

Geomorphology of the Irish Rockall Trough mapped from INSS improved multibeam bathymetric and backscatter dataset.

Fabio Sacchetti¹, Sara Benetti¹, Paul Dunlop¹, Rory Quinn¹
Aggeliki Georgiopoulou², Pat Shannon²
Brian O'Reilly³

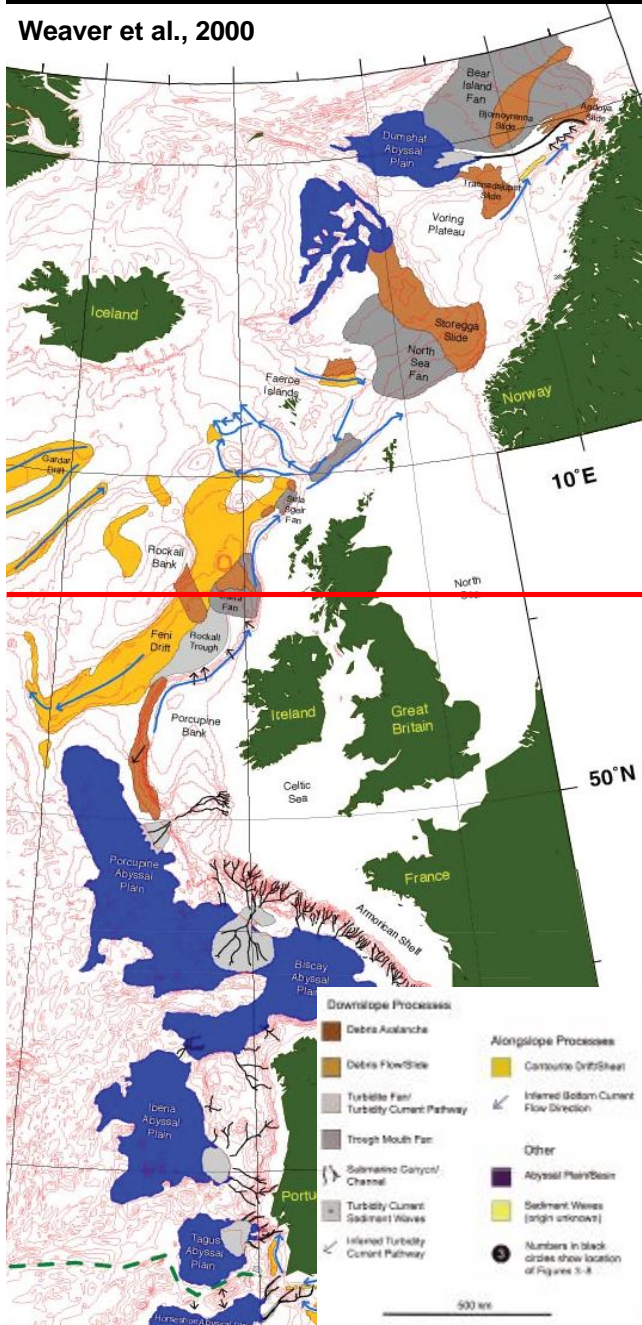
¹ School of Environmental Sciences. University of Ulster.

² UCD. School of Geological Sciences. University College Dublin.

³ DIAS. Dublin Institute for Advanced Studies

STUDY AREA – Glaciated/Glacially-influenced margin

Weaver et al., 2000

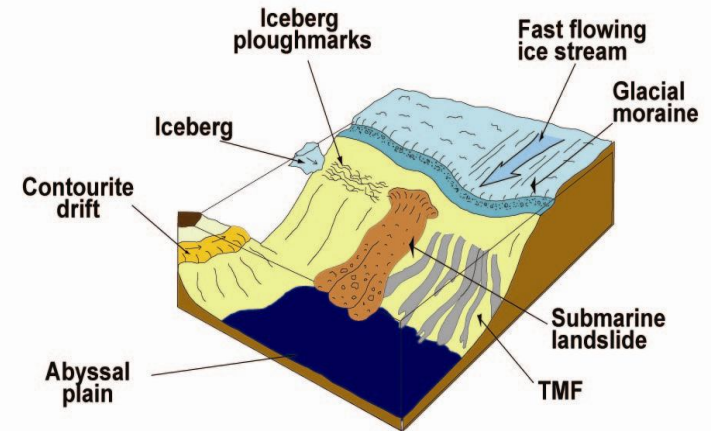


Dominated by sedimentary processes which occurred during glacial times when ice extended across the continental shelf.

56°N

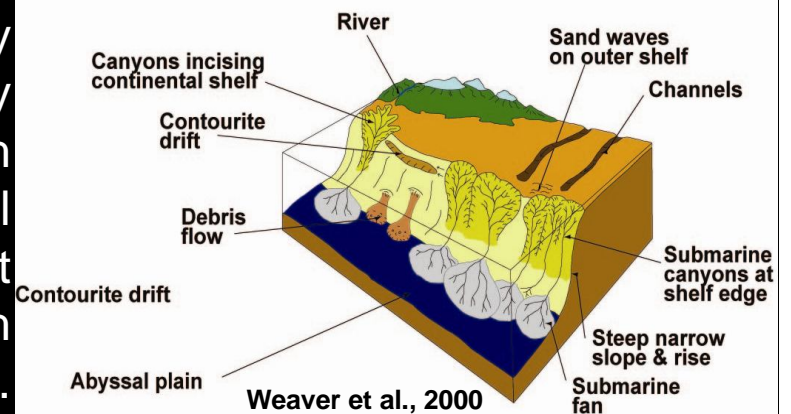
Heavily influenced by sedimentary processes which occurred during glacial times when sediment supply was much greater.

GLACIATED MARGIN - North of 56°N



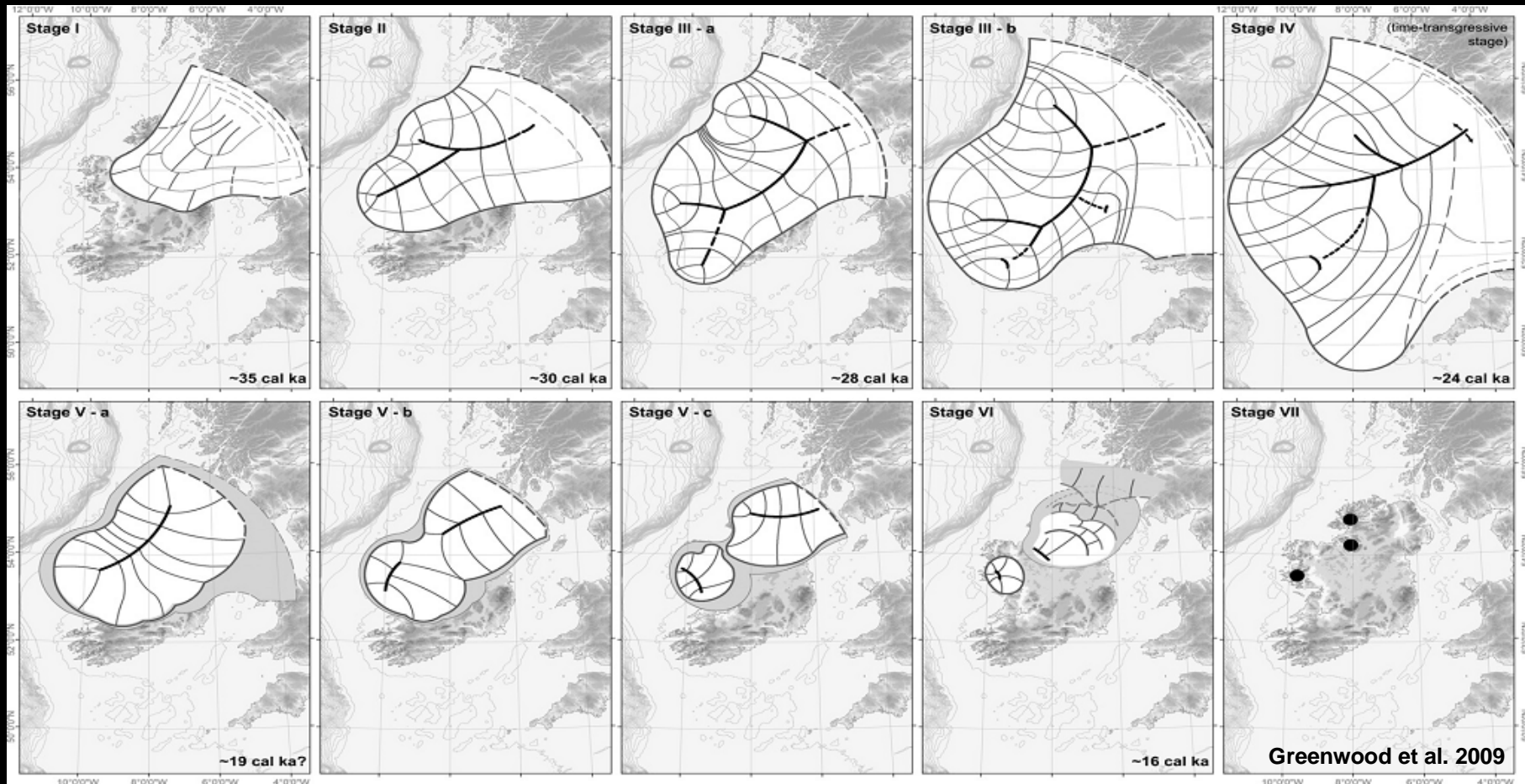
Weaver et al., 2000

GLACIALLY-INFLUENCED MARGIN - 26° to 56°N



Weaver et al., 2000

Background – Reconstruction of the last Irish Sheet

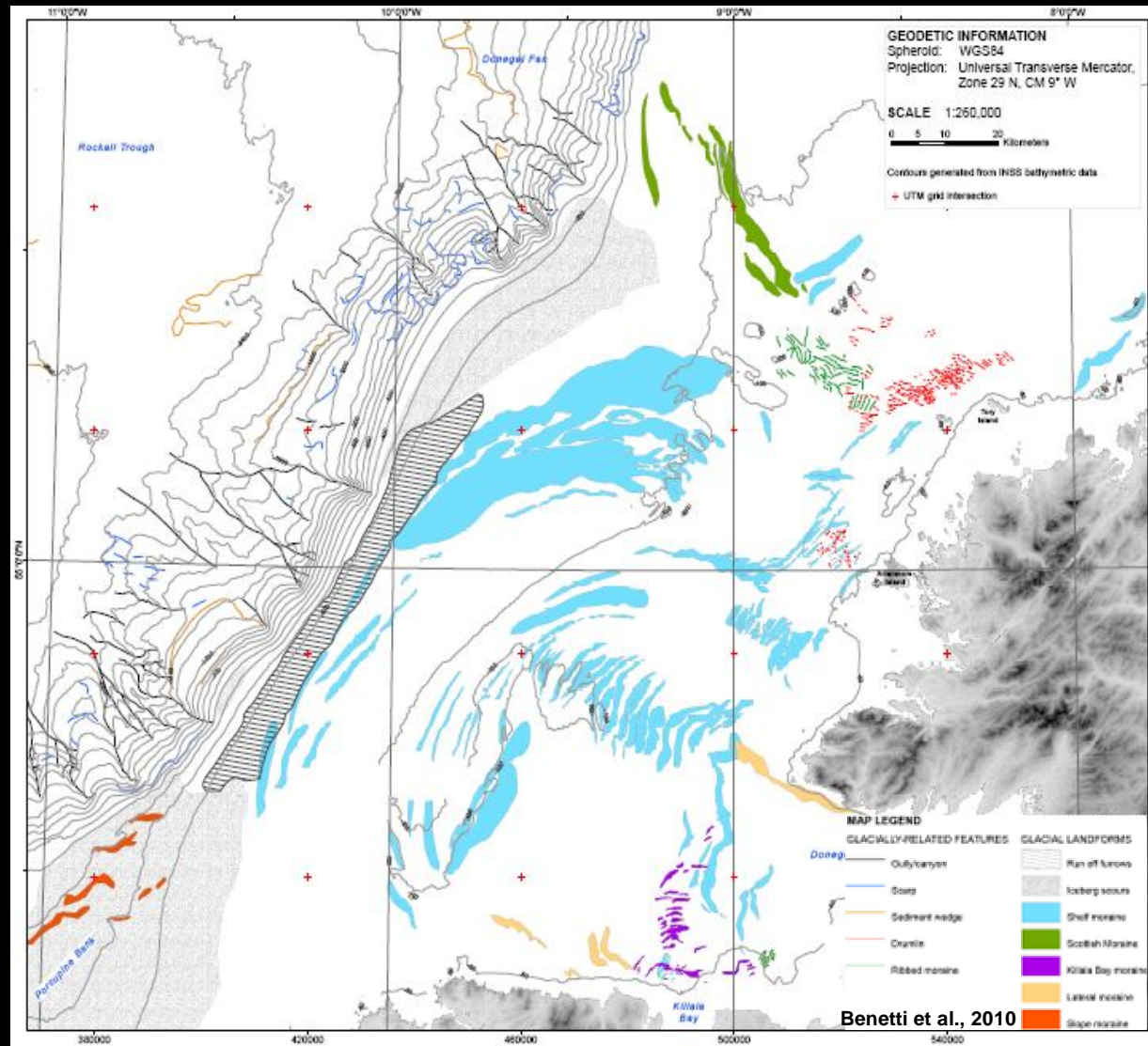


Build-up of the last Irish Ice Sheet started with an early ice advance from Scotland

LGM (c 29–27 cal ka BP) Irish and British Ice Sheet were confluent and grounded at the shelf break and delivered glaciogenic debris to Donegal and Barra fans.

Deglaciation began ~23 cal ka BP with final collapse of all marine sectors occurred by 17 ka BP: Irish sector of the BIIS became autonomous during deglaciation, retreating to remnant ice domes in the north and west of Ireland

Continental shelf-glacial morphology



Found first evidence that the BISS was grounded as far out as the shelf break

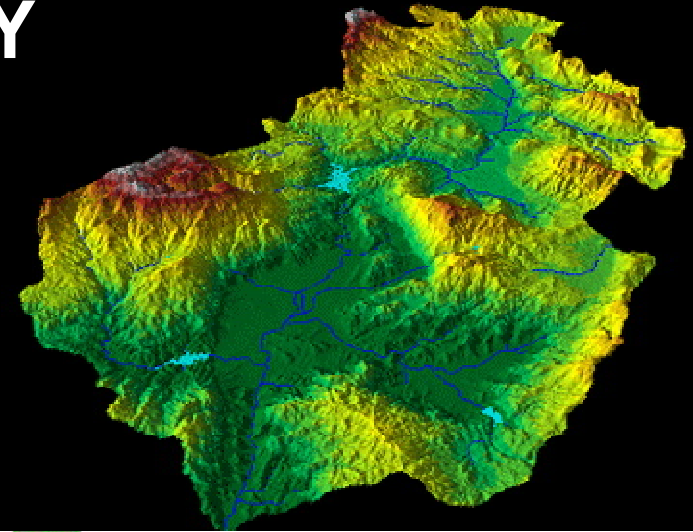
Ice flow came predominantly from Counties Donegal and Sligo in a W or NW direction

Moraines on shelf record slow retreat with several still stand towards Donegal

Malin Sea moraines indicate an incursion of Scottish ice in the northern portion of the study area

Iceberg scours at the shelf edge suggest rapid break-up of the ice margin

METHODOLOGY



Multibeam bathymetry

Raw data processing
Removal of all artefacts
(calibration errors/sound velocity refraction/noise..)

High resolution (30m) 3D bathymetric model

Morphometric analysis using Arcgis Spatial Analysis

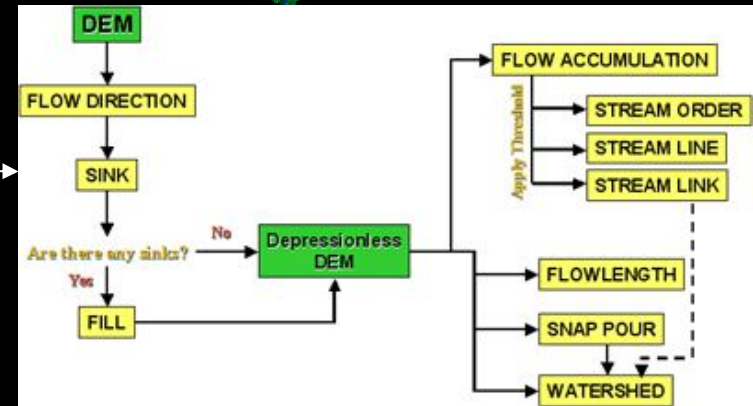
Slope, Aspect, Contours, slope contours, rugosity, curvature

Automatic Classification –
Bentic terrain modeller (BTM)

Hydrological analysis using Arc Hydro

Manual mapping

Fledermaus 3D models – QC checks



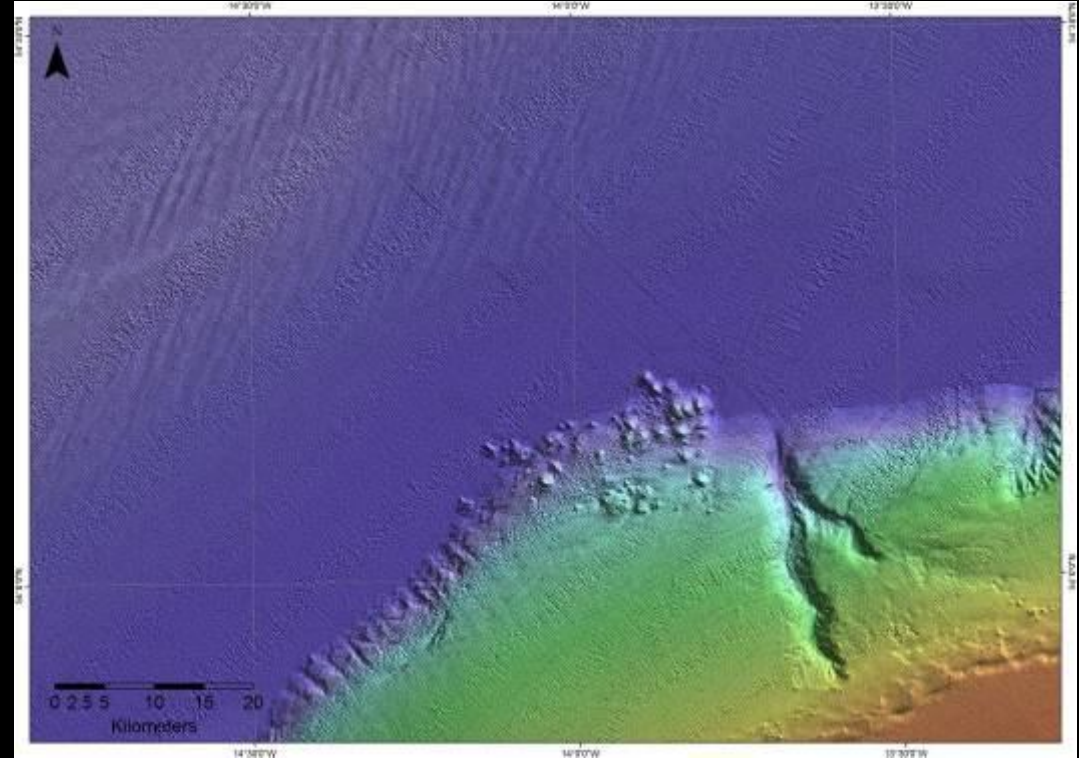
Final mapping: Canyons and gullies axes and drainage systems, scarps, creeps, terraces, iceberg scours, seabed lineation, coral mounds, depositional lobes, sand wave fields

METHODOLOGY

Multibeam
backscatter

Raw data reprocessing -
GEOCODER

High resolution (40m)
backscatter mosaic

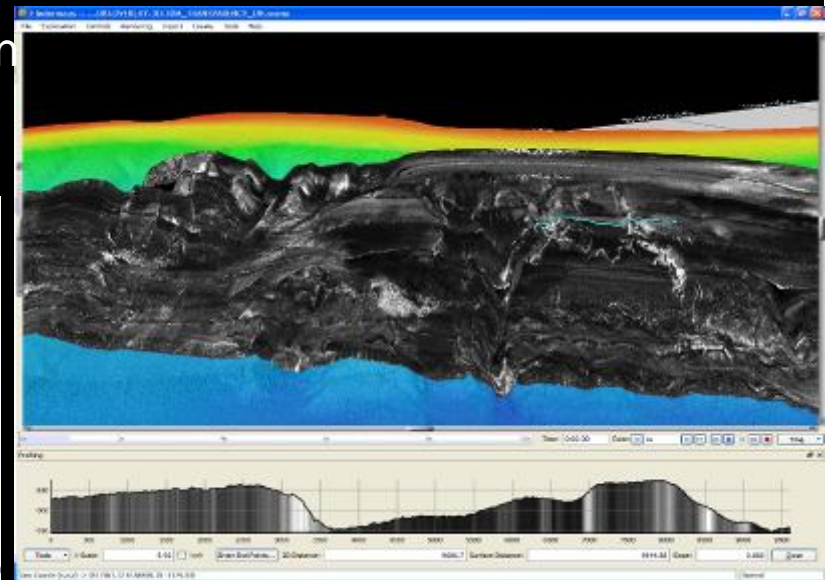
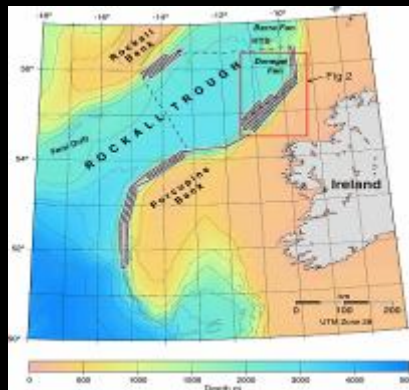


TOBI side
scan sonar

TOBI
- developed at NOC-Southampton
- towed 400 m above the seabed
- can achieve a resolution of 5 m

Draping on high
resolution 3D model

Used as QC tool



Outcomes

- A variety of new geomorphological structures such as slides, creeps, scarps, mass wasting deposits and iceberg scours have now been mapped in great detail.
- Defined several slope styles representing an increasing degree of slope evolution and possible links with glacial processes on the continental shelf.
- Extensive fields of iceberg scours have been identified for the first time on the Rockall Bank.
- Showed the real potential of Zone 3 INSS multibeam dataset.

Publications and data

- **Dunlop, P., Sacchetti F., Benetti S. and Ó Cofaigh C.**- *Mapping Ireland's glaciated continental margin using marine geophysical data*. Book chapter in **Smith, M., Paron, P. and Griffiths, J.** (eds) - *Geomorphological Mapping: a professional handbook of techniques and applications (Elsevier B.V.)* **Accepted.**
- **Sacchetti F., Benetti S., Georgiopoulou A., Dunlop P., Quinn R.** - *Geomorphology of the Irish Rockall Trough, North Atlantic Ocean, mapped from multibeam bathymetric and backscatter data*. *Journal of Maps.* **Under review.**