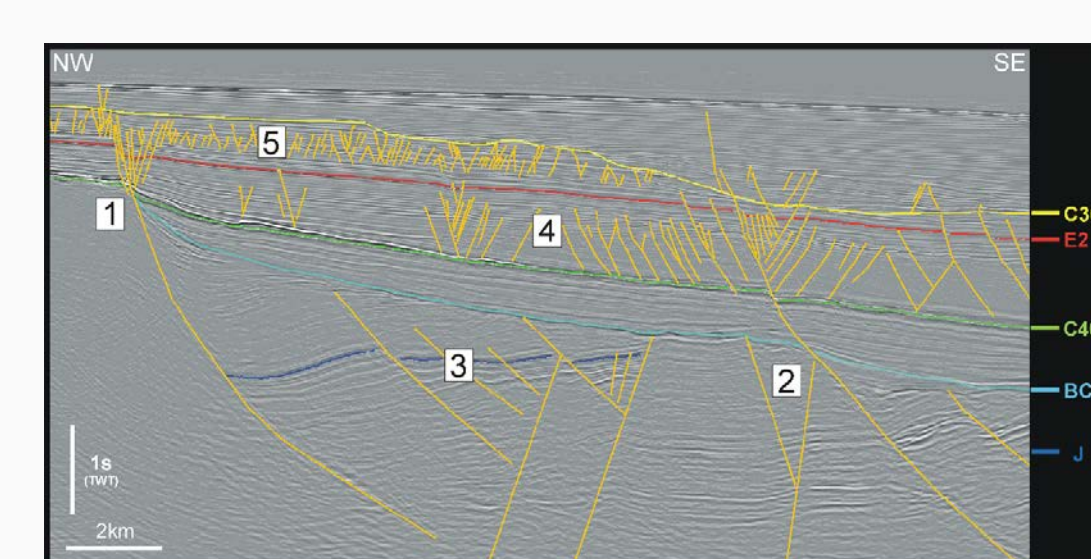
Childs, C., Syta, O., Molyneux, S., Morewood, N., Manzcocchi, T., Walsh, J.J., Hammann, D. 2009. Calibrating fault seal using a hydrocarbon migration model of the Oostergat area, Viking Graben. *Marine and Petroleum Geology*, 26, 764-774.

## Geological analysis and modelling of offshore NW Europe



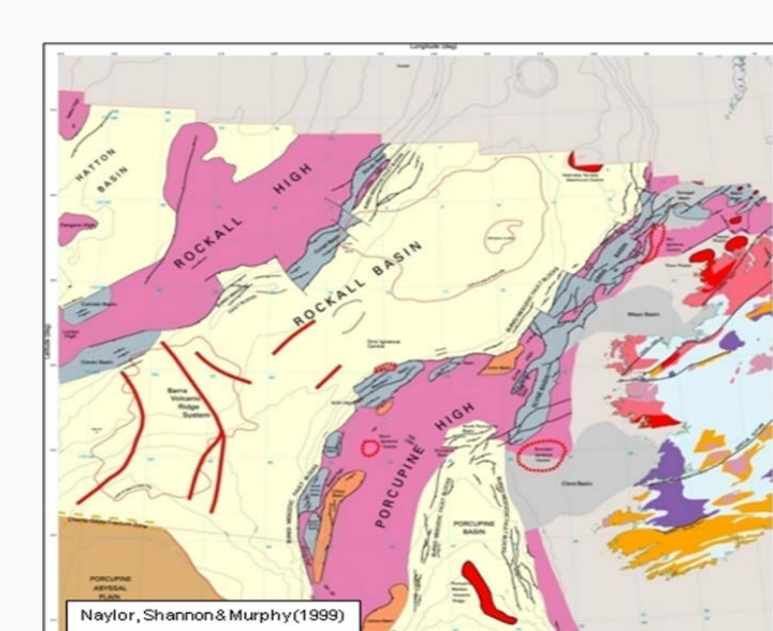
Praeg, D., Stoker, M.S., Shannon, P.M., Ceramito, S., Heiburn, B.O. and Mathiesen, A. 2006. Episodic Cenozoic tectonism and the development of the NW European 'passive' continental margin. *Marine and Petroleum Geology*, 22, 1007-1030.

## Fault characterization and structural evolution



Bailey, W., Shannon, P.M., Walsh, J.J. & Ummenhofer, V. 2003. The spatial distributions of faults and deep sea carbonate mounds in the Porcupine Basin, offshore Ireland. *Marine and Petroleum Geology*, 20, 509-522.

## Petroleum geology of the continental margin of NW Europe

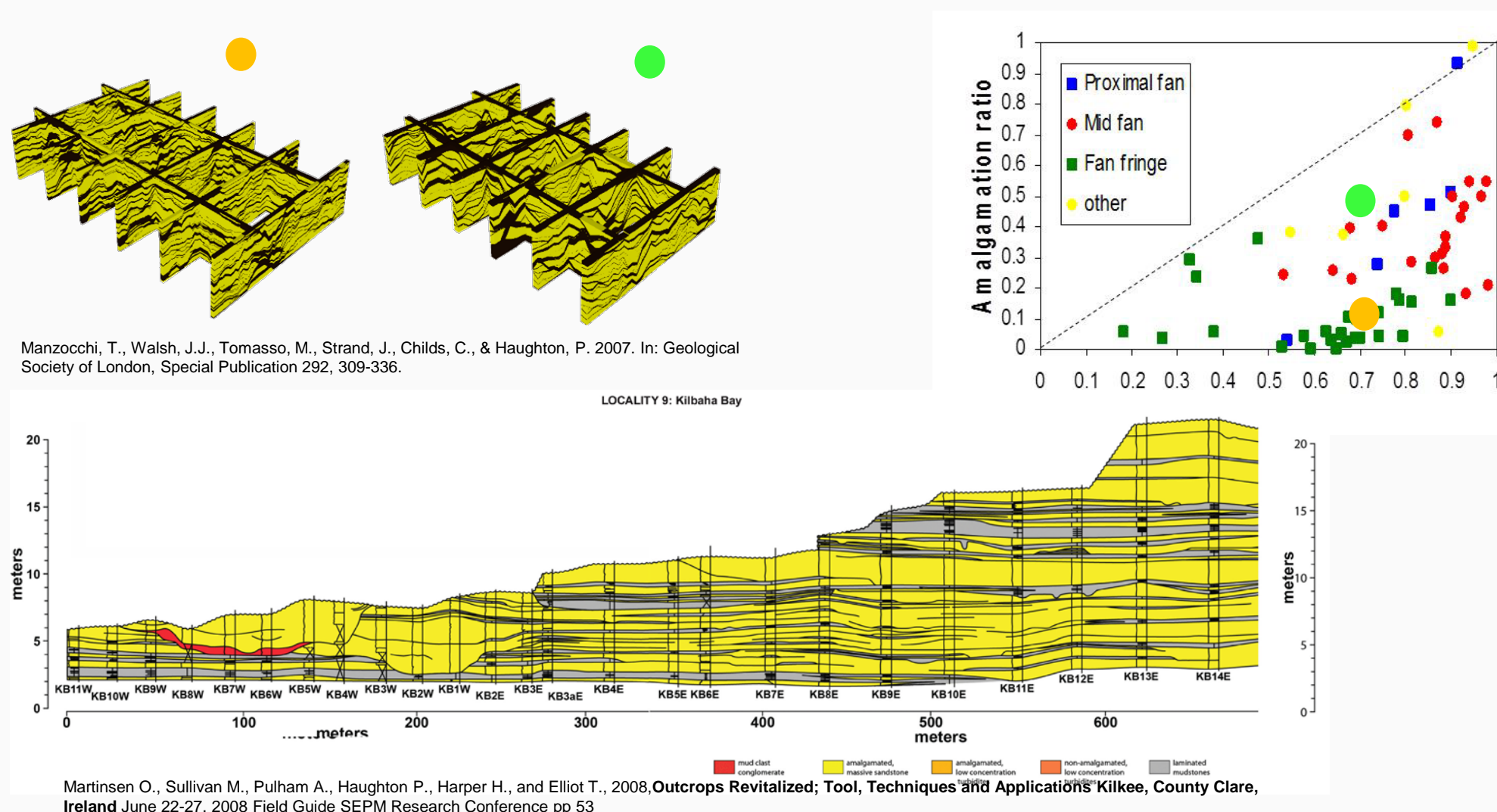


Shannon, P.M., Falade, J.-J., Smallwood, J.R. and Walker, I. (2005) The Atlantic margin from Norway to Ireland: geological review of a frontier continental margin province. In: Cook, A.G. and Vining, B. (eds). *Petroleum Geology: North-West Europe and Global Perspectives*. London: The Geological Society, London.

## Project TP4.3: Reservoir modelling

Production of new workable models of sedimentological and structural reservoir heterogeneity that will assist in maximising oil and gas recovery in complex reservoirs and the associated development of new reservoir modelling software techniques for the hydrocarbon industry.

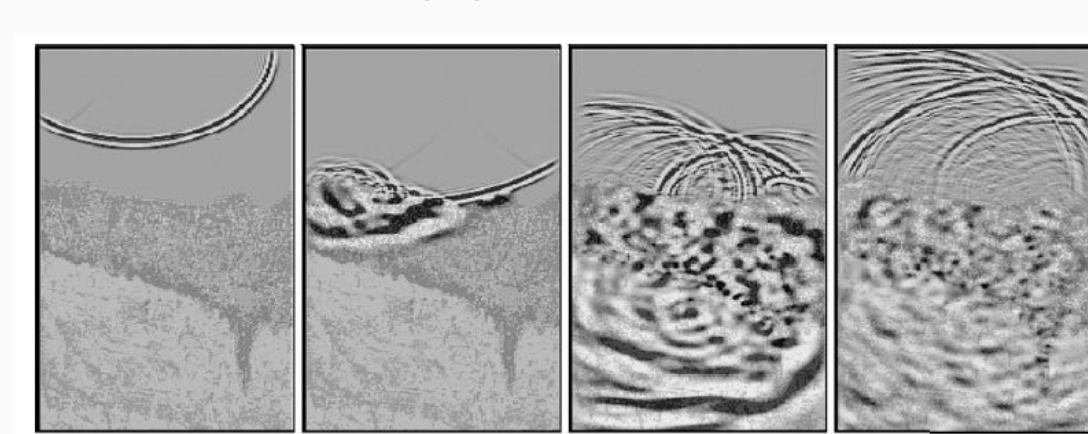
## Sedimentological modelling – development of software techniques



Manzcocchi, T., Walsh, J.J., Tomasso, M., Strand, J., Childs, C., & Haughton, P. 2007. In: *Geological Society of London, Special Publication 292*, 309-336.

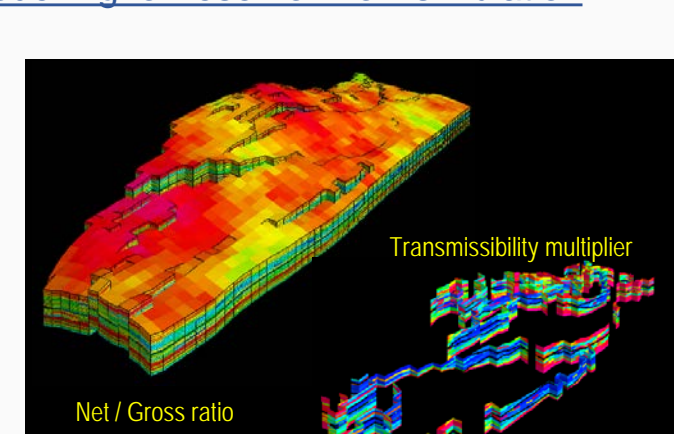
Manzcocchi, T., Walsh, J.J., Tomasso, M., Strand, J., Childs, C., & Haughton, P. 2007. In: *Geological Society of London, Special Publication 292*, 309-336.

## Optimisation of seismic imaging.



Bean, C.J. & F. Martin (2010). Sub-basalt seismic imaging using optical-to-acoustic model building and wave-equation deconvolution processing. *Marine & Petroleum Geology*, 27, 555-562. doi:10.1016/j.margeo.2009.09.007. downloaded pdf

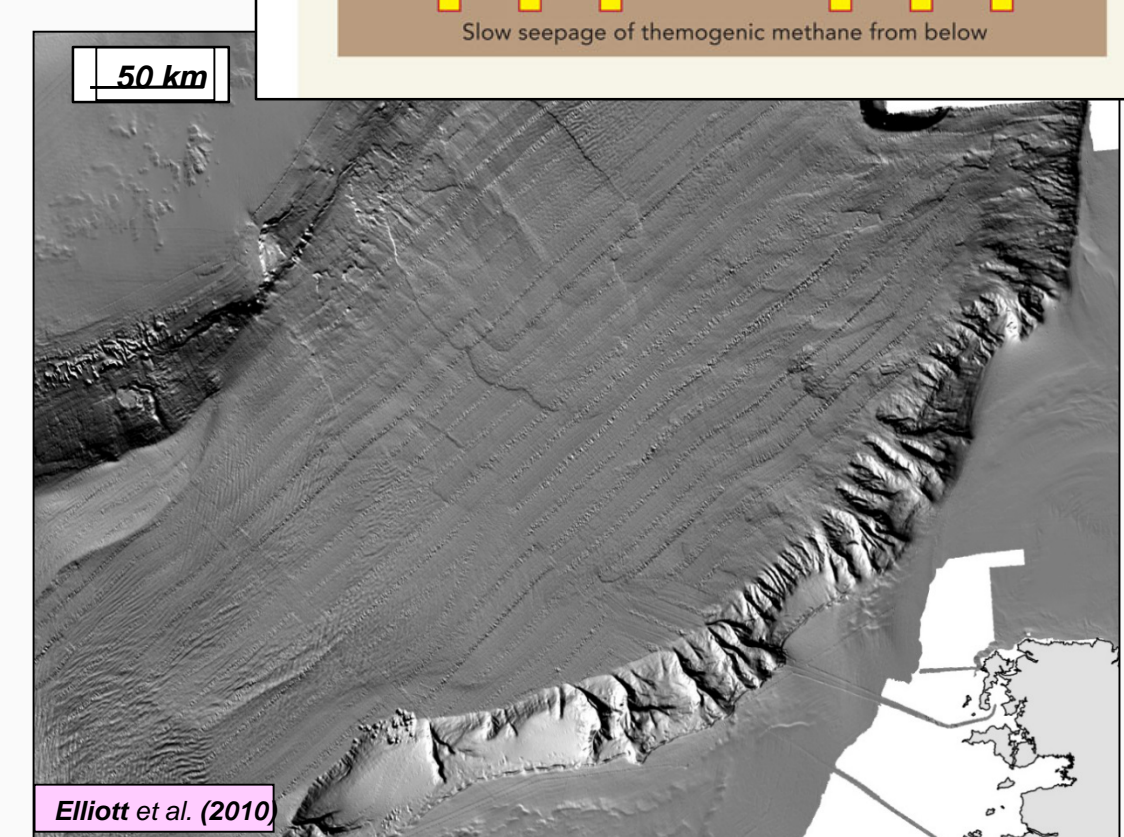
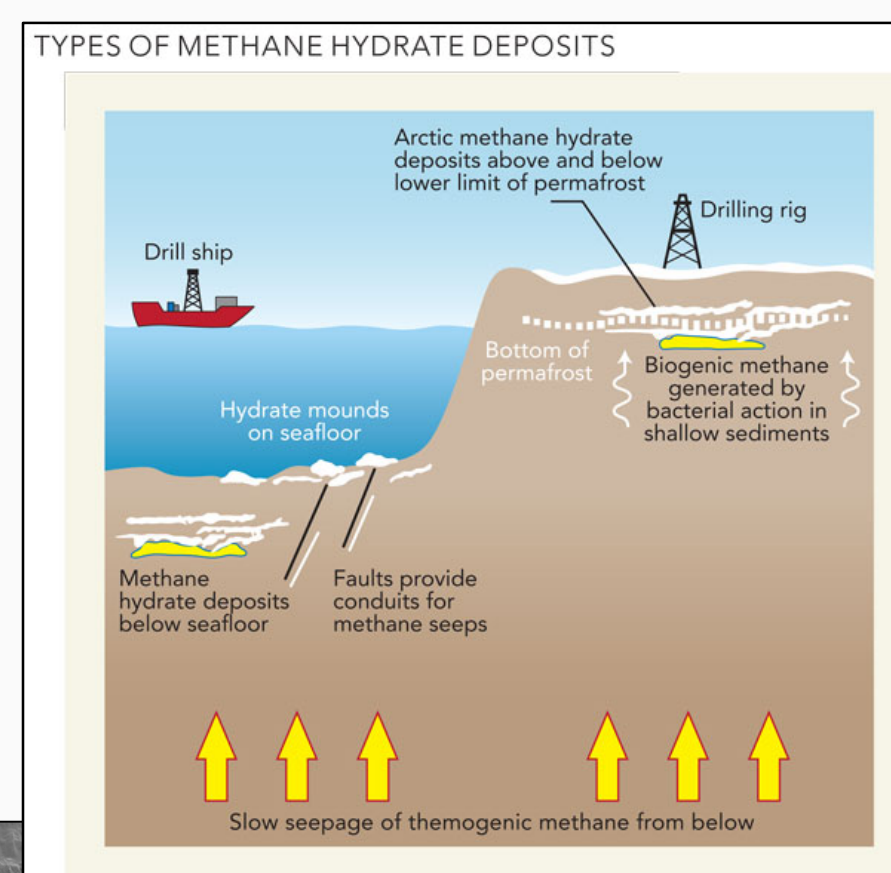
## Modelling for reservoir flow simulation



Manzcocchi, T., Heath, A. E., Palanichandran, B., Childs, C. & Walsh, J.J. 2008. Faults in conventional flow simulation models: a consideration of representational assumptions and geological uncertainties. *Petroleum Geoscience*, 14, 91-110.

## Project TP4.4: Unconventional hydrocarbons

Assessment of unconventional hydrocarbon potential in the Irish offshore, specifically natural gas hydrates, including the identification of potential exploration and production techniques and their associated geoscientific risks.



Elliott et al. (2010)

## Project TP4.5: Subsurface training centre

Development of a global subsurface training and information centre combining behind-outcrop cores and associated outcrop and borehole data from the Clare Basin, western Ireland. This work continues our collaboration with Statoil on our Clare coring project.

