IQUA

Cumann Ré Cheathartha na h-Éireann

Irish Quaternary Association
http://www.tcd.ie/Geography/IQUA/Index.htm

February 2011
NS 46
ISSN 0790-4096

Editor: Sarah Murnaghan

1. Introduction

Dear IQUA member,
Welcome to newsletter No. 46.

Thanks to all who attended the successful Autumn Symposium held at the GSI last November. An excellent programme of speakers (see extended abstracts below – item 5) proved not to disappoint, and provided an inspiring set of talks on ongoing research and new insights into Quaternary landforms and sediments in areas of offshore Ireland. Thanks to all the speakers and organisers of the event and the GSI for facilitating the meeting once again. Special thanks to INFOMAR for sponsoring the drinks reception at the end of the symposium, which was enjoyed by all.

Last year, we also ran a successful fieldtrip to the Beara penninsula, Co. Cork, (see item 4 for details). Thanks to all who attended and shared their inspiring knowledge of the Quaternary features of Beara. We now have another IQUA fieldguide (no. 28), thanks to Steve McCarron and Bettina Stefanini, which summarises the detail of the trip very well.

This year we look forward to the upcoming Spring meeting and AGM (Saturday 16th April) – see item 3 for details - which is being held in conjunction with the Irish Environmental History Network at the Long Room Hub, Trinity College Dublin. Our thanks go to Francis Ludlow and the Irish Environmental History Network for agreeing to host the event. We also hope to organise another fieldtrip this year, and we welcome all ideas and suggestions for the location/theme (for more information, see item 4).

Finally, thanks to all who contributed to this edition of the newsletter.
Kind regards,
Sarah Murnaghan, Dept. of Geography, TCD, Feb 2011

2. IQUA Committee (2010/2011)

The IQUA Committee, following the 2010 AGM is as follows:
President: Prof. Pete Coxon, TCD (continuing)
Secretary: Dr. Stephen McCarron, NUIM (continuing)
Treasurer: Mr Francis Ludlow TCD (continuing)
Postgrad rep: Gayle Mc Glynn, TCD (continuing)
Website manager: Dr Robin Edwards, TCD. (Continuing)
Publications Secretary: Dr. Stephen McCarron, NUIM (continuing)
Ordinary members: Dr Bettina Steffanini (continuing), Sarah Murnaghan (continuing), Dr Graeme Swindles (U. of Bradford) (continuing).

3. IQUA Spring Meeting and AGM 2011

The Irish Environmental History Network (hosted by the Long Room Hub, Trinity College Dublin) will hold the Spring meeting and AGM on Saturday 16th April. If you are interested in giving an oral or poster presentation please submit an abstract (no more than 300 words) to Sarah Murnaghan (email: murnaghs@tcd.ie) by Friday 1st April 2011. Registration/coffee will commence at 9.30 am.

The Annual AGM will follow the Spring Meeting. The Secretary (email: stephen.mccarron@nuim.ie) welcomes suggestions for Agenda Items up to Friday 1st April 2011. The Agenda will be circulated before the meeting, with proposed changes to the Committee on it.

The IQUA committee strongly encourages all members to attend the Spring Meeting and AGM, to show support and appreciation of the organiser's efforts and help plan out IQUA activity for the year ahead. Postgraduate members are particularly encouraged to use the opportunity to present their work to date or thesis findings and discuss it in a

friendly environment whilst building valuable network contacts. More details on the venue location and submitting an abstract are available on the IQUA Meetings webpage. (http://www.tcd.ie/Geography/IQUA/Index.htm).

4. IQUA 2010 Annual Fieldtrip

IQUA Fieldtrip to the Beara Peninsula, 10th-12th September 2010.
Prof Pete Coxon, Department of Geography, Trinity College Dublin.

IQUA's record of fascinating field meetings stepped up another notch when we assembled in Castletownbere in Co. Cork on Friday 10th September 2010. The detail of the trip is nicely summarised in an IQUA fieldguide prepared for the trip by Steve McCarron and Bettina Stefanini (2010).

After a quick look at the (now famous) McCarthy's Bar (McCarthy 2001) we all retired to Toomey's Bar – the scheduled meeting place. From the moment we set foot in Toomey's it was certain that we would be entertained. Thanks are due to Billy O'Brien for a fantastic, engrossing and accessible lecture and introduction to the archaeology of the area - and thanks too for helping with the organisation of the rest of the itinerary - something we could not have done without his help. Billy gave us an insight into the prehistory of 3 of the areas on Beara: Ardgroom, Barrees and Cloontreem (O'Brien 2009) whilst concentrating on the area we would be visiting in the morning – Ardgroom. Nick Hogan (Hogan 2003) went to great trouble to be at Ardgroom (and to get us there - with useful maps, etc.) and guide us across a Bronze Age landscape - fascinating, not as wet as some places we've been, and very memorable - thanks for doing that under pressure of a pending football match. The handout was much appreciated too. "*This ancient 'farmscape' is also home to numerous Bronze Age monuments, including standing stones, cairns, fulachtaí fia, boulder-burials, and the well known Ardgroom stone circle".* Hogan 2010 (in McCarron and Stefanini (2010)).
We all enjoyed the hike across this ancient landscape and full credit to the McCarron and Taylor children who made this boggy trek without a murmur of complaint.

Left: Prehistoric field wall (Ardgroom). Right: Standing stone and quartz boulder (Ardgroom)

Penny Durell showed us around a place she knows so well and did so brilliantly (Durell 1996). Penny took us to several sites including an overlook of Ilaunbeg – a small island off Dursey, once connected by a drawbridge.
"*In June 1602 the fort was attacked and taken by Carew's forces, who razed it to the ground, executed the defenders and slaughtered the island population."*
Thanks for the introduction to Dursey - a memorable place and one I think all of us would love to get back to -there was a palpable sense of envy as the backpackers crossed over as we had to return. There is something special about such places in the company of someone who is so knowledgeable.

Section in defensive wall (Ilaunbeg, Dursey).

McCarthy's Bar worked its magic on Saturday evening (Sunday morning) - but despite that...
The copper mines of the 19th Century and then the Bronze Age (incredible... that we set foot where thousands of years before our ancestors ground quartz to obtain metal. I can just see the youngsters being sent off to the beach for more stone hammers ... 'don't pick the small ones, watch out for bears lads - and stay out of the sea'). Thanks to Theo Dahlke for his mine of information, knowledge and enthusiasm.

Nineteenth Century Mine pumping engine in Cornish style (Allihies).

On Sunday afternoon the remnants of the party drove to the Curraheen River, c.5 km WSW of Tralee, to see the two types of sediment fan in front of Slieve Mish. The first stop was at the old water tanks (Q784111) above St Brendan's Church, to view the morphology and composition of the upper fan, the "Curraheen Boulder Lobe". The down-slope front of this is steep and looks like an end-moraine from below. However, the upper surface rises irregularly to the apex at the mountain front, and is covered with blocks of sandstone and conglomerate <6 m across. Exposures near the water tanks reveal a matrix-supported diamict of large blocks in pebbly sand. The boulder lobe may be a large debris flow.

The second stop was at the former seaweed plant on the W margin of the Curraheen Lobe (Q775110), where sandstone bedrock is overlain by a coarse boulder gravel >6 m thick, belonging to the much more extensive, lower sediment fan, the "Curraheen Alluvial Fan". Geomorphology and poor exposures indicate that this pinches out up slope at this locality, and is covered by the boulder lobe

View east: c.1.25 m of boulder gravel of the Curraheen Alluvial Fan, directly overlying cleaved Devonian red siltstone. Cleavage bent northwards immediately below gravel on right. Boulders show imbrication dip towards S, i.e. up-fan.

The alluvial fan extends to the shoreline of Tralee Bay, where it forms a protruding arc 3 km across. Stop 3 (Q781121) shows the alluvial fan in a more central location, where it is 4 m thick, and may be cryoturbated; but this locality was not visited. These deposits post-date regional glaciation derived from the N, and pre-date a series of inner-valley moraines and blockfields, but no absolute age is available.

With many thanks to Steve, Bettina and the other leaders for a marvellous weekend.

IQUA members (old and new) survey a cairn (Ardgroom).

References:
Durell, P. (1996) *Discover Dursey. Allihies,* Ballinacarriga Books.
Hogan, N. (2003) Ardgroom: Recording an Archaeological Landscape on the Beara Peninsula, Co. Cork. Unpublished MA Thesis. NUIG.
McCarron, S.G. and Stefanini, B.S. (Eds.) (2010) *The Beara Peninsula*, IQUA Field Guide No. 28, Irish Quaternary Association, Dublin.
McCarthy, P. (2001) *McCarthy's Bar: a journey of discovery in Ireland.* London. Sceptre.
O'Brien, W. (2009) *Local Worlds: Early settlement landscapes and upland farming in south-west Ireland.* Collins Press.

5. IQUA 2011 Autumn Symposium

Ireland's Offshore Quaternary Deposits

Friday 26th November 2010

Abstracts:

Keynote Address:

Reconstructing ice sheet history on glaciated continental margins: an offshore perspective

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The growth and decay of large Pleistocene ice sheets is preserved in the marine-geophysical and –geological record of many high- and mid-latitude continental margins. On high-latitude shelves, glacially-eroded, bathymetric troughs extend from fjords and mountainous hinterlands to the continental shelf edge. During full glacials, ice sheet outlets drained through these troughs and delivered meltwater, sediment and icebergs to the adjoining deep ocean basins. Former grounded ice flow through these troughs is recorded by a variety of streamlined subglacial bedforms. Mega-scale glacial lineations up to several kilometres in length and formed in soft deformable subglacial sediment record former streaming flow along the troughs. The adjacent inter-trough shallow banks are commonly iceberg scoured but in some locations they preserve recessional moraines or grounding-zone wedges indicative of episodic recession of non-streaming ice. During full-glacials the record of sediment delivery to the continental slope is highly variable along a continental margin. In front of the major cross-shelf bathymetric troughs large submarine sediment fans are present. These 'trough-mouth fans' are composed of glacier-derived debris delivered to the ice stream terminus and then remobilised downslope by debris flow processes. Fans may show considerable variation in terms of their morphology and sedimentology, reflecting a number of controls including slope gradient and meltwater supply. In other areas of the margin, fans are replaced by well-developed submarine channel systems and large-scale sediment slides. The pattern of glacial landforms on many high-latitude continental shelves also provides information on the style of ice sheet retreat during deglaciation. Where these data are combined with dated sedimentary records, absolute retreat rates may be calculated. Recent studies have shown that retreat rates of ice streams varied markedly between troughs, even where water depths along these troughs increased inshore. This talk will provide an overview of the glacigenic landform-sediment assemblages on glaciated continental margins and discuss their implications for former ice sheet history. It will include a series of examples drawn from both high- and mid-latitude continental margins.

Latest surprises from the offshore record of the British-Irish Ice Sheet: ice-calving at 2.6 Ma and other oddities

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The marine geology group in UCC has been engaged in research in shallow and deep water setting for a range of applications. In the process of these studies, various data have been acquired that proved pertinent to the history of the British-Irish Ice Sheet (BIIS). A quick tour of some of the more intriguing insights is presented.

A previously presented at IQUA, seafloor evidence for palaeo-glaciated terrain, unique in its kind on the European Shelf, from offshore Anglesey is presented again. This provides the sole evidence for a grounded part of the Irish Sea Ice Stream with well-preserved ribbed moraines, drumlins, flutes, eskers, De Geer moraines and iceberg scour marks. The features show evidence for a thawing front migrated up-glacier and drumlinised the subglacial bed, partly eroding the edge of the surveyed ribbed moraine field. Analyses of the ice-marginal bedforms provide evidence for glaciomarine conditions in this part of the Irish Sea during the final phase of deglaciation. The ice stream retreated stepwise, leaving behind De Geer moraines, actively calving into a proglacial water body, creating iceberg scour marks.

Continued work in the Irish Sea has reveal as buried till overlying a bedrock platform in the NW Irish Sea (the mudbelt), sparker seismic and vibrocore data is currently being analysed. A separate study is focussed on the seismic stratigraphy, sedimentology and hydrodynamics of the Codling Deep.

During IODP Exp. 307, a unique record of early Pleistocene (2.6 – 1.7 Ma) ice-rafting is presented

from the Irish NE Atlantic continental margin (east Porcupine Seabight). The late Pliocene – early Pleistocene onset and intensification of Northern Hemisphere glaciation marks an important threshold in Earth's climate system. Evidence of early continental ice sheet expansion is preserved in the North Atlantic Ocean, where ice-rafted detritus (IRD) records attest to widespread discharges of debris-bearing icebergs into the ocean. So far, these surges have been related to the presence of high-latitudinal ice sheets (on Canada, Scandinavia and Iceland), without much evidence supporting significant ice build-up in more temperate mid-latitudinal regions.

A rigorous detection and ground-truthing procedure (siliciclastic particle-size end-member modelling, quartz grain-surface micro-textures) allowed the identification of multiple IRD intervals; the oldest deposited around 2.6 Ma. Multiproxy provenance analyses, including Nd-Sr isotopic fingerprinting, clearly indicate a dominant sediment input from the adjacent British-Irish Isles, even for the early Pleistocene IRD deposits. Consequently, this study evidences, for the first time, the presence of a considerable, early Pleistocene ice sheet on the British-Irish Isles, which repeatedly expanded into the marine domain. Even in the early stages of Northern Hemisphere glacial expansion, significant ice accumulation in mid-latitudinal regions, such as the islands of Britain and Ireland, should therefore be accounted for.

GLAMARous RIDGES: exploring glacial landscapes in the Celtic Sea

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The glacial history of the Irish-UK Celtic Sea is being explored within the INFOMAR project RIDGES, building on the 2009 GLAMAR campaign of the Italian research vessel OGS Explora. These initiatives address open questions regarding the southerly extent of the last British-Irish Ice Sheet (BIIS) and the dynamics of the Irish-Celtic Sea ice stream. An ice stream grounding line has been postulated on the mid-shelf of the Irish-UK sectors, based on the minimum seaward extent of subglacial tills proven by BGS vibrocores, but no morphological evidence of an ice limit is recognized at seabed. Instead, the Celtic Sea is dominated by a fan-like system of shelf-crossing ridges, up to 60 m high and 7 km wide and 300 km long, which lie transverse to the shelf edge of the Irish, UK and French sectors. The ridges have been interpreted as palaeo-tidal sand banks formed by reworking of glacial outwash during the post-glacial marine transgression; however, this model does not readily account for one BGS vibrocore that proved glacial till on the flank of a ridge. An alternative interpretation of the ridges is that they are glaciofluvial features, formed by meltwater drainage beneath an ice sheet margin that extended beyond the known limits of glaciation. This model was tested by the GLAMAR campaign, which targeted a study area straddling the Irish-UK boundary, which crosses the postulated ice stream grounding line and includes the sites of five key BGS vibrocores. The first multibeam imagery of the ridges reveals remarkable bedforms of varying scale: en echelon ridge segments up to 60 m high and 50 km long are flanked by and give way axially to transverse 'ribs' up to 10 m high; superimposed on some of these are 'crenellations' mainly <1 m high. Interpretation of the ribs and crenellations as subglacial bedforms is supported by Chirp subbottom profiles that afford stratigraphic ties to the BGS vibrocores and show the ridges to be mantled by subglacial till and glaciomarine sediments. The inferred subglacial bedforms extend at least 65 km beyond the postulated ice stream grounding line, while the ridges themselves extend a further 100 km to the shelf edge. Our working model is of broad eskerine ridges and transverse de Geer moraines, formed by subglacial outwash along the receding margin of the Irish-Celtic Sea ice stream. These results have broad implications for the seaward extent and dynamics of the BIIS across the Celtic Sea and for the associated discharge of meltwater and sediment to the North Atlantic.

Note: RIDGES (Regionally IntegrateD GEological Mapping of the Celtic Sea) is an INFOMAR-funded collaboration of NUIM, OGS & BGS; GLAMAR (GLAcial Meltwater & Continental MARgins) was an OGS-led contribution to the International Polar Year.

Walking on Ice footprints around the Porcupine Bank

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Repeated periods of glaciation by the British-Irish Ice Sheet (BIIS) to grounded marine margins, with associated production of Ice Rafted Detritus (IRD), have occurred during at least the last 46ka (Scourse et al, 2010) . The last Irish ice sheet (Midlandian, last glacial maximum (LGM), ~27ka B.P. [Clark et al, 2010]) is now accepted to have extended both south and west of the present coastline (e.g. Ballantyne, 2008). However, there is still limited evidence and even less dating of Pleistocene glacial advances onto the Atlantic continental margin west of Ireland (cf. Clark et al, 2010) bar a series of continuous, shore parallel, generally S-N trending ridges were mapped and interpreted as 'end' moraines from BIIS ice emanating from Ireland by Sejrup et al, (2005).

The Porcupine Bank lies west of the Irish landmass, in water depths between 150 and 500m, covering an area > 50,000 km². It is separated from the continental shelf by a saddle with maximum depths of 300m. Eustatic sea level was up to 140 m lower during the late Midlandian glacial period, which would have brought the top of the Bank (150 m WD) near sea level. . It is an open question whether Late Midlandian ice extended across the saddle towards or onto the Bank, resulting in glacigenic landforms.

Under the Irish National Seabed Survey (INSS 2000-2002) this area was comprehensively mapped, generating multiple acoustic datasets including high resolution multibeam echosounder data and shallow seismic records. These datasets allow a large-scale integrated seabed physical characterization of the Porcupine Bank for multidisciplinary applications (Monteys & O'Toole 2010). Analysis of backscatter and bathymetry data and their integration with seabed samples has resulted in a baseline delineation of the surface sediment distribution.

Geomorphological mapping and seabed feature identification sheds light on the nature and pattern of possible glacigenic landforms from the shelf edge to the top of the Bank. Shallow stratigraphy provides indications of the structure and composition of some of these features allowing a more refined classification. Where available, groundtruthing information, in terms of sediment samples, video footage and shallow sediment cores, has been used to determine their composition.

A series of discontinuous, small scale, sharp-crested ridges have been identified between the shelf edge (200m WD), "saddle" (300m WD) and the top of the Bank (150 m WD). These sinuous asymmetrical features typically stand out about 20 m above the surrounding seabed. Some of these ridges run discontinuously crossing the "saddle" from east to west and can be delineated both north and south of the saddle. They generally appear in the sub-bottom records comprised of chaotic, soft sediments. The landward side shows undifferentiated Quaternary unconsolidated sediments, while on the seaward side the sediment's uppermost 20 m shows some internal stratification, onlapping the ridges. Shallow cores taken from the top of one of these ridges, at 225 m WD, confirms the presence of coarse angular gravel in a muddy matrix at the surface.

References:

Ballantyne, C.K, Stone, J.O and McCarroll, D. (2008) Dimensions and chronology of the last ice sheet in western Ireland. *Quaternary Science Reviews* **27,** 3-4.

Clark, C.D., Hughes, A.L.C., Greenwood, S.L., Jordan, C., Sejrup, H.P. (*2010)* Pattern and timing of retreat of the last British-Irish Ice Sheet. *Quaternary Science Reviews*. doi:10.1016/j.quascirev.2010.07.019

King, E.L., Haflidason, H., Sejrup, H.P., Austin, W.E.N., Duffey, M., Helland, H., Klitgaard-Kristensen, D. and Scourse, J.D. (1998) End moraines on the northwest Irish continental shelf, Poster Presented at Third ENAM II Workshop, Edinburgh.

Monteys, X. and O'Toole, R. (2010) Acoustic Seabed Characterization of the Porcupine Bank, Irish Margin. Proceedings of the National Geoscience 2010 conference. Geological Survey of Ireland. Dublin Castle.

Scourse, J.D., Haapaniemi, A.I., et al. (2009) Growth, dynamics and deglaciation of the last British-Irish ice sheet: the deep-sea ice-rafted detritus record. *Quaternary Science Reviews* **28,** 27-28

Sejrup, H.P., Hjelstuen, B.O., Dahlgren, K.I.T., Haflidason, H., Kuijpers, A., Nygard, A., Praeg, D., Stoker, M.S. and Vorren, T.O. (2005) Pleistocene glacial history of the NW European continental margin. *Marine and Petroleum Geology* **22**, 9-10

Analysis of sediment cores from the environs of Galway Bay, Ireland

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A number of sediment cores obtained from the Galway Bay area, Ireland, by vibrocoring have been analysed for sedimentology, ^{14}C dating, foraminiferal content, grain size distributions and, in one case, carbon and oxygen isotope variations. The shallower water cores show the initiation of the marine shoreline at approximately 9,500 B.P. in the North Sound transgressing eastwards with time. One core taken from slightly deeper water containing sediment from 16,000 B.P. shows a pronounced change of foraminiferal content initiated at about 12,200 B.P. and lasting until 11,400 B.P. approximately. The presence of scattered IRD in the earlier part of this segment and ^{18}O values showing a progressive cooling from the base of the core to this segment suggests the effects of the Younger Dryas event on the western Irish seaboard.

Stratigraphy, sedimentation and facies distribution on the Porcupine Bank and links to Late Quaternary climate variability

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A dense array of gravity and piston cores from the western Porcupine Bank have been studied in order to (1) better understand the stratigraphic record and sediment distribution of Late Quaternary deposits on submarine slopes west of Ireland and (2) assess possible links between changes in deeper level oceanographic circulation and North Atlantic climate oscillations. The study site is important as relatively low gradients and low sediment supply mean that the slope is stable and preserves a thin and largely undisturbed record extending from relatively shallow (~500 m) to deep water (~3000 m). Elsewhere on the flanks of the Rockall Trough, gravity failures have extensively modified the slope stratigraphy. Although there are detailed palaeoceanographic records from basin floors and banks in the region, the slope deposits are potentially interesting as they straddle boundaries between different water masses and allow the changing structure of the water column during glacial interglacial cycles to be constrained. The studied gravity (up to 3 m long) and piston cores (up to 7 m) reveal a complex alternation between two main facies associations; paler, dominantly pelagic calcareous deposits consisting largely of calcareous nanoplankton and planktonic foraminifera (carbonate-dominated lithofacies), and darker siliciclastic muds, sandy muds and sands (siliciclastic-dominated lithofacies). The muddier lithologies commonly contain sand- to pebble-sized lithic grains interpreted as ice rafted debris (IRD), and intervals of relatively well-sorted sand with erosional bases that are interpreted as bottom current winnowing events. A series of core transects both transverse and parallel to the slope demonstrate that a coherent stratigraphy can be recognised and traced over an area of ~2500 km^2. Correlation between the cores is achieved using the alternation of calcareous and siliciclastic intervals, distinctive marker beds ('grey bands'), bioturbated horizons and prominent erosional surfaces. The correlations are supported by a range of proxy records and by a calcareous nanofossil biostratigraphic study based on the recognition of acme zones. The first-order alternation of calcareous and siliciclastic facies is attributed to glacial/interglacial cyclicity driven by 100 kyr Milankovitch pacing and suggests that the cored record extends back to c. 500,000 years (MIS 13). Superimposed smaller scale variations may reflect changes in thermohaline structure related to higher frequency stadial/interstadial variations. Furthermore, sedimentological, micro-palaeontological, physical and geochemical properties indicate that the 'grey bands' are the local expression of Heinrich Events associated with enhanced ice-rafting in the North Atlantic. This is confirmed by the application of a novel provenance study using the Pb-isotopic signature of IRD feldspars. This work indicates a Laurentide ice sheet source for IRD from the putative Heinrich Layers, with an important local IRD flux derived from a British-Irish Ice Sheet source during intervening periods. This establishes the extension of the Ruddiman Belt onto the lower Porcupine Bank slope for layers H2 and H3, and identifies a thick Heinrich-like layer associated with MIS 8.

Ice sheets and ocean change – new results from the Porcupine Bank, NE Atlantic Ocean

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Reconstructions of the last glacial palaeoenvironment of the NE Atlantic region have produced conflicting versions of the maximum extent of sea-ice cover. This is an important topic, as it has implications for the construction of models to explain the growth and decline of ice sheets by identifying parts of the ocean that would have been able to provide precipitation. Most studies use a quantitative technique to reconstruct sea surface temperatures and then infer the sea-ice edge at points where the temperature drops to 0°C. However, these techniques (mostly using transfer functions and geochemical based analyses of planktonic foraminifera) are compromised by a relatively poor performance at higher latitudes where only one or two species dominate over a wide range of temperatures or where the exponential relationship between temperature and the geochemistry of the shell is relatively flat. A new method that uses the known relationship between some species of planktonic foraminifera and the distribution of perennial and seasonal sea-ice is applied to two deep water cores from the western flank of the Porcupine Bank. These suggest that the bank was perennially covered by sea-ice during parts of the last glacial, with the longest episode of cover between approximately 17-24 kyr B.P., with evidence for some shorter episodes of sea-ice cover preceding this associated with the Marine Isotope Stage 3 stadial-interstadial climate variations. The longest episode corresponds with the maximum westward extent of the British Irish Ice Sheet proposed by previous studies. However, this severely contradicts sea surface temperature estimates, which suggest that temperatures in this region fell as low as 5-7°C. A possible explanation for this discrepancy could be the unique position of the Porcupine Bank and how the bank interacts with the gyre systems that dominate this region today (and, presumably also in the past). As can be observed in laboratory experiments, a rotating fluid flowing over an obstruction will create an oceanographic phenomenon known as a Taylor column. This traps cold, relatively deep water over the obstruction, a situation which is occurring today at the Porcupine Bank and is likely to have also occurred in the past and which favours the retention of sea ice over the bank area. These changes in sea surface conditions also impacted assemblages of benthic foraminifera, implying a close relationship between changes in surface ocean conditions and deep sea processes.

New insights on sedimentary processes during the formation of the Rockall Bank Mass Flow, offshore western Ireland, initial results from RV Celtic Explorer cruise CE10008

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Submarine landslides are considered a geohazard for their destructive effect on marine infrastructure but also for their tsunamigenic potential. It is well known and accepted that the majority of submarine landslides are triggered by earthquakes, but what causes the particular part of the slope to be unstable and the recurrence interval are still the focus of much research. Some open questions are for example: what the role of pore pressure, climate change, sea-level rise and presence of weak layers is; if there is a relation between mode of failure and tsunami genesis; why some slides get diluted by incorporating ambient water while others do not.

Offshore western Ireland, the floor of the Rockall Trough is dominated by the Feni Drift, a giant contourite mound formed by Neogene ocean bottom currents, but also the scarps and depositional lobes of the Rockall Bank Mass Flow (RBMF), about which little is known. In June 2010 the RV Celtic Explorer cruise CE10008 collected the first comprehensive set of piston cores from the Irish sector of the deep Rockall Trough in order to understand the processes that took place during the RBMF failure, transport and deposition. Here we present initial results from a transect of cores extending across the deposits of the RBMF and onto the seafloor down-dip of the failure. The cores (up to 4 m in length) were taken in water depths of nearly 3000 m and reveal that significant coarse sediment (up to coarse sand) was emplaced on the deep basin floor by both turbidity currents and bottom currents. We identify at least 15 discrete turbidite sand and silt deposits with two distinct

sources, and one bed of contouritic sand. The youngest two turbidites appear to have been generated from the area occupied by the RBMF. The remaining 13 events suggest an easterly or northeasterly source, probably from the Donegal-Barra Fan. The core record thus shows at least two periods of turbidity current activity; first from the Donegal-Barra Fan, possibly associated with glacial processes, and then more recently from the Rockall Bank linked to the RBMF. The switch in source area appears to have occurred after a thick (>1.5 m) structureless water-saturated sand was deposited on the seafloor, possibly formed by bottom current reworking of the Feni Drift.

We believe that initial collapse was caused by bottom current undercutting of the Rockall Bank. The remobilised sediments loaded the water-saturated contouritic sand that had been buried near the seafloor at the time, leading to liquefaction and dewatering. Dewatering and volume reduction in turn caused vertical collapse of the seafloor and potentially further collapses at the head of the slide. Backscatter and shallow seismic data collected as part of the INSS and INFOMAR surveys provide evidence suggesting dewatering just beyond the toe of the RBMF.

Canyons, Channels, Seamounts, Escarpments, Mounds and Ploughmarks: An Atlas of the Irish Deep-Water Seabed

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From 2000 to 2002, the Irish National Seabed Survey mapped the majority of the designated Irish seabed deeper than 200 m water depth using remotely sensed multibeam echosounder data. The acquired data sets provided bathymetric information of a resolution sufficient to resolve seabed features as small as cold-water coral carbonate mounds measuring only hundreds of metres across. As part of the follow-up, shallow-water mapping programme (INFOMAR), the INSS-processed MBES data have been analysed to systematically identify a variety of morphological seabed features including: seamounts, submarine canyons, channels systems, escarpments, mounds, coral carbonate mounds and iceberg ploughmarks. Maps generated from the INSS multibeam data sets, in combination with seabed photography recorded with deep-sea cameras and remotely operated vehicles, form the basis of the seabed atlas.

The atlas itself is divided into 4 sections: Introduction – providing the context of the atlas and background information, thematic atlas – describing and highlighting the various morphological seabed features, regional atlas – presenting the morphological features in a geographical context and a guide to the atlas – giving the sources of the data sets and useful links. The Atlas of the deep-water seabed: Ireland (ISBN 978-90-481-9375-2) is available from www.springer.com and www.amazon.ie.

6. IQUA Annual Fieldtrip and Autumn Symposium 2011

Suggestions for locations and offers to help organise the next IQUA Fieldtrip (September 2011) are welcomed by the IQUA Committee by the Secretary (email:stephen.mccarron@nuim.ie) for discussion at the upcoming AGM.

Suggestions for an Autumn Symposium theme by potential convenors are also welcome (through the Secretary) for discussion at the AGM.

7. Recent PhD completions

On the Utility of the Irish Annals for Climatic Reconstruction.

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The Irish Annals (henceforth Annals) contain annual records of major events from the early Christian to early modern periods. They are unique in Europe for their continuity and contain abundant records of meteorological extremes (e.g. windstorms, flooding, drought) and associated societal and biosphere impacts (e.g. famine, animal mortality). Despite knowledge of their existence, these records have never been systematically exploited for palaeoclimatic or impact studies. This thesis comprehensively surveys these sources. Recorded extremes and impacts are categorised and quantified according to internationally-recognised classes of documentary palaeoclimatic evidence.

Documentary evidence can possess several distinct advantages over many natural archives of palaeoclimatic information. It is by and large accurately and precisely dated and provides unique information on societal and biosphere impacts of extremes. But this evidence may also be exaggerated or fabricated. Recording may also be spatially and temporally incomplete. The central research question of this thesis therefore asks whether the records in the Annals are sufficiently reliable and complete to enable credible palaeoclimatic reconstruction.

A systematic methodology is developed for assessing reliability, beginning with the exploration of the perception of rare natural phenomena (e.g. eclipses, comets, earthquakes) recorded in the Annals, c. AD 400-1650. Conceptions of such phenomena as portents and miracles are examined and shown to extend to the perception of meteorological extremes. This knowledge informs assessment of the varying motives for recording extremes, each of which tend to promote recording of greater or lesser objectivity and accuracy. Motives include the spectacular visual character of extremes, their severe impacts, political or financial benefits to be gained from their interpretation as portents and miracles, as well as an overriding scholarly desire to maintain genuine records of important historical events.

A scale of prospective reliability is developed that recognises the impossibility of determining reliability with absolute confidence due to incomplete information and bias on the part of the assessor. This ranges from 0 for records considered unreliable, 1 for records of uncertain reliability and 2 for records considered reliable. Records are quantified by their place on each point of this scale, and the vast majority are shown to fall at point 2, providing firm foundation for palaeoclimatic studies. However, certain categories of extremes exhibit higher proportions of records considered unreliable, associated with perceptions that promote exaggeration or fabrication, including lightning strikes attributed to divine retribution.
Factors affecting completeness of recording are explored, including changing perceptions over time, resulting in varying motivations to record extremes, and varying source numbers through time. Source availability is shown to operate as a non-climatic control on numbers of recorded extremes that must be taken into account. The seasonal and geographical bias of recorded extremes is explored. Extremes are recorded for all seasons, although autumn is given least coverage. Places named in connection with recorded extremes show a strong focus upon major monastic urban settlements across Ireland.

The thesis concludes with the first systematic comparison of recorded severe cold and independent evidence of explosive volcanism in the Greenland Ice Sheet Project 2 ice-core. The remarkably strong correspondence observed confirms that the majority of records in the Annals are genuine and sufficiently complete to attempt accurate palaeoclimatic reconstruction.

8. New Research projects

Connemara landscape showcased in Google Earth at Google Headquarters, California.

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The first Geological Society of America Penrose Conference(www.geosociety.org/penrose/10google.htm) dedicated to the use of Google Earth in geoscience education and research took place at Google's headquarters (Googleplex) in Mountain View, California in early January 2011. NUI Galway Earth and Ocean Sciences researcher Dr. Ronán Hennessy travelled to Google to present his research into the innovative use of the Google Earth 3D earth viewer for education. The conference was attended by over 70 leading international experts in the fields of geo-visualisation, GIS, technology in education and distance learning.

Dr. Hennessy showcased a novel approach to presenting geoscientific data in a socio-historical context, which can be used in primary, secondary and third-level education. Focusing on Connemara, the Google Earth visualisations include early GSI geology maps of Connemara; 3D pop-up geological cross-sections; old Galway-Clifden railway and regional mineral tramways routes; temporal granite emplacement models; and a 3D recreation of Alcock and Browns pioneer trans-Atlantic flight in 1919, from Newfoundland to Derrygimla bog, outside Clifden. The educational content is designed to integrate historical, industrial and social aspects of the Connemara landscape with the region's geology, to provide an interactive and stimulating learning environment in Google Earth. Dr. Hennessy has carried out research on the use of Google Earth and Keyhole Mark-up Language (KML) for displaying and analysing a surficial and bedrock datasets since the Google Earth virtual globe was released in 2005. Examples of the

Connemara Google Earth visualisations are available on Dr. Hennessy's Google Earth blog http://geoscene.blogspot.com/.

British Academy grant: 'Mobility, climate and culture: remodelling the Irish Iron Age'.

Dr. Graeme Swindles is part of a successful grant application for a British Academy-awarded project, 'Mobility, climate and culture: remodelling the Irish Iron Age' (total amount awarded is stg £142,000). The Principal Investigator on the project is Professor Ian Armit, University of Bradford. The project is truly interdisciplinary and focuses on the response and adaptation of humans to abrupt climate change. The palaeoclimate and archaeological work packages will be led by G. Swindles and I. Armit, respectively.

9. Quaternary Research News

Moynagh points, Cranógs and Fish traps
New finds from a watery world
Michael Gibbons* and Jim Higgins
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Among the more important discoveries has been a stone point from the River Corrib near Galway City, which has produced a large array of Mesolithic material over the years, together with four dug-out canoes (undated). These points have recently been named as "Moynagh points" from a type site in Moynagh Lough, Co. Meath, where six similar objects where found in Mesolithic levels beneath an early Christian period lake dwelling/Crannóg. Their presumed use was as projectile heads or spear points. The ground stone point is a narrow sliver of stone, pointed at either end, and measuring 22.6 cm in length, 3.2 cm maximum in width and 0.45-0.10mm in thickness. It is made of dark shale, or mudstone, which was originally shaped, burnished and polished over most of its surface. The object, one of only a handful from the west coast of Ireland, belongs to the latter part of the Irish Mesolithic period, and probably dates to c. 5500-4500 BC.

Further west, on Ross Lake, the remains of a large stone Crannóg were identified during some summer fieldwork on the site of a robbed-out late medieval castle. Low water levels revealed the remains of an enclosing cashel wall at the water's edge on the south and east sides of the Island along with a well - preserved bow-shaped stone dock on the north-east corner. The Crannóg cairn on which the later castle was built is massive, rising steeply from the lake bed to a height of over 2 m on the southern side.

Further west, Ruairi O'Neill discovered a new stone lake dwelling on Lough Dhuleitir, in an area already rich in similar sites. Some were clearly occupied and used by the Gaelic elite, to their destruction during the mid 17th century.

In the far west of Connemara, on the Errislannan peninsula, we identified a multi-phase complex of stone-built fish traps at the mouth of three small streams on Lough Sáile, one of which is still in use. The largest of these stone traps (now unused except by otters) was used to catch Mullet in the autumn, while the smaller of the two trap complexes was used to catch a small fish known as Marns (Marracháns), these have been identified as sand smelt by Dr. James King (Central Fisheries Board). This fishery was an important food resource right around the circle of Mannin bay, which was densely populated in the 19th century. These stone traps are extremely rare on Irelands West Coast. The only other ones known are from Doonbeg on the west coast of Clare.

Further north, on old Head Beach, Clew Bay, Co. Mayo, local people came across timbers beneath the sand, but it is not clear if these are from ship or part of a quay structure. Fieldwork is ongoing in mapping the tidal zone archaeology of a number of south Connemara islands. Early indications are that these islands contain one of the richest arrays of historic features in the country. The sites vary and include holy wells, stone boats, intertidal roads, quays, slips, fish traps and kelp kilns. The bulk of the quays date to the 18th and 19th centuries and were used to ferry a range of goods throughout the islands and beyond. The trade in turf in particular left a huge impact and led to the destruction of nearly all the coastal bogs in the area.

10. Forthcoming workshops, seminars & conferences

Irish Met Society conference
Ireland's Weather Past, Present and Future

The Irish Met Society conference on Ireland's Weather Past, Present and Future will take place on March 26th in NUI Maynooth, Co. Kildare. There will be lectures by John Sweeney (climate change), Duncan Stewart, Chris Bean (seismology), Katie Howard (weather forecasting) and Peter Lynch (the atmosphere) as well as the opportunity to visit the National Science Museum (in St. Patrick's College Maynooth).

There is a small registration fee of €7.50 for Met Society members, €15 for non-members and it is free for students presenting posters on their research. Further details, including online registration details (which can be paid online or by cheque/cash), are available at http://www.irishmetsociety.org/. Contact Emily Gleeson, Secretary, Irish Met Society, (email: emily.gleeson@met.ie) for further details.

New Tilia for Windows training workshop

Eric Grimm is coming to Europe to hold two training workshops on use of the new Tilia for Windows and interaction with palaeoecological databases:
9th – 11th May 2011 in Liverpool
16th – 18th May 2011 in Aix-en-Provence

There will be training sessions on other techniques and topics as well. Please email (Richard.Bradshaw@liv.ac.uk) if you think you might come and indicate whether you choose Liverpool or Aix. You will have to pay for travel and accommodation but we hope to subsidise some of the on-site costs. There are several cheap flights to Liverpool or Manchester airports and we can organise budget accommodation. Visit www.europeanpollendatabase.net for further details.

11. Recent Publications:

De Vleeschouwer, F., Chambers, F.M. and Swindles, G.T. (2010). Coring and sub-sampling of peatlands for palaeoenvironmental research. *Mires and Peat* **7**, 1-10.

Mitchell, F.J.G. (2011). Exploring vegetation in the fourth dimension. *Trends in Ecology and Evolution* **26**, 45-52.

Roe, H.M., Patterson, R.T. and Swindles, G.T. (2010). Controls on the contemporary distribution of lake thecamoebians (testate amoebae) within the Greater Toronto Area and their potential as water quality indicators. *Journal of Paleolimnology* **43**, 955-975.

Swindles, G.T. (2010). Dating recent peat profiles using spheroidal carbonaceous particles (SCPs). *Mires and Peat* **7**, 1-10.

Swindles, G.T., De Vleeschouwer, F. and Plunkett, G. (2010). Dating peat profiles using tephra: stratigraphy, geochemistry and chronology. *Mires and Peat* **7**, 1-9.

Vincent, P.J., Lord, T.C., Telfer, M.W. and Wilson, P. (2011). Early Holocene loessic colluviation in northwest England: new evidence for the 8.2 ka event in the terrestrial record? *Boreas* **40**, 105-115.

Wheeler, J., Swindles, G.T. and Gearey, B.R. (2010). Finding Bosworth Battlefield: A multiproxy palaeoenvironmental investigation of lowland sediments from Dadlington, Leicestershire, England. *Journal of Archaeological Science* **37**, 1579-1589.

Wilson, P., Vincent, P.J., Lord, T.C., Schnabel, C. and Wilcken, K. (2010). Dating the Norber erratics. *Earth Heritage* **34**, 8-9.

12. General Membership Items

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IQUA now offers a fast, safe, online payment system already familiar to many (**PayPal**) for joining IQUA or renewing your membership (!!!) and for purchasing past field guides (where available).
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http://www.tcd.ie/Geography/IQUA/Member/Mem_Home.htm

Francis Ludlow, TCD.

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Treasurer:
Mr Francis Ludlow, Dept. of Geography, TCD, Dublin 2.

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