

Climate Change Consortium of Wales
Consortiwm Newid Hinsawdd Cymru

Report to the Management Board December 2011 – December 2012

Contents

Overview	1
Structure	1
Website	4
Research	4
Research Funding and Partnerships	6
Research Outputs	8
Prizes	9
Advanced Graduate Training	9
C3W Outreach Activity	10
Educational Outreach	11
Policy Outreach	12
Business Outreach	13
Media Outreach	14
Organisation and Delivery of Workshops	14
Climate Change Evidence Base	15
Impact Plans	15
Sponsorship for Outreach Activity	16
Appendices	
Appendix 1: Organisational Structure	17
Appendix 2: Research Awards: by Sponsor	18
Appendix 3: C3W Employed Staff	27
Appendix 4: C3W Outreach Activity	28
Appendix 5: C3W Bibliography by Thematic Cluster	37

CLIMATE CHANGE CONSORTIUM OF WALES Report to Management Board, January 2013

Overview

In terms of delivery and development of overall strategy, 2012 was another successful year for C3W. Since the launch of C3W in 2009, 14 papers involving C3W scientists have been published in Nature and Science journals. For this reporting period, C3W employed staff have been awarded £5,898,484 for their institutions. As evidenced in Appendix 4, C3W scientists and outreach staff have continued to work collaboratively, as trusted policy and educational advisors for, and collaborators with, the Welsh Government, the new single environmental body - Natural Resources Wales, UK Meteorological Office, DECC, DEFRA, Cynnal Cymru, UK and Welsh Museums, Welsh primary and secondary schools and the Climate Change Commission for Wales. During 2012 two C3W scientists have been working as Lead Authors for the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC); C3W science is well represented in the current draft of IPCC AR5 and we are confident that we will be able to highlight the significant contribution of C3W climate scientists when the final report is published in 2014. This involvement, in combination with our contributions published in the very best journals, is evidence that C3W climate science is of the highest possible quality and that C3W is delivering on its ambition to be a significant player on the international stage. Two C3W scientists have won prestigious awards and the GLIMPSE film on the Greenland Ice Sheet produced by the Swansea C3W team also won an award. The close collaboration with HPCWales and Fujitsu has continued to strengthen and, following the workshops sponsored by Fujitsu and delivered by C3W, five climate change PhD studentships were successfully funded by Fujitsu; these use the HPCWales facility and enhance computational upskilling and collaboration with SMEs in Wales. Active collaborations with the Centre for Ecology and Hydrology (CEH) and the Wales Environment Research Hub continue in the field of climate change impacts modelling and in the effective communication of science. The Science on a Sphere (SoS) outreach initiative is on track, the key output for 2011 featuring high profile lectures by the C3W Director using the SoS installation in the Science Museum, London - with plans for more this year. We are now communicating our successes, achievements and initiatives more successfully through a completely redeveloped website.

Structure

The organisational structure is shown in the schematic diagram in Appendix 1.

The developments and successes listed above were achieved against a backdrop of some organisational upheaval. One key change in management structure was the departure

of Tim Williams (0.5FTE Project Officer and 0.5FTE Media Officer based in Aberystwyth) in March 2012. Saskia Pagella took over as Acting Project Officer — with no increase in salary or FTE — until the end of 2012 when she was appointed to the 0.5FTE Project Officer role in addition to her 0.5FTE Education Outreach role. She is based in Bangor and will be in post until March 2015. Vince Jones was appointed to the 0.5FTE Media Officer role in Aberystwyth in September 2012. In effect C3W lost 0.5FTE of outreach/management effort during the 2012 calendar year. The Director especially thanks Saskia Pagella for her contribution as Acting Project Officer and Clive Walmsley for his support during this difficult transitional phase, and Gary Reed for facilitating the necessary change of roles.

Non Lavaro (Aberystwyth) joined the C3W team during the year with responsibility for financial management and conference/workshop administration.

Dr Andrew Thomas, appointed as a Senior Lecturer in Climate Change at Aberystwyth University will be taking over from Prof Neil Glasser, as the Institutional Director at Aberystwyth in January 2013. Professor Hambrey, as the founder of C3W and original Institutional Director in Aberystwyth, continues to sit on the Scientific Executive in an exofficio capacity.

The following meetings and research workshops have taken place:

- a) Monthly Video Conference meetings
- b) C3W Management Board met on 23rd January 2012, by video conference
- c) C3W Executive Group met on 18th June 2012, Shrewsbury
- d) C3W Outreach Panel met on 18th June 2012, Shrewsbury
- e) C3W Executive Group met on 25th October 2012, Shrewsbury
- f) C3W Outreach Group met on 13th November 2012, Shrewsbury

C3W Research continues to be organised into Thematic Clusters and are led as follows:

Cryospheric Systems and Climate Change (CSCC): Professor Tavi Murray (Swansea)

The major collaborative centres involved in CSCC are the Glaciology Centres in Swansea and Aberystwyth universities and the School of Ocean Sciences (SOS) at Bangor University. Major research themes include the mass balance and dynamics of the Greenland Ice Sheet (Swansea/Aberystwyth), reconstructing ice sheets and their dynamics (Swansea/Aberystwyth/Bangor), glacial hazards in the Himalaya (Aberystwyth) and modelling the effects of ocean tides on ice sheets and implications for sea-level rise (Bangor/Swansea). A series of collaborations have developed with the British Antarctic Survey (BAS) and the British Geological Survey (BGS) (see below).

Terrestrial Systems and Climate Change (TSCC): Professor Geoff Duller (Aberystwyth)

The major collaborative centres involved in TSCC are the Institute of Geography and Earth Sciences (IGES) in Aberystwyth, the Department of Geography in Swansea, the School of Engineering in Cardiff and the School of Environment, Natural Resources and Geography (SENRGy) in Bangor. Major research themes involve the sensitivity of landscape(s) to climate change (Aberystwyth), desertification in the sub-tropics (Aberystwyth), river flooding and flood hazards (Cardiff/Swansea/Bangor), and carbon cycling and sequestration in soils and wetlands (Bangor/Swansea).

Marine and Atmospheric Systems and Climate Change (MASCC): Professor James Scourse (Bangor)

The major collaborative centres involved in MASCC are SOS Bangor, the Department of Earth and Ocean Sciences at Cardiff University, the Institute of Biological, Environmental and Rural Sciences (IBERS) at Aberystwyth and Biosciences in Swansea. Major research themes include the stability of the North Atlantic meridional overturning circulation (AMOC) (Cardiff/Bangor), the role of the ocean in rapid climate change (Cardiff/Bangor), the generation of ultra-high-resolution records of marine climate change (Bangor/Cardiff), the dynamics and biogeochemistry of sea ice in the Arctic (Bangor) and the impact of climate change on marine ecosystems (Aberystwyth/Bangor).

Human Dimensions of Climate Change (HDCC): Professor Nick Pidgeon (Cardiff)

The major collaborative centres involved in HDCC are the Department of Psychology in Cardiff University, now housing Tyndall Cardiff (see below), Institute of Geography and Earth Sciences and the Department of International Politics in Aberystwyth and the Law School in Swansea. Major research themes include the psychological and social dimensions of climate change mitigation and adaptation (Cardiff/Aberystwyth) links with the Low Carbon Research Institute through Aberystwyth University's Institute of Biological, Environmental and Rural Sciences and legal and insurance risk aspects of climate change (Swansea).

Last year we reported the addition of a Solar Systems and Climate Change Thematic Cluster led by scientists at Aberystwyth and Glamorgan universities; unfortunately there was no substantive progress towards the integration or development of this initiative during the year, so the Scientific Executive took the decision during 2012 to remove this cluster from the C3W organisational structure.

Website

Since its inception the C3W website had been seriously deficient in many key respects and not fit for purpose. It was clear during 2011 that a completely new and upgraded website would be required, and the website improvement was a major strategic aim of the Scientific Executive during 2012. The website upgrade was therefore a key element of the job specification for the replacement 0.5FTE Media Officer post in Aberystwyth. Since his appointment in September 2012, Vince Jones has prioritised web development in close collaboration with the rest of the Outreach Team and the Scientific Executive and a completely revamped C3W website launched in January 2013 (c3wales.org). This new site provides C3W with an appropriately professional web presence and will facilitate interactions and communication with external individuals and organisations as well as an effective internal management tool for C3W staff. The Director would like to thank Vince Jones for his expertise and effort in delivering the new website over the last four months of 2012.

Research

Research Focus and Strategy

C3W research is organised to address the four Grand Challenges:

Earth System Modelling (ESM)
Sea Level Change (SLC)
Hazard Evaluation and Risk (HER)
Welsh Dimensions of Climate Change (WDCC)

Following on from the Research Strategies agreed at the 27/28 April 2011 Aberystwyth C3W Inaugural Research Conference, intensive workshops were conducted on specific themes to stimulate collaborative research funding. Some of these were funded from the 20k ring-fenced from the Bangor budget but some were also fully or partially sponsored by external sources.

Climate Change Impacts and Fujitsu/HPC Wales Studentships Review Gregynog workshop ($19^{th} - 22^{nd}$ March 2012) (ESM)

This workshop was a two-part event co-organised by C3W and hosted at Gregynog. The first session was co-funded with C3W by the Wales Environment Research Hub (http://www.werh.org/) — to assist in delivering their Priority Theme 2b — "Climate Change — Mitigation, Impacts and Adaptation" and the specific Action: "To provide an assessment of appropriateness of the models used for impact assessment from climate change scenarios". A range of researchers from each of the four institutes and the Centre for Ecology and Hydrology (CEH) presented their work, covering a range of broad habitat types and ecosystem services arising from them (such as water quality).

Workshop attendees ranged from representatives from Welsh Government, agencies and the research community.

The second and third day of the workshops were fully funded by Fujitsu Laboratories of Europe (FLE) (£10,000) and were part of the developing strategic collaboration between C3W, High Performance Computing Wales (HPCW, http://www.hpcwales.co.uk) and FLE. FLE, as the successful contractor to HPC Wales, are committed as part of the contract to £multi-million research support investment using HPC Wales. FLE have a global strategic initiative to develop modelling in two areas, climate modelling and genomics. As part of the HPCW contract they have developed a collaboration with C3W as an effective organisation to deliver and facilitate their climate modelling strategy.

The workshop heralded the start of this initiative, with C3W responsible for delivering the call for interested PIs and managing the £10,000 budget supplied by Fujitsu to run and deliver the workshop. There was an opportunity for delegates attending the WERH/C3W climate change impacts workshop to attend the FLE-funded dinner on the 19th March to facilitate networking and engagement between researchers, policy-makers and agency staff. Prior to the HPC Wales/Fujitsu workshop, scoping proposals were solicited for PhD studentships and the direct research collaboration in the field of climate change and bioinformatics/genomics. In addition, FLE offered research collaboration in the form of post-doctoral computational scientists employed by FLE to facilitate the porting and operational set-up of code on HPCW.

For the climate change workshop there were more than 48 Wales-wide proposals submitted and after an independent review, 15 Principal Investigators and their research groups were invited to present their work at the Gregynog workshop. Following these sessions, researchers interacted with staff from HPC Wales and Fujitsu in one-to-one consultation breakouts, with the aim of honing the proposals to ensure success once proposals were formally submitted in May 2012. In total five C3W HPCW studentship proposals have so far been funded.

This process was developed in a close working relationship with HPC Wales and Fujitsu, which is continuing into other projects. Successful proposals were judged on the basis of excellence by an independent peer-review panel and had to demonstrate:

- 1. A clear requirement for HPC
- 2. Commercial or policy potential (e.g. environmental impact assessment or direct collaboration with SMEs).

Gregynog Mathematics Colloquium, May 2012 (ESM)

Dr Hilary Weller (Reading University) from NCAS presented a C3W-sponsored talk at this event.

Tyndall Annual Assembly, September 2012 (HER/WDCC)

C3W part sponsored a 3-day international event hosted by Tyndall Cardiff featuring the work of scientists from Tyndall centres throughout the UK and from the new Tyndall Hub in Shanghai, China.

Royal Society Research Workshop on Tides, Palaeotides, Sea Level and Glacio-Isostatic Deflection, November 2012 (ESM/SLC)

This workshop was organised by C3W and funded by Fujitsu Laboratories of Europe (£16k) to explore research collaboration between scientists using Fujitsu HPC systems in the UK (including HPCW), Australia and Japan. The use of The Royal Society as a venue was facilitated by participant Professor Kurt Lambeck AO (Australian National University), former President of the Australian Academy of Science, and the meeting was attended by 20 scientists from Bangor University (School of Ocean Sciences), Imperial College London, Plymouth University, British Antarctic Survey, National Oceanography Centre Southampton, the University of Tokyo, Kyushu University and the Australian National University. Dr Adel Rouz, Vice-President of FLE, also attended. Three major areas of potential/enhanced tidal modelling applications emerged from discussions following the presentations: (1) Palaeotidal corrections to sea-level index points (SLIPs) to reduce uncertainty in UKCP09 coastal flooding risk assessment and refine assessment of Greenland Ice Sheet melt rate, (2) Control of organic mud ("black shale") sedimentation in epicontinental shelf basins by seasonal stratification dynamics, (3) Tidal energy: optimising arrays and assessing environmental impacts (coastal erosion, bed level changes, ecology). All three areas are being developed into research proposals; the first of these is likely to be a NERC Large Project proposal on theme 1 to be submitted as an outline proposal during March 2013.

Research Funding and Partnerships

Research projects enabled by C3W's organisational structure and strategy have resulted in an additional research income being generated by C3W employed staff of £5,898,484 for this reporting year. Some highlights of 2012 include:

NERC Consortium Grant: BRITICE-CHRONO

The C3W-funded BRITICE-CHRONO workshop held at Gregynog in May 2011 (reported in the previous Management Report) led to a proposal being submitted to NERC in July 2011, which after a protracted delay was successfully funded (£3.6 million). This was the first research workshop supported by direct C3W funding ring-fenced from the Bangor budget and allocated by the Director; the ultimate success of the proposal evidences the success of this strategy. BRITICE – CHRONO: Constraining rates and style of marine-influenced ice sheet decay was officially launched in September 2012. It focuses of the rates and controls of rapid ice sheet collapse with the aim of enhancing the ability of ice

sheet models to simulate the dynamics of West Antarctic Ice Sheet collapse. It consists of a stellar consortium of research and industrial partners:

- University of Sheffield
- C3W Bangor University, Aberystwyth University, Swansea University
- University of Durham
- University of Liverpool
- University of Glasgow
- University of Ulster
- British Antarctic Survey
- British Geological Survey
- NERC Radiocarbon Facility
- University of Glasgow, SUERC
- University of St Andrews
- Geological Survey of Ireland
- University of Bergen, Norway
- Stockholm University, Sweden
- Simon Fraser University, Canada
- University of Ottawa, Canada
- · Penn State University, USA
- Centre Nationale de la Recherche Scientifique, France
- Centrica Energy
- SP Transmission
- Natural England
- English Heritage
- Scottish Natural Heritage
- Countryside Council for Wales

The project also secured £35k from NERC to support the delivery of the Pathways to Impact Plan and this has been subcontracted to the C3W Outreach Team.

Fujitsu-funded HPCW PhD studentships

Five studentships were successfully funded by Fujitsu with support from HPCWales, following the C3W delivered call and proposal Workshop in March 2012:

- Dr Mattias Green, Bangor University: The influence of the polar tides on ice sheet dynamics.
- Dr Michaela Bray and Professor Roger Falconer, Cardiff University, in collaboration with SME Waterco: The impact of extreme weather events upon steep river basins throughout Wales.

- Dr Simon Creer, School of Biological Sciences, Bangor University in collaboration with Professor Freeman, Professor Golyshin, Dr McDonald and Dr Fenner: Understanding the microbial mechanisms underpinning the release of carbon from peatland ecosystems.
- Dr Simon Neill, Bangor University: Feedback on tidal stream array operation and the marine environment.
- Dr Reza Hashemi, Bangor University: Simulating the impacts of climate change on estuarine dynamics using an integrated catchment-to-coast model.

President's Awards, Cardiff University

Following the award of 12 President's Awards' PhD studentships to C3W researchers at Cardiff, the success of this initiative has led to the award of a further five studentships. Several of these involve collaboration/co-supervision within C3W across institutions, realising the aim of C3W to foster PhD co-supervision across Wales. Further cross-institutional co-supervised PhD research proposals have been submitted to NERC.

IPCC Fifth Assessment Report

C3W researchers have been key authors for a number of formal publications including the upcoming Fifth Assessment Report of the IPCC, Dr Hilary Kennedy in Bangor (carbon storage in marine ecosystems) and Professor Tavi Murray in Swansea (Greenland Ice Sheet mass balance). Added to this a significant number of C3W publications have been cited in the current draft evidence base for the report; the final report is due for release in 2014.

Communicating Science Report

Professor Nick Pidgeon (Cardiff) launched a high profile report along with Dr Emily Shuckburgh and Rosie Robinson: *Communicating science, the public and the news media*. This work was funded by NERC, UK MET Office, DECC, DEFRA (all a part of the Living with Environmental Change Partnership (LIWEC)). The Royal Meteorological Society funded a public event to launch the report at Imperial College, London in November 2012.

Research outputs

A full publication list is included as Appendix 5. C3W researchers (highlighted in **bold**) contributed a further seven papers published during year by *Science* and *Nature* journals, making a total of 13 since the inception of C3W:

Burrows, M.T., Schoeman, D.S., Duarte, C.M., O'Connor, M.I., Buckley, L.B., Kappel, C. V., Parmesan, C., Halpern, B. ., Brown, C., Brander, K.M., Bruno, J. F., Pandolfi, J.M., Sydeman, W.J., **Moore, P.**, Kiessling, W., Richardson, A.J. & Poloczanska, E. S. (2012) Invasive species unchecked by climate response. *Science* **335**: S pp538-539 (Aberystwyth)

Corner, A. (2012) Psychology science literacy and climate views. *Nature Climate Change*. **2**: 10, 710-711. (Cardiff)

Fourqurean, J.W., **Kennedy, H.**, Marba, N., Holmer, M., Mateo, M.A., Apostolaki, E.T., Kendrick, G.A., Krause-Jensen, D., McGlathery, K.J. & Serrano, O. (2012) Seagrass ecosystems as a globally significant carbon stock. *Nature Geoscience* **5**: 7, pp505-509 (Bangor)

Hall, J.W., Brown, S., Nicholls, R.J., **Pidgeon, N.F.** & Watson, R.T. (2012) Proportionate adaptation. *Nature Climate Change* **2**: 12, pp833-834 (Cardiff)

Hinder S.L., Hays, G., Edwards, M., **Roberts, E.C,** Walne, A.W. & **Gravenor, M.B.** (2012) Changes in marine dinoflagellate and diatom abundance under climate change. *Nature Climate Change* **2**: 4, pp271-275 (Swansea)

Hönisch, B., Ridgwell, A., Schmidt, D.N., Thomas, E., Gibbs, S.J., Sluijs, A., Zeebe, R., Kump, L., Martindale, R.C., Greene, S.E., Kiessling, W., Ries, J., Zachos, J.C., Royer, D.L., **Barker, S**., Marchitto Jr., T.M., Moyer, R., Pelejero, C., Ziveri, P., Foster, G.L. & Williams, B. (2012) The geological record of ocean acidification. *Science* **335**: 6072, pp1058-1063 (Cardiff)

Wanamaker, A.D., **Butler, P.G., Scourse, J.D.,** Heinemeier, J., Eiriksson, J., Knudsen, K.L. & **Richardson, C.A.** (2012) Surface changes in the North Atlantic meridional overturning circulation during the last millennium. *Nature Communications* **3**: 899 (Bangor)

Prizes

Professor Geoff Duller, Aberystwyth University has been awarded the prestigious Bigsby Medal of the Geological Society of London, in recognition of his work in the development and application of luminescence dating in key geological, geomorphological and archaeological sites. Dr Kate Hendry, Cardiff University has been awarded the 2012 Challenger Fellowship for Marine Geology.

The GLIMPSE film on the Greenland Ice Sheet produced by the Swansea C3W team won an award at the 2012 Blue Ocean Film Festival in Monterey, California, USA.

Advanced Graduate Training

Dr Andrew Thomas, the new Institutional Director at Aberystwyth University (as of 2013) and Dr Saskia Pagella (Education Outreach) have been researching the development of a distance learning MSc in Climate Change, to be designed and delivered by scientists in all four of the C3W institutes. Ideally the course will adopt a flexible approach to learning, starting with stand alone Continuing Professional Development (CPD) workshops

(accredited), which would then make students eligible to enrol on distance learning modules. Modules could also be stand alone (with CPD points attached), but would also allow students to build up enough credits to gain a full MSc. The CPD element of the training would be interactive and tailored towards sectors such as policy, business and education (teacher training), in order to make the latest climate change research widely accessible, leading to greater awareness, innovation and sustainability across these sectors. Aberystwyth University (IBERS) and Bangor University (SENRGY) are currently in the process of developing a jointly delivered MSc in Sustainable and Efficient Food Production (by distance learning) funded by BBSRC as an Advanced Training Partnership. In this programme the funders have made generous bursaries available for those working in the relevant industries. Saskia is liaising closely with the project, as it offers a powerful model upon which to base some of the apparatus for the delivery of such a course.

This initiative builds on the CPD delivery for agency staff and policymakers that has been delayed while the new Single Body — Natural Resources Wales - is under development (operational from April 2013). We are also researching the need CPD for teachers, in relation to ensuring that evidence-based climate change science is delivered within the National Curriculum.

NERC Knowledge Exchange Workshop

Dr Shaun Russell of the Wales Environment Research Hub (WERH) has been awarded £10k to run a Knowledge Exchange workshop for policymakers, agency staff and academics. Given the expertise in the C3W team in this field he has essentially subcontracted the team to deliver this. Saskia Pagella will be the first point of contact for this event, scheduled in May 2012. The WERH Steering Board are keen for the broad focus to be on "Communicating Science" This is an area that key C3W researchers are engaged with nationally - in particular Professor Nick Pidgeon's research team (Tyndall Cardiff and the School of Psychology, Cardiff University), as well as the four Outreach Officers based in Bangor, Aberystwyth, Swansea and Cardiff universities.

C3W Outreach Activity

A full record of the outreach activities for 2012 can be found in Appendix 4. Although Outreach Officers are nominally managing a specific area of outreach, excepting media which has a more distinct remit, all outreach officers are actively engaged in educational, business and policy outreach. With the aim of limiting travel where possible, individual Outreach Officer participation is dictated to some degree, by the geographical location of events.

Educational Outreach

There were many Wales-wide educational initiatives that C3W were centrally involved in throughout 2012 (see Appendix 4 for the full range). The highlights include:

C3W Public Lecture Series

Bangor's lecture series finished at the start of December 2011 and was well attended. The final evening started with keynote speech from the former Minster for Environment Jane Davidson, on 'Sustainable Development'. Then BBC's Adam Walton hosted a C3W public Question Time Debate, where a panel of experts answered questions from the audience. Over 100 people attended the debate. Panel members included: Prof James Scourse, Dr Clive Walmsley, Jane Davidson, Dr Lorraine Whitmarsh and our Chief Scientific Advisor - Sir John Houghton FRS. The programme was broadcast on the Science Café, BBC Radio Wales on the 6th December 2012.

Cardiff University's six month lecture series, with one keynote lecture per month, finished in June 2012. This series was very well attended (over 100 people per lecture) and received external sponsorship from the Co-operative Group, St David's Dewi Sant Group and Cardiff University.

Swansea's lecture series has now started with details of the lectures available on the website.

Aberystwyth University are planning their lecture series for autumn 2013.

Science on a Sphere (SoS)

A business development plan for the Wales Science on a Sphere touring project was written and submitted to Welsh Government (WG) at the request of Jennifer Pride – Head of Climate Change, Communications and Engagement team (WG), with the aim of attracting seed funds to develop a full business and exhibition plan. After a protracted delay from the WG end it became clear during the year that no support would be forthcoming, so the C3W Outreach Team and the National Museum of Wales are now pushing forward with a revised proposal to attract sponsorship for the project.

James Scourse gave two high profile public lectures, using the SoS installation in the Science Museum, London. Both were a great success and clearly demonstrated the high impact of the technology in terms of delivering climate education. Saskia Pagella continues to sit on the UK Network group, chaired by Sir Crispin Tickell, which meets biannually in the Science Museum, London. This group is pushing forward with two proposals: a) to build a network of experts who can lecture using the installation in the Science Museum, as James Scourse did — Saskia along with Sara Summers from NOAA

are leading this initiative - and b) to support C3W in their bid to purchase SoS for Wales. C3W are aiming to provide a series of lectures in London, using their SoS installation during Climate Week ($4^{th} - 10^{th}$ March 2012)

Urdd National Eisteddfod 2012, Caernarfon

C3W hosted a stand in the science pavilion at the Urdd National Eisteddfod (the youth Eisteddfod) led by Cindy Froyd. Researchers from Swansea Geography and Bangor's School of Ocean Sciences ran interactive displays and activities focussing on C3W research activities in glaciology, tephrachronology, and climatic reconstructions utilising shells of *Arctica islandica*. Over 14,000 visitors visited the exhibit featuring "glacial goo", an erupting volcano, ice cores, Ceri the Clam and a real live beach to explore. C3W would like to thank all of the presenters (15 in total) who braved the traffic queues, torrential rain and mud to help make this event such a success.

Climate Week (12-18th March 2012)

C3W outreach was very busy this week running climate science experiments in schools all over Wales, for over 400 pupils in total. Clive Walmsley and Saskia Pagella chaired and facilitated sessions in the Wales Low/Zero Carbon Hub (LZCH) Summit during the week, in Cardiff. The LZCH promote carbon management best practice for the construction industry and its application in buildings across Wales. The Summit sought to showcase the work of the Hub and explore the potential of new initiatives such as the Green Deal to deliver reductions in emissions.

Climate Change Commission for Wales – Funky Dragon

At the Eco-Schools Youth Climate Change Conference 2012, some 120 pupils and teachers from 30 schools across Wales heard about the likely impacts of climate change in Wales from Clive Walmsley and some inspiring examples of school activities developed by Funky Dragon. Subsequent workshop sessions involving Jeanette Reis sought to motivate and enable pupils to hold a Climate Change Day of Action in their own schools and local communities.

C3W Outreach Officers are currently designing a survey to assess the quality of climate change science teaching in secondary schools from both the perspective of pupils and teachers. This is in collaboration with Funky Dragon and the Climate Change Commission for Wales. The output of this research will feed into the CPD workshops under development and linked to the MSc programme (see Advanced Graduate Training p9).

Policy Outreach

C3W have been actively engaged with the appropriate departments in Welsh Government. Jeanette Reis has continued to liaise with Cynnal Cymru and Commission

for Wales (CCCW) to avoid duplication in the area of policy outreach. In collaboration with C3W (Cardiff), Cynnal Cymru recently received funding for their project One Voice Wales to review climate change risk and perception of risk in Wales. Clive Walmsley is a Board Member for CCCW and a member of the Adaptation and Land Use and Climate Change sub groups; Saskia Pagella is a member of the CCCW Low/Zero Carbon sub group. Saskia Pagella liaises closely with the Welsh Government funded Wales Environment Research Hub and as a result share attendance on meetings and jointly deliver outreach, such as workshops, where appropriate.

Bespoke training by way of briefing notes and Continuing Professional Development CPD units and/or workshops for the Countryside Council for Wales and the Environment Agency has been delayed until the new Single Environmental Body, Natural Resources Wales, is up and running (April 2013). However, during Climate Week, Jeanette Reis facilitated a well attended 'science into policy' event at Cardiff University. Swansea's cutting edge film — A Glimpse of Greenland - was premiered to policymakers and academics. Following this, there was a paper exchange and academics presented and discussed their latest research with colleagues and policy-makers. Clive Walmsley and Jeanette Reis will also be facilitating/delivering a UKCP09 training workshop for policymakers and agency staff in March 2013.

In December 2012 the bilingual *Arctica islandica* Royal Society exhibit travelled to the Palace of Westminster, London. This was used as a vehicle for an MOU between CEFAS, Lowestoft and the School of Ocean Sciences, Bangor; SOS will be training ~10 PhD studentships in CEFAS-funded topics over the next five years. There was also a reception for Welsh MPs making the event an excellent opportunity to highlight the work of C3W in the political arena. Lord Elis Thomas was the host for this event.

Business Outreach

In 2011 via research and liaison with CCCW business forums, it was clear that a C3W business forum was neither a sensible aim, nor one that was likely to have realistic deliverables. As a result Cindy Froyd (Swansea Outreach) is a member of the Wales 2020 Business subgroup in CCCW.

C3W have developed a close working relationship with HPCWales – the conditions imposed by the Welsh European Funding Office (WEFO) on HPCWales studentships is such that they have to have SME business relationships written in and that the research clearly improves upskilling and employability in Wales, e.g. one studentship funded under this scheme relates to tidal power generation of the Welsh coast and provides strong linkage with the development companies involved.

The closest relationship C3W has with any individual company is Fujitsu European Laboratories.

Media Outreach

Website

The vastly improved website is due for launch on the 31st January 2013, as a result of the employment of our new Media Outreach Officer – Vince Jones in Aberystwyth University. The website has several interactive features that will serve to integrate climate change researchers from all disciplines in Wales and the rest of the world, such as a postgraduate forum. Outreach resources, such as recorded lectures will also be available.

A GLIMPSE of Greenland - The Disappearing Ice

The Welsh language version of this visually stunning film showcasing climate science in action was launched at the Urdd Eisteddfod in Glynllifon and the National Eisteddfod in the Vale of Glamorgan this year. The film was shot, edited and produced by PhD student Laurence Dyke and Professor Tavi Murray (C3W Institutional Director, Swansea) in association with 196 Productions, Cardiff. The film documents the 2010 and 2011 southeast Greenland field campaigns of scientists from Swansea University's Glaciology Group. It tracks their investigations of how and why Greenland's ice is changing. Amongst the highlights are dramatic time-lapse footage of a huge iceberg calving event, a wild storm amongst the icebergs, a close encounter with a polar bear, and the stunning mountains and glaciers of the remote fjords. Funding to create the bilingual film was provided by Swansea University, 196 Productions Ltd. and EPSRC. GLIMPSE is a 5-year project supported by the Leverhulme Trust based in the Glaciology Group at the Department of Geography, College of Science, Swansea University. Bilingual viewings of the film in Bangor are scheduled for Climate Week – March 4th-10th, 2013.

BRITICE-Chrono

With £35k awarded by NERC for outreach during the research project, the C3W Outreach Team is planning many events and the media element will be at the forefront of the delivery of the impact plan. The first event is scheduled for July 2013 on the Isles of Scilly.

Organisation and Delivery of Workshops

- Climate Change Impacts Modelling Workshop, Gregynog March 2012 (see p4)
- Fujitsu/HPC Wales Climate Change studentship proposals, Gregynog March 2012 (see p5).

- International Conference on Marine Environmental Governance Dr Jen Reis presented a paper on papers on climate change and marine management
- Matlab training for early researchers, Gregynog October 2012. A 3-day course delivered by C3W, featured training from Martin Trauth – author of the popular handbook *Matlab: Recipes for Earth Sciences*. C3W postgraduate students received significant bursaries towards attending the course, while external delegates paid the full course costs. HPCWales provided sponsorship towards the course costs for delegates residing in Convergence Zones. C3W and HPCWales are consequently assessing whether the software should be bought for use on the HPC facility.
- Tyndall Annual Assembly, Cardiff University, September 2012 jointly funded by C3W.
- Royal Society Research Workshop on Tides, Palaeotides, Sea Level and Glacio-Isostatic Deflection, November 2012 (ESM/SLC).

Climate Change Evidence Base – developments in the last 5 years

The Climate Change Commission for Wales (CCCW) recently requested C3W to put out a call to scientists in Wales to provide any climate change developments and updates for the evidence base, across disciplines. The response was good and C3W are now synthesising the submissions to produce an accessible document, aimed at a wide audience. The publication will be launched in Climate Week ($4^{th} - 10^{th}$ March)

Impact Plans

The Outreach Team have been increasingly involved in assisting researchers in writing their Impact Plans in research bids. In the successfully funded Cynnal Cymru One Voice Wales bid, Jeanette Reis has also been sub contracted to deliver part of the Impact Plan. Likewise in BRITICE-Chrono, C3W have been subcontracted to deliver the public outreach component of the Impact Plan, led by Saskia Pagella and Vince Jones. The team are currently writing an Impact Plan Portfolio to assist proposal writing and also to showcase the potential services the outreach team can offer researchers in this element of their projects. Information will shortly be available on the website.

Sponsorship received for Outreach Activity (since start of C3W)

Project Title	Funder	Amount	Lead	Institution
Public Lecture Series,				
Cardiff	Co-operative Group	£500	Jeanette Reis	Cardiff
Public Lecture Series,				
Cardiff	St Davids Dewi Sant	£2000	Jeanette Reis	Cardiff
Public Lecture Series,				
Cardiff	Cardiff University	£500	Jeanette Reis	Cardiff
			Lorraine Whitmarsh,	
	Sustainable Living		Jeanette Reis, Eli	
Strong Roots Project	Wales	£3287	Lazarus	Cardiff
Bilingualising Arctica				
islandica	Bangor University	£3000	Saskia Pagella	Bangor
Workshop to refine PhD				
proposals	Fujitsu	£10,000	James Scourse	Bangor
Urdd Eisteddfod				
demonstrators	Bangor University	£1000	Saskia Pagella	Bangor
Support for Matlab				
training	HPCWales	£2000*	Saskia Pagella	Bangor
BRITICE-Chrono impact				
plan	NERC	£35,000	James Scourse	Bangor
Welsh version of	Use of Welsh			
GLIMPSE Greenland film	Committee	£6000	Cindy Froyd	Swansea
Urdd Eisteddfod	Welsh Government	£2000	Cindy Froyd	Swansea
GwyddonLe Urdd	Welsh Government	£600	Cindy Froyd	Swansea
Knowledge Exchange			Shaun Russell/Saskia	
Workshop	NERC	£10,000	Pagella	Bangor

^{*} Eligible for £2000 but depends upon student return of forms



Organisational Structure 16/10/2012

Management Board

Aberystwyth: Professor Martin Jones Bangor: Professor David Shepherd Cardiff: Professor Hywel Thomas Swansea: Professor Ian Cluckie

Scientific Executive

Professor Sir John Houghton

C3W Director: Professor James Scourse Director of Outreach: Dr Clive Walmsley Institutional Director: Professor Neil Glasser Institutional Director: Dr Stuart Jenkins Institutional Director: Professor Ian Hall Institutional Director: Professor Tavi Murray

Professor Mike Hambrey Professor Nick Pidgeon Professor Mark Stallworthy Professor Geoff Duller C3W Manager: Gary Reed

C3W Project Officer: Dr Saskia Pagella

C3W Administrator: Non Lavaro

Outreach Officers

Aberystwyth: Vince Jones Bangor: Dr Saskia Pagella Cardiff: Dr Jeanette Reis Swansea: Dr Cynthia Froyd

Appendix 2: Climate Change Research Awards: by sponsor (109 items) Institutional collaboration a = Aberystwyth b = Bangor Value Lead **Sponsor Project Title** c = Cardiff Institution (£) s = Swansea ? = level of collaboration not known CC Related, non C3W funded (58 items) Methane Emissions Aberystwyth ? **Abertec** 85,643 University from Ruminants Sustainable Arable LINK - Project Bangor **ADAS UK Ltd** 35,000 a, b Research University Management ATP for Sustainable Bangor and Efficient Food 358,002 a, b University Production **Energy Grasses and** Aberystwyth Biorefining (EGB) 5,939,040 ? University ISPG Manipulating germination in the Aberystwyth 92,173 ? bioenergy crop University Miscanthus Characterisation and exploitation of Aberystwyth ? 36,109 bacterial endophytes University **Biotechnology and** in C4 energy crops **Biological Sciences** FACCE-JPI Knowledge Research Council (BBSRC) Hub co-ordination of Aberystwyth livestock/grasslands 120,542 ? University (LIVEM) component of MACSUR Integrated Biorefining Research Aberystwyth ? and Technology Club 92,173 University - Aberystwyth University Developing a ceral straw biorefinery Cardiff ? 8,000 using rice as a model University and feedstock

	Mechanistic studies	Cardiff		
BP International Ltd	of catalyst deactivation	University	170,000	?
Cambridge University	Knowledge exchange partnership sustainable food production	Bangor University	66,000	?
Careers West Wales	DISCOVER! 2012 - events series promoting STEM careers	Swansea University	2,500	?
DEFRA	Increasing efficiency of dietary nitrogen use in Dairy systems	Aberystwyth University	1,113,737	?
	Chagos Marine Protected Area	Bangor University	216,592	?
Dŵr Cymru Cyf (Welsh Water)	Towards Eutrophication Control in the Cefi Catchment	Bangor University	40,000	?
Engineering and Physical	Tuning catalysts surfaces to control aldol reactions in biomass conversion	Cardiff University 365,947		?
Sciences Research Council	Catalytic transformation of bio-derived platform molecules	Cardiff University	398,425	?
	TRANSFOR-M (TRANSatlantic FORestry Master- program)	Bangor University	79,259	?
	Payments for ecosystem services in tropical forests	Bangor University	87,332	?
	QUEEN	Bangor University	60,090	?
	Conservation of Mangifera Sylvatica	Bangor University	91,778	?
European Commission	Forest conservation by eminent domain	Bangor University	91,778	?
	BIOVADIA - Biodiversity and Valorisation of Blue Diatoms	Cardiff University	8,282	?
	AFTERTHEGOLDRUSH - Addressing global sustainability challenges by changing perceptions in catalyst design.	Cardiff University	1,869,424	?

	CAN TOGETHER (Crops and animals together) Aberystwyth University		194,976	?
	Mesoporous graphitic carbon nitrides supported noble metal Cardiff nanoparticles for University green catalysis under visible light. (NOMGCNGP)		171,407	?
European Space Agency (ESA)	Prototyping the Retrievals of Energy Fluxes and Surface Soil Moisture (PROGRESSION)	Aberystwyth University	32,861	?
Exxon Mobil Research & Engineering Co	Catalytic oxidative cracking of polynuclear aromatics	Cardiff University	129,629	?
Fishmongers' Company's Charitable Trust	Sustainable scallop fisheries in the English Channel	Bangor University	15,000	?
Henkel AG & Co. KGaA	Laundry and care home products	Cardiff University	58,400	?
Higher Education Council for Wales	Impact and effectiveness of widening access to HE in Wales	Cardiff University	100,725	?
International Union for Conservation of Nature			7,459	?
Invista Textiles (UK) Ltd	Designing gold catalysts for oxidation reactions	Cardiff University	140,480	?
Leverhulme Trust	Integrating ecology and social science in conservation: orchards, beetles and agroecology	Aberystwyth University	82,768	?
Multi - Sponsorship	Sustainable scallop fisheries in the English Channel	Bangor University	61,566	?
	Scale dependence of stocks and flows in ecosystem services valuation	Bangor University	1,639	?
NERC	Diversity in upland rivers and ecosystem service sustainability - DURESS (multi- sponsorship)	Cardiff University	1,198,117	c, a

	Diversity in upland rivers and ecosystem service sustainability - DURESS (multi- sponsorship)	Aberystwyth University	189,248	a,c
Royal Society	New directions in organic opto-electronics; probing advanced supramolecular materials and novel deposition technologies	Aberystwyth University	14,850	?
	The microbial decomposition of cellulose in the environment	Bangor University	14,904	?
Sasol Technology (PEY) Ltd	Selective oxidation of alkenes to epoxide over carbon supported gold/palliadium	Cardiff University	150,000	
	GIFT Green Innovations Future Technology	Bangor University	371,609	?
Southern & Eastern Regional Assembly, Ireland	Hydro BPT	Bangor University	134,419	,
	GIFT	Bangor University	192,691	?
Syngenta Ltd	Nanoengineering heterogeneous catalysts for the selective hydrogenation of key agrochemical derivatives	Cardiff University	36,000	?
Teagasc (Ireland)	WALSH FELLOWSHIP SCHEME- "High throughput approaches to evaluate genetic variation in digestive efficiency for cattle and sheep"	Aberystwyth University	70,088	?
Technology Strategy Board	Increasing ruminant production through the use of saponins to reduce protozoal numbers in rumen	Aberystwyth University	189,034	?
reciniology Strategy Board	Efficient Forage- Based Systems for Ruminant Livestock Production in UK	Bangor University	95,218	a, b

United Nations Environment Programme	Systematic review STAP (UNEP) 2011	1 2 1 8		?
U.S. Department of the Interior	Exploration & Bar Atlantic Deepwater Un Habitats		62,833	?
Waste and Resources Action Programme	PAS 100/CQP Producer Support - North Wales	Bangor University	4,167	?
Welsh European Funding Office	Welsh pilot scale plant for supercritical CO₂ extraction	Bangor University	326,042	?
	Improving catchment environmental quality through better nutrient management in the livestock farming landscape (CEFN Conwy) - extension	Bangor University	56,000	?
Welsh Government	Human Pathogens and Shellfish	Bangor University	552,577	?
	All Wales Academic Social Care Research Collaboration (ASCC)	Cardiff University	227,341	?
	The function and restoration of biogenic reefs formed by Sabellaria alveolata	Bangor University	45,279	?
	Scaling up conservation agriculture (Evergreen)	Bangor University	10,499	?
World Agroforestry Centre	Smallholder production systems and markets for forests, trees and agroforestry	Bangor University	15,432	?

Subtotal: £16,466,721

C3W Staff and their teams (50 items)					
Belgian Science Policy Office (Belspo)	Constraining ice mass changes in coastal Dronning Maud Land Antartica (IceCon) Aberystwyth University 5,28		5,289	?	
Birkbeck College	Pilot Study of dating aeolian sediments in North Africa	Aberystwyth University	5,000		
Cardiff University	Impacts of climate change on the coastal zone	Bangor University	2,488	a, c	
ccw	Using remote sensing to measure ecosystems in wales project	Aberystwyth University	14,010	?	
Department for Environment, Food and Rural Affairs (DEFRA)	Sea turtles in the British Indian Ocean Territory	Swansea University	24,985	?	
Depertment for Energy and Climate Change (DECC)	Support for IPCC Convening Authors during financial year 2012/13 Bangor University		9,470	?	
Dŵr Cymru Cyf (Welsh Water)	Catchment influences on DOC trends in the Alwen and Conwy Reservoirs	Bangor University	50,000	?	
European Commission	BARIUMCYCLING: Barium cycling in Antarctic waters: Understanding present and past ocean processes	Cardiff University	82,000	?	
	The Impacts of Multiple Climate & non-Climate Stresse Marie-Curie	Aberystwyth University	83,657	?	
European Space Agency (ESA)	Synergistic use of sentinel missions for estimating and monitoring land surface temperature (SEN4LST) Swansea University		68,638	?	
European Union	Visiting Professor, Institute of Ecology & Environment Protection, Nicolaus Copernicus University, Poland	Swansea University	2,365	?	
Fujitsu Limited	Tide-ice sheet interaction in a future climate	Bangor University	69,085	?	

Fundacao Para a Ciencia e a Technologia Halcrow Group Ltd	Landscape genetics of stone martens and red foxes in cork oak fragmented forest in Southern Iberia: A tool for carnivore management and conservation Environmental water	Cardiff University Cardiff	10,483	?
Trailerow Group Ltu	management	University	00,300	•
Interact	Measuring englacial liquid-water using borehole geophysics at Storglaciaren, Sweden	Swansea University	5,861	?
interact	Seismic assessment of basal galcier ice and its water content at Storglaciaren, Sweden (SEIS-STOR)	Swansea University	3,905	?
Leverhulme Trust	Southern ocean sponges: The link between biogeography and geochemistry	Cardiff University 75,142		?
	PHILIP LEVERHULME PRIZE - Siwan Davies	Swansea University	70,000	?
National Geographic Society	The role of fjords in regulating ocean drivers of glacier dynamic changes in Greenland	Swansea University	12,466	?
Natural History Musuem	Taxonomic evaluation of cryoconite cyanobacteria: barcoding keystone taxa On Glaciers	Aberystwyth University	6,785	?
	Development of a laser-based sea-ice chlorophyll sensor	Bangor University	3,210	?
	Swahili Seas	Bangor University	32,346	?
NERC	Quantifying gas- phase losses of carbon from mangrove ecosystems.	Bangor University	78,276	?
	The Environment of the Arctic: Climate, Ocean and Sea Ice (tea-cosi)	Bangor University	255,526	?

1	T		
FASTNEt - Fluxes Across the Sloping Topography of the North East Atlantic	Bangor University	422,506	?
Boreal Nitrogen Gap: Impacts of nitrogen fixation in forest ecosystems	Bangor University	337,257	?
Determination of the CO2 system at sub- zero temperatures in seawater	Bangor University	535,147	?
BRITICE-CHRONO	Bangor University	182,495	a, b, s
BRITICE-CHRONO	Aberystwyth University	200,295	a, b, s
BRITICE-CHRONO	Swansea University	103,520	a, b, s
Response of ES to coupled MN cycles from Source to Sea	Bangor University	800,320	?
Examine relationship between biodiversity and ecosystem service flows	Bangor University	304,240	?
Examine relationship between biodiversity and ecosystem service flows	Bangor University	21,071	?
Science into Policy for the Ecosystem Approach	Bangor University	10,000	a, b, c, s
Climate change and the costs of survival in marine crustaceans	Bangor University	23,714	?
Extended Range Optical Televiewer Imaging of the NEEM Deep Ice Borehole	Aberystwyth University	52,407	?
Sequencing the Antarctic marine microbial eukaryotic biosphere.	Bangor University	1,400	?
Shifting climate as a predictor for change in marine biodiversity at local, regional & global basis	Aberystwyth University	25,709	?
Glacier surfaces the last refuge of an evolutionary ancient lineage of fungi?	Aberystwyth University	62,865	?

Subtotal			£5,898,48	4
Welsh Government	Energy system change survey in Wales	Cardiff University	3,200	?
WAVE Foundation	Adaptation of marine turtles to climate change	Bangor University	2,421	?
Use of Welsh Committee, Swansea	Welsh language film. GLIMPSE: Yr iâ sy'n diflannu o'r Ynys Las	Swansea University	6,000	
University of Gloucester	Evaluating and modelling the impact of extreme events on South Africa dryland rivers: Cyclone Dando	Aberystwyth University	2,094	?
Royal Society	BIOSMART: Mapping movement mathematically; a facility to extract behaviour from acceleration	Swansea University	393,630	?
	Impact of forest thinning on carbon sequestration	Swansea University	3,000	?
Royal Academy of Engineering	Development of an integrated numerical model for the flood risk management in urban areas and its application	Cardiff University	24,000	?
Quaternary Research Association	Baobabs as a palaeoclimatic archive	Swansea University	550	?
	Assessing the role of millennial-scale variability in glacial-interglacial climate change	Cardiff University	274,336	?
	Multi-scale response of water quality, biodiversity and C sequestration to coupled macronutrient cycling from source to sea	Bangor University	1,064,021	
	Interrogating trees as archives of environmental sulphur variability	Swansea University	10,799	?

Appendix 3: C3W Employed Staff

Climate Change Consortium of Wales

C3W staffing as at 31st October 2012 Names in red appointed during the reporting period up to Dec 2012

Appendix 3: C3W Staff

INSTITUTE	NAME	START DATE
Aberystwyth University		
Terrestrial Systems PDRF	Dr Georgina King	01/02/2011
Cyrospheric Lecturer buy out	Dr Tom Holt	01/10/2011
Financial administrator	Non Lavaro	07/02/2012
Cryospheric PDRF	Dr Ann Rowan	01/03/2012
Media Outreach Manager	Vince Jones	01/09/2012
Terrestrial Systems Lecturer	Dr Joseph Williams	01/09/2012
Human Dimensions PDRF	Dr Rachel Howell	17/09/2012
Bangor University		
Sclero Technician (80% fte)	Mr Brian Long	01/05/2010
Support technician mesocosm (50%)	Amanda Pettersen	01/11/2010
Marine Geologist (replacement for Prof Scourse)	Dr Anna Pienkowski	01/02/2011
Education Outreach Manager	Dr Saskia Pagella	14/02/2011
Marine Systems Research Lecturer	Dr Stephanie Wilson	01/06/2011
Dynamic Oceanography PDRA	Clare Green	01/10/2011
CNS Lecturer	Dr Paul Butler	01/03/2012
Senior Lecturer Marine Systems	Dr Mattias Green	to start in 2013**
Cardiff University		
Policy Outreach Manager	Dr Jeanette Reis	01/02/2011
Human Dimension Junior Research Assistant	Dr Jessica Paddock	01/03/2011
Marine Research Assistant	Dr Kai Yan	01/04/12
Human Dimension Junior Research Assistant	Dr Stuart Capstick	01/11/2011
Human Dimension Research Associate	Dr Kelvin Mason	01/04/2012
Human Dimension Research Associate	Dr Kelvin Mason	01/04/2012
Terrestrial Lecturer	Dr Kate Hendry	01/01/2012
Human Dimension Junior Lecturer	Dr Christina Demski	starting May 2013
Marine Research Lecturer	Dr Martin Ziegler (20% FTE)	01/10/2012
Junior Marine Research Assistant	Dr Paolo Moffa Sanchez	01/10/2012
Marine Research Fellow (new post)	Dr Lukas Jonkers	26/11/2012
Swansea University		
Swansea - Project manager/researcher	Dr Tim James	01/10/2009
Business Outreach Manager	Dr Cynthia Froyd	01/03/2011
Terrestrial Mass spec Technician	Dr Giles Young	01/04/2011
Marine Lecturer	Dr John Griffin	15/09/2012
Human Dimensions Research Assistant	Dr Mark Allen	01/12/2012
Cryosphere Research Officer	Dr Daniella Jansen	01/05/2012
Cryosphere Research Officer	Dr Nicholas Selmes	15/08/2012
Cryosphere Research Officer	Dr Adam Booth	15/02/2012
Swansea - C3W secretary (10% fte)	Ms Catrin Evans	09/01/2012
Swansea - C3W secretary (20% fte)	Mr YoannDrocourt	05/11/2012

^{**}currently NERC Advanced Research Fellow, but progressing to C3W---funded position on termination of NERC contract

2012

27 Nov

13 Nov

12 Nov

2012

7 Nov

2012

2012

2012

Series:

Fujitsu

Research

Meeting

Outreach

Panel Meeting

Low Carbon

Conference

Communicat-

Science Report

ing Climate

Launch

Futures

Consortium

University

Royal

Society,

London

Gateway

Shrewsbury

Cardiff City

Imperial

College,

London

Hall

Centre,

Froyd

James

Scourse

Outreach

Jeanette

Vince Jones

and Saskia

Pagella

Reis

Panel

Appendix 4: C3W Outreach Activity Activity Target Date Venue Lead **Outreach Notes Title** Audience Natural Met the new board of Natural Resources Resources 20 Dec Jeanette Policy Cardiff Wales and made them aware of C3W 2012 Wales meet Reis makers activities. and greet Met the new CEO Emyr Roberts and Natural Policy introduced him to the work of C3W. Also CCW Resources 18 Dec Saskia makers, had a talk from the new Chair for NRW Offices, NGOs and 3rd 2012 Wales meet Pagella about how the new organisation will North Wales and greet sector function. James Scourse and Clive Walmsley also attended **Brown Bag** Lunch 4 Dec Cardiff Jeanette PhD lunchtime seminar series. Approx 10 **PhD Students** Seminar-Sarah 2012 University Reis attendees. Moore Howardian **Pupil Referral** 10 pupils and 4 staff from the Howardian 29 Nov 14 – 16 year Jeanette Cardiff PRU explored Climate Change via Unit field 2012 Reis olds practical sessions in Cardiff Bay. session-Cardiff Bay Swansea 'Our changing climate: science, impacts 28 Nov Swansea Cindy General **Public Lecture**

public

International

researchers

and industry

Outreach

Academics

General

public, policy

researchers

and industry

Panel

and policy'

was the main topic

Minutes available – new website design

LCRI conference attended. Discussed

experiences between C3W and LCRI.

Very interesting range of speakers - the

science is increasingly being considered

http://www.lwec.org.uk/publications/climate-science-public-and-news-media

importance of how we communicate

possibility of exchanging training

Agreed to meet in the new year.

by a range of stakeholders

UK Science on a Sphere (SoS) UK Network Meeting	30 Oct 2012	Science Museum, London	Saskia Pagella	SoS stakeholder policy and education sector	Sir Crispin Tickell chaired a meeting with NOAA's Sara Summers and other stakeholders in the UK SoS Network. Productive meeting with clear actions to follow up regarding Saskia getting a group of presenters together using the Science Museum SoS and the group to assist C3W with getting funding to purchase SoS
Risk Management Conference	26 Oct 2012	Cardiff University	Jeanette Reis	Academics and policy makers	Attended conference and discussed C3W assessment and management of climate change risks with several academics, BGS representatives and policy makers.
SoS/Pontio meeting	10 Oct 2012	Managemen t Centre, Bangor	Saskia Pagella	C3W, Bangor University	Meeting with Prof Gerry Hunter - Pontio Theme Leader to discuss the prospect of SoS in Pontio exhibition space. James also attended
Green Awareness Day	05 Oct 2012	Cardiff University	Jeanette Reis	Students and academics	Helped organise and deliver a Green Awareness Day. Hosted a stand at entrance to Psychology Building. Approx 100 attended. Lorraine Whitmarsh led the event.
MATLAB training for early researchers	03 Oct 2012	Gregynog Hall	Saskia Pagella	PhD students and Early Researchers	This was initiated by Dr Henry Lamb in Aberystwyth University, organised by Saskia and delivered by Martin Trauth. HPCWales provided funding for those in convergence zones. C3W subsidised costs for C3W postgraduates, while externals paid full costs.
Climate Change Commission for Wales Breakfast Meeting	02 Oct 2012	Manage- ment Centre, Bangor	Saskia Pagella	Business, policy and academics	Looking at how business can become more sustainable. Clive Walmsley, Ian Hall and Lorraine Whitmarsh also attended.
6 Month HEFCW Report submitted	01 Oct 2012	n/a	Saskia Pagella	HEFCW	Saskia/James/Non and Gary submitted the interim report. Publications and grants not included.
BRITICE CHRONO Launch Meeting	27 Sep 2012	Peak District	Saskia Pagella	Researchers and outreach	Launch of big NERC Research Consortium - C3W been sub-contracted to do the Impacts Proposal (apart from the business outreach). Funded 35k for outreach
International Conference on Marine Environmental Governance	27 Sep 2012	Kaoshiung Taiwan	Jeanette Reis	Inter- national policy makers and academics.	Paper presented on climate change and policy response in Wales. Also Chaired a session. 3-day conference 25-28th September 2012. Attended by approx 150.
Film festival	24 Sep 2012	Monterey, California, USA	Laurence Dyke	General public	The film 'A GLIMPSE of Greenland The disappearing ice' won an "honourable mention" in the student category of the 2012 Blue Ocean Film Festival http://www.blueoceanfilmfestival.org/Monterey, California.
Tyndall Conference	13 Sep 2012	Cardiff University	Jeanette Reis	PhD students & academics	Assisted organisation of Tyndall Conference. Approx 120 attendees.

Tyndall Public Event- Parc Thistle Hotel	12 Sep 2012	Cardiff	Jeanette Reis	General public, policy makers, academics	Organised public event held at Parc Thistle hotel in Cardiff. Approx 150 attendees.
Tyndall Assembly (11th - 13th September)	11 Sep 2012	Cardiff University	Jeanette Reis	Research and policy community	This was an excellent annual meeting where mainly Tyndall researchers presented. Prof Pidgeon allocated some space for C3W to attend. Saskia Pagella and James Scourse attended the first event - an open public debate about perceptions of climate change. On the second day Dr Kevin Anderson and Prof Bob Watson had a live debate about whether climate change scientists should attend international conferences
Film showing: A GLIMPSE of Greenland The disappearing ice	01 Sep 2012	Pennard Men's Club	Tavi Murray	General public	
Summer Newsletter sent out	12 Aug 2012	Wales-wide	Saskia Pagella	C3W Contacts	Academics, policy makers (including Chief Scientist - John Harries), agencies, NGOs and students (400+) received a copy by email - good feedback
National Eisteddfod	07 Aug 2012	Cowbridge, Vale of Glamorgan	Cynthia Froyd	General public, Welsh speakers	Film showing: GLIMPSE: yr iâ sy'n diflannu o'r Ynys Las
National Eisteddfod	07 Aug 2012	Cowbridge, Vale of Glamorgan	Siwan Davies	General public, Welsh speakers	Interview with adventurer Lowri Morgan
Climate Networking Day	03 Jul 2012	Cardiff University	Jeanette Reis	PhD students	Kate Hendry delivered a climate networking day for PhD students. Approx 25 attendees.
Big Bang Fair	28 Jun 2012	Liberty Stadium, Swansea	Cynthia Froyd	Secondary schools	Glacial goo demonstration. Discover! girls reporting on this year's programme.
Interview for CCIEP tender Phase 1	22 Jun 2012	Cadwyn Clwyd, Ruthin	Saskia Pagella	Cadwyn Clwyd	Our tender scored very highly and we were asked to come to a second interview. Clive Walmsley also attended to represent the CCW in-kind contribution in the bid.
Public Lecture. Climate Change- Implementing Policy Responses	19 Jun 2012	Cardiff University	Jeanette Reis	General public, policy makers and academics	Prof Mark Stallworthy, Swansea University delivered a 1 hour public lecture. Approx 100 attendees from general public, policy makers and academics.
Science Executive Meeting	18 Jun 2012	Shrewsbury	James Scourse	C3W	Saskia and Non attended and recorded the minutes
The Times Cheltenham Science Festival	17 Jun 2012	Cheltenham	Tavi Murray	General public	Talk on Greenland's changing ice - featuring footage and images from the film documentary GLIMPSE of Greenland: The Disappearing Ice, which follows a team of Swansea glaciologists on adventurous field research in south-east

					Greenland in 2010 and 2011, to investigate how and why Greenland's ice is changing. 160 attendees.
Film premier. GLIMPSE: yr yr iâ sy'n diflannu o'r Ynys Las	08 Jun 2012	Caernarfon	Cynthia Froyd	Secondary schools	Premier of Welsh language version of the Greenland film.
Urdd Eistedfodd	04 Jun 2012	Caernarfon	Cynthia Froyd	Education sector: primary and secondary school children	4- 10 June. 14,000 attendees. Coverage on S4C. C3W had two stands in the science tent: Arctica islandica exhibit, and activities / display about tephra, ice cores and glacial processes. Collaborated with Bangor team - Saskia Pagella and Bangor Arctica researchers for which Bangor Uni student Recruitment supplied funding
CCIEP tender delivery	31 May 2012	Ruthin	Saskia Pagella	Cadwyn Clwyd	Submitted tender for the Climate Change Information and Education Project in Clwydian Range and Dee Valley AONB. Phase 1 is a review and stakeholder engagement. Phase 2 and 3 - not yet bid for, are to design and deliver the education programme itself
Glacial goo activity	30 May 2012	Severn Sisters	Eleri Harris	Primary school	
Public lecture: Climate Change - Engineered Solutions?	29 May 2012	Cardiff University	Jeanette Reis	General public, policy makers, academics	Prof John Shepherd of Southampton University delivered a public lecture. Approx 120 attended.
Shipping and Sustainability Meeting	29 May 2012	Norweigian Church, Cardiff Bay	Jeanette Reis	Academics, industry.	Cardiff University and industry representatives attended this meeting. Approx 25 attendees.
Glacial goo activity	28 May 2012	Glynneath	Eleri Harris	Primary school	
Child Protection Training	24 May 2012	Bangor University	Saskia Pagella	Bangor staff/C3W outreach and volunteers	Law changing
SOS Meeting	21 May 2012	Science Museum	Cynthia Froyd	C3W academics & outreach	Meeting with the UK Network team to review whether more SoS should be purchased in UK
Howardian Pupil Referral Unit field trip	16 May 2012	Cardiff Bay	Jeanette Reis	Young people excluded from school	10 key stage 3 pupils explored a changing climate in Cardiff Bay
Meeting with Kate Walker to develop Engagement Proposal for funding	15 May 2012	Cardiff University	Jeanette Reis	Postgrad students	Met with Kate Walker (PhD student) to scope a multi-disciplinary engagement proposal for climate change network activities.

Climate Change experiments	11 May 2012	Ysgol Hirael	Saskia Pagella	Year 2 and Year 6 (50 pupils)	Finishing off the organic waste and GHG experiments that were started in Climate Week
Meeting to progress Sustainable Living Wales grant	08 May 2012	Cardiff University	Jeanette Reis	Community councils	Met with Lorraine Whitmarsh, Cynnal Cymru, One Voice Wales and representatives of community councils to scope the Sustainable Living Wales grant application.
Public Lecture: Climate Change - Public Perceptions	01 May 2012	Cardiff University	Nick Pidgeon	General public, policy makers, academics	Professor Nick Pidgeon of Cardiff University delivered this public lecture. Approx 130 attended.
SOS Meeting Jennifer Pride, Lucy Corfield, Clive Walmsley and James Scourse	01 May 2012	Welsh Gov, Cardiff	Saskia Pagella	Welsh Government	This meeting followed her receipt of the business development proposal where we discussed the seed funds for the SOS project. Other key initiatives in the CC Division were also discussed with the potential involvement of C3W considered
Public Lecture: Climate and Ancient Civilisation	17 Apr 2012	Cardiff University	Jeanette Reis	General public, policy makers, academics	Prof. David Hodell (Cambridge University) delivered this public lecture. Approx 120 attended.
Public Lecture: Climate Change- Communicat- ing Policy Relevant Science	03 Apr 2012	Cardiff University	Jeanette Reis	General public, policy makers, academics	Dr Gavin Schmidt (NASA) delivered this public lecture. Approx 150 attendees
Glacial goo activity	02 Apr 2012	DOVE Workshop, Banwen, Neath	Eleri Harris	Primary school students	
C3W/CEH MOU	30 Mar 2012	СЕН	Saskia Pagella	C3W	Meeting with Prof Emmett to draw up an MOU between C3W and CEH - Clive Walmsley also attended.
Glacial goo activity	28 Mar 2012	Swansea University	Cynthia Froyd	Secondary schools	Science activity for potential Discover! members. Attended by 30 secondary school girls.
Fujitsu/ HPCWales studentship workshops	20-21 Mar 2012	Gregynog Hall	Saskia Pagella	Academics and business	Fujitsu and HPCWales review Climate Change PhD proposals submitted from PI's throughout Wales, ahead of the actual Call to refine and make sure bids incorporate Convergence Zone targets etc
Climate Change Impacts Modelling Workshop WERH/C3W	19 Mar 2012	Gregynog Hall	Saskia Pagella	Researchers and policymakers	Successful workshop featuring some of the leading CC impacts modelling in various habitats/ecosystems in Wales and UK. Delivered in collaboration with Wales Environment Hub
Science Week - Hidden Worlds	17 Mar 2012	Bangor University	Saskia Pagella	General Public	C3W stand and feature of Antarctic Climate Change Research in Bangor - over 400 visitors

Climate Week - Funky Dragon event	16 Mar 2012	Pierhead Building, Cardiff Bay	Jeanette Reis	Key stage 4 pupils	Clive Walmsley and Jeanette Reis attended this session. Clive presented an introduction to climate change science. Identified a list of climate active secondary schools.
Climate Week - Science Policy Event	15 Mar 2012	Cardiff University	Jeanette Reis	Academics and policy makers	Swansea's climate change film was shown and academics exchanged papers and presented their latest research.
Climate Week - CCC Low Zero Carbon Hub Annual Summit	14 Mar 2012	Cardiff	Saskia Pagella	Business, research and policy	Large Summit with key stakeholders in the built environment. Facilitated the breakout session on 'retrofit'. Clive Walmsley chaired the day. 400+ attended
Climate Week - Reardon Smith schools event	14 Mar 2012	Cardiff University	Jeanette Reis	Key Stage 3 pupils	"Sea snakes and ship ladders" game was used to explore the implications of climate change for shipping. 2 x 30 pupils. Kate Hendry assisted.
Climate Week - school experiments	13 Mar 2012	Waterfront Museum, Swansea	Cynthia Froyd	Secondary schools	'Glacial goo'. Hands-on glacial processes demonstration for 60+ secondary school children. Building their own glacier to investigate the nature of glacial movement: exploring which areas of a glacier move fastest and why, calculating rates of flow, and understanding the effects of temperature and topography.
Climate Week - school experiments	13 Mar 2012	Ysgol Hirael	Saskia Pagella	Key Stage 1 and 2 pupils	Managing organic waste sustainably - climate change mitigation - "What rots?" experiments with 50 primary school kids
Climate Week - Bitesize Climate Change	13 Mar 2012	Radyr Secondary School, Cardiff	Jeanette Reis	Key Stage 4 pupils	Jeanette Reis and Rebecca Marsh (a PhD student) delivered a bite-size climate change session at a secondary school. Approx 30 attendees.
Howardian pupil referral unit fieldtrip	07 Mar 2012	Cardiff Bay	Jeanette Reis	Key stage 4 pupils	10 pupils (Key Stage 4) used environment metres and survey equipment to explore what a changed climate might look like in Cardiff Bay.
Community Action on Climate Change pathfinder advisory team	07 Mar 2012	Cwm Clydach	Tim Williams	Pathfinder group, Welsh Government and local groups	Peter Davies's team of advisors met to support and advise the pathfinders involved. TW represents C3W on this panel
Public lecture: Health & Society	06 Mar 2012	Cardiff University	Jeanette Reis	General public, policy makers, academics	Prof Virginia Murray (Health Protection Agency) delivered a public lecture. Attendee by approx 140.
Meeting Sally Sudworth - Zero Low Carbon Hub, Climate Change Commission Wales	29 Feb 2012	Bangor University	Saskia Pagella	Outreach	Saskia joined this working group in the Commission - meeting to discuss the Summit they are planning for the 14th March 2012 in Cardiff

Public lecture by Lord Dafydd Elis-Thomas AM.	23 Feb 2012	Swansea University	Cynthia Froyd		'A carbon-free Wales, is it possible in time?'
Bangor University Science Outreach Meeting	21 Feb 2012	Bangor University	Saskia Pagella	Scientists delivering outreach	Second meeting to develop mission statement and strategy for science outreach in Bangor University
Contact with Fujitsu regarding PhD funding and other potential funding for climate change research	11 Feb 2012	Aberystwyth University	Tim Williams	Fujitsu HPC Wales and Welsh Government	Phone calls with Ross Nobes and James Southern regarding Gregynog event and other Fujitsu input leading to C3W Climate Modelling Facility in Wales
Meet Ewen Brierley	09 Feb 2012	Aberystwyth	Tim Williams	HEFCW	TW gave a resume' of C3W activities in a meeting with Ewen Brierley of HEFCW who oversee the C3W project.
Meeting with Cynnal Cymru	09 Feb 2012	Cardiff University	Jeanette Reis	Community council groups	Meeting with Rhodri Thomas of Cynnal Cymru and Lorraine Whitmarsh of Cardiff University to discuss a Strong Roots Communities grant application. Agreed to submit a joint bid.
Bangor University Science Outreach Strategy Meeting	07 Feb 2012	Bangor University	Saskia Pagella	Scientists delivering outreach	Developing mission statement and strategy for science outreach throughout the university
Public lecture: Climate Change- The Role of Living Things	07 Feb 2012	Cardiff University	Jeanette Reis	General public, policy makers, academics	Prof Andy Ridgwell of Bristol University delivered a public lecture. Attended by approx 140
Fujitsu HPCWales meeting with C3W	03 Feb 2012	Bangor University	Saskia Pagella	C3W, Fujitsu, HPC Wales and Bangor University	Planning meeting to: a) finalise student agreement for Sophie's PhD (funded by Fujitsu) b) set criteria and arrangements to review incoming PhD proposals and c) arrangements for associated workshop in Gregynog.
Media briefing on Climate Change Commission Annual Report	31 Jan 2012	Cardiff	Clive Walmsley	Government, agencies, researchers and press	Clive, Jen and Saskia attended to launch and met with some of the Climate Change Commission team including Peter Davies

Natural Environment Framework: Sustaining a Living Wales	30 Jan 2012	Tata Steel in Port Talbot	Saskia Pagella	Policy makers, agency and academics	Welsh Government launched the Green Paper - which sets out how they aim to take an 'ecosystem approach' to change the way we manage and regulate the environment in order to improve outcomes for society, business and the environment. Followed by a NEF/SEB reference group meeting - discussing the Single Environmental Body proposal
Launch of Climate Change Consortium Annual Report	29 Jan 2012	Senedd, Cardiff Bay	Jeanette Reis	Policy makers	Attended by approx 50 people
Public Lecture: Climate Change - Human Evolution	17 Jan 2012	Cardiff University	Jeanette Reis	General public, policy makers, academics	Prof Julia Lee thorpe (Oxford University) delivered a public lecture. Attended by approx 120.
Meeting Prof Bridget Emmett	16 Dec 2011	Wales Environ- ment Research Hub	Saskia Pagella	C3W Outreach	Discussed the Fujitsu/WERH & CEH workshop March 2012. Draft workshop proposal to be circulated Jan 2012
Planning Meeting for Science Week 2012	14 Dec 2011	Bangor University	Saskia Pagella	Bangor staff	Dr Rosanna Robinson heading up the team in Bangor - meeting to record people's desire to input and in what way to Science Week in Bangor. Minutes available in Jan 2012
Arctica islandica exhibition - Westminster	12 Dec 2011	West- minster Palace	James Scourse	Politicians and business	James and his research group took the whole exhibition upon invite from the Anglesey MP - Albert Owen. A very productive networking event with much interest shown from politicians and businesses, such as Horizon
Community Action for CC Pathfinder meeting (Welsh Government)	06 Dec 2011	Carmarthen	Tim Williams	Community Pathfinders	Advising Pathfinders on future activity, Welsh Government
BBC Radio Wales broadcast Climate Change: the evidence - Question Time debate	06 Dec 2011	BBC Radio Wales	Saskia Pagella	General Public	The Question Time debate in our final evening of the C3W annual lecture series was hosted by Adam Walton and broadcast at 7pm via the Science Cafe. C3W panel of experts for the evening were Prof James Scourse, Sir John Houghton (FRS), Dr Clive Walmsley, Dr Lorraine Whitmarsh & Jane Davidson
Bridge Innovation Centre Opening	05 Dec 2011	Pembroke Dock	Cynthia Froyd	Business sector	Attended opening of Bridge Innovation Centre at the Pembrokeshire Science and Technology Park. Talk by Edwina Hart, Minister for Business, Enterprise Technology and Science

Public lecture, the last in Bangor series - Climate Change: the evidence BBC Radio Wales record & host the Question Time debate	29 Nov 2011	Bangor University	Saskia Pagella	General public	Evening started with keynote speech from former Minster for Environment Jane Davidson, on 'Sustainable Development'. Then BBC's Adam Walton hosted a C3W public Question Time Debate, where a panel of experts answered questions from the audience. 100+ attended. Panel members included: Prof James Scourse, Dr Clive Walmsley, Jane Davidson, Dr Lorraine Whitmarsh and our Chief Scientific Advisor - Sir John Houghton (FRS). The programme was broadcast on the Science Café, BBC Radio Wales.
Welsh Government Capacity Building Workshop	25 Nov 2011	Cathays Park Cardiff	Tim Williams	Welsh Government	Sustainable Behaviours and Engagement Team Sustainable Places Division, Welsh Government - what skills practitioners will need to learn to be able to deliver low carbon lifestyles; - audience to be targeted; types of interventions to be used; projects to be prioritised to achieve the greatest impact.
Film premier: A GLIMPSE of Greenland The disappearing ice	22 Nov 2011	Swansea University	Tavi Murray	General public	The film opened to a "sell out" audience of ~300 in the Arts Cinema Taliesin on Swansea University campus.
Bangor Public Lecture series no.8 - Climate Change: the evidence	22 Nov 2011	Bangor University	Saskia Pagella	General Public	Climate Change and carbon accounting - Dr Rachel Taylor: Carbon Footprinting & Life Cycle Assessment (agriculture) & Dr Calvin Jones: Measuring GHG emissions associated with tourism in Wales. Approx 70 - 80 attended
Public lecture: Climate Change - Biodiversity	22 Nov 2011	Cardiff University, Cardiff	Michael Bruford	General public, academics	Public lecture by Prof. Mike Bruford. Approx 150 attendees.
Bangor public lecture no.7 - Climate Change: the evidence	15 Nov 2011	Bangor University	Saskia Pagella	General Public	Climate Change & the Welsh Dimension - Prof Bridget Emmett (CEH) & Dr Clive Walmsley (CCW) Approx 60 - 70 attended
LCRI - Presentation on C3W and collaborative outreach	15 Nov 2011	Cardiff University	Tim Williams	Academics, business and policy advisors	

C3W Cryosphere and Climate Change bibliography 2011 – 2012 C3W employed scientists and those working in C3W Institutions and linked to research themes

- 1. Bailey, I., Foster, G.L., Wilson, P.A., Jovane, L., Storey, C.D., Trueman, C.N. & Becker, J. 2012, Flux and provenance of ice-rafted debris in the earliest Pleistocene sub-polar North Atlantic Ocean comparable to the last glacial maximum. *Earth and Planetary Science Letters* **341-344**, pp222-233.
- 2. Bendle, Jacob M. & Glasser, N.F. (2012) Palaeoclimatic reconstruction from Lateglacial (Younger Dryas Chronozone) cirque glaciers in Snowdonia, North Wales. *Proceedings of the Geologists Association* **123**
- 3. Bevan, S. L., Luckman, A. J., & Murray, T. (2012) Glacier dynamics over the last quarter of a century at Helheim, Kangerdlugssuaq and 14 other major Greenland outlet glaciers. *The Cryosphere* **6:** 5, pp923–937
- 4. Bevan, S. L., Murray, T., Luckman, A. J., Hanna, E., & Huybrechts, P. (2012) Stable dynamics in a greenland tidewater glacier over 26 years despite reported thinning. *Annals of Glaciology 53:* 60
- 5. Booth, A.D., Clark R.A and Murray. T (2011) Influences on the resolution of GPR velocity analyses and a Monte Carlo simulation for establishing velocity precision. *Near Surface Geophysics* **9**: 5, pp399-411
- Booth, A. D., Clark, R. A., Kulessa, B., Murray, T., Carter, J., Doyle S. & Hubbard A. (2012) Thin-layer effects in glaciological seismic amplitude-versus-angle (AVA) analysis: implications for characterising a subglacial till unit, Russell Glacier, West Greenland. *The Cryosphere* 6: pp909-922, doi:10.5194/tc-6-909-2012
- 7. Carrivick, J.L., Davies, B.J., Glasser, N.F., Nyvlt, D. & Hambrey, M.J. (2012) Late-Holocene changes in character and behaviour of land-terminating glaciers on James Ross Island, Antarctica, *Journal of Glaciology* **58**: S pp1176-1190
- 8. Christoffersen, P., Mugford, R. I., Heywood, K. J., Joughin, I., Dowdeswell, J. A., Syvitski, J. P. M., Luckman, A. & Benham, T. J. (2011) Warming of waters in an East Greenland fjord prior to glacier retreat: mechanisms and connection to large-scale atmospheric conditions. *The Cryosphere* **5**: 3, pp701-714
- 9. Clark, J., McCabe, A., Bowen, D. & Clark, P. (2012) Response of the Irish Ice Sheet to abrupt climate change during the last deglaciation. *Quaternary Science Reviews* **35**pp100-115.
- 10. Cook, S., Zwinger, T., Rutt, I.C., O'Neel, S., Murray, T. (2012) The effect of surface meltwater in a physicall-based calving model applied to Columbia Glacier, Alaska *Annals of Glaciology* **53**: 60 pp90-96
- 11. Davies, B.J., Carrivick, J.L., Glasser, N.F., Hambrey, M.J. & Smellie, J.L. (2012a) Variable glacier response to atmospheric warming, northern Antarctic Peninsula, 1988-2009. *Cryosphere* **6**: S pp1031-1048

- 12. Davies, B.J. & Glasser, N.F. (2012) Accelerating shrinkage of Patagonian glaciers from the Little Ice Age (similar to AD 1870) to 2011. *Journal of Glaciology* **58**: S pp1063-1084
- 13. Davies, B.J., Roberts, D.H., Bridgland, D.R. & Cofaigh, C.O. (2012b): Dynamic Devensian ice flow in NE England: a sedimentological reconstruction. *Boreas* **41**: S pp337-366
- 14. Davies, B.J., Roberts, D.H., Bridgland, D.R., Cofaigh, C.O., Riding, J.B., Demarchi, B., Penkman, K.E.H., Pawley, S.M. (2012c) Timing and depositional environments of a Middle Pleistocene glaciation of northeast England: New evidence from Warren House Gill, County Durham. *Quaternary Science Reviews* 44: S pp180-212
- 15. Davies, B.J., Hambrey, M.J., Smellie, J.L., Carrivick, J.L., Glasser, N.F. (2012d) Antarctic Peninsula Ice Sheet evolution during the Cenozoic Era. *Quaternary Science Reviews* **31**
- 16. Doyle, S.H., A.L. Hubbard, C.F. Dow, G.A. Jones, A. Fitzpatrick, A. Gusmeroli, B. Kulessa, K Lindbäck, R. Pettersson & Box. J. (2012) Ice tectonics during the rapid tapping of a supraglacial lake on the Greenland Ice Sheet. *The Cryosphere Discussions* **6**, pp3863-3889
- 17. Drocourt, Y., Borgo, R., Scharrer, K., Murray, T., Bevan, S. & Chen, M. (2011) Temporal visualization of boundary-based geo-information using radial projection. *Computer Graphics Forum* **30**: 3, pp981–990
- 18. Foster, G.L., Lear, C.H. & Rae, J.W.B. (2012) The evolution of pCO₂, ice volume and climate during the middle Miocene. *Earth and Planetary Science Letters* **341-344**, pp 243-254
- 19. Gasson, E., Siddall, M., Lunt, D., Rackham, O., Lear, C., Pollard, D. (2012) Exploring uncertainties in the relationship between temperature, ice volume, and sea level over the past 50 million years. *Reviews of Geophysics* **50**: RG1005.
- 20. Glasser, N.F. & Gudmundsson, G.H. (2012) Longitudinal surface structures (flowstripes) on Antarctic glaciers. *Cryosphere* **6**
- 21. Glasser, N.F., Harrison, S., Schnabel, C., Fabel, D. & Jansson, K.N. (2012a) Younger Dryas and early Holocene age glacier advances in Patagonia. *Quaternary Science Reviews* **58**: S pp7-17
- 22. Glasser, N.F., Hughes, P.D., Fenton, C., Schnabel, C. & Rother, H. (2012b) 10Be and 26Al exposure-age dating of bedrock surfaces on the Aran ridge, Wales: evidence for a thick Welsh Ice Cap at the Last Glacial Maximum. *Journal of Quaternary Science* 27
- 23. Gregory, J.M., Browne, O.J.H., Payne, A.J., Ridley, J.K., Rutt, I.C. (2012) Modelling large-scale ice-sheet climate interactions following glacial inception *Climate of the Past Discussions* **8**, pp169-213
- 24. Gusmeroli, A., Jansson, P., Pettersson, R. & Murray, T. (2012) Twenty years of cold surface layer thinning at Storglaciaren, sub-Arctic Sweden, 1989-2009 *Journal of Glaciology* **58**: 207, pp3-10
- 25. Hambrey, M.J. & Glasser, N.F. (2012) Discriminating glacier thermal and dynamic

- regimes in the sedimentary record. Sedimentary Geology 251: S pp1-33
- 26. Harrison, S., Glasser, N.F., Duller, G.A.T. & Jansson, K.N. (2012) Early and mid-Holocene age for the Tempanos moraines, Laguna San Rafael, Patagonian Chile. *Quaternary Science Reviews* **31**
- 27. Hiemstra, J.F., Kulessa, B. King, E.C. & Ntarlagiannis, D. (2011) The use of integrated sedimentological and geophysical methods in drumlin research a case study of Pigeon Point, Clew Bay, Northwest Ireland. *Earth Surface Processes and Landforms* **36**: 14 pp1860-1871
- 28. Hughes, A.L.C., Rainsley, E., Murray, T., Fogwill, C.J., Schnabel, C., Xu, S. (2012) Rapid response of Helheim Glacier, South-east Greenland to early Holocene climate warming. *Geology* **40**: 5, pp427-430
- 29. Irvine-Fynn, T.D.L., Hodson, A.J., Moorman, B.J., Vatne, G. & Hubbard, A.L. (2011) Polythermal glacier hydrology: a review. *Reviews of Geophysics* **49**
- 30. Jakobsson, M., Anderson, J.B., Nitsche, F.O., Gyllencreutz, R., Kirshner, A.E., Kirchner, N., O'Regan, M., Mohammad, R. & Eriksson, B. (2012) Ice sheet retreat dynamics inferred from glacial morphology of the central Pine Island Bay Trough, West Antarctica. *Quaternary Science Reviews* **38**: pp1-10
- 31. James, T.D., Murray, T., Barrand, N.E., Sykes, H.J., Fox, A.J. and King, M.A. (2012) Observations of enhanced thinning in the upper reaches of Svalbard glaciers. *The Cryosphere* **6**, pp1369-1381
- 32. Kirshner, A.E., Anderson, J.B., Jakobsson, M., O'Regan, M., Majewski, W. & Nitsche, F.O. (2012) Post-LGM deglaciation in Pine Island Bay, West Antarctica. *Quaternary Science Reviews* **38** pp11-26.
- 33. Kuchar, J., Milne, G., Hubbard, A., Patton, H., /Bradley, S., Shennan, I. & Edwards, R. (2012) Evaluation of a numerical model of the British-Irish ice sheet using relative sea-level data: implications for the interpretation of trimline observations. *Journal of Quaternary Science* 27
- 34. Kulessa, B. Chandler, D.C., Revil, A. & Essery R. (2012) Theory and numerical modelling of electrical self-potential (SP) signatures of unsaturated flow in melting snow. *Water Resources Research* **48**: W09511, doi:10.1029/2012WR012048.
- 35. Livingstone, S. J., Evans, D.J.A., Cofaigh, C.O., Davies, B.J., Merritt, J.W., Huddart, D., Mitchell, W.A., Roberts, D.H. & Yorke, L. (2012) Glaciodynamics of the central sector of the last British-Irish Ice Sheet in Northern England. *Earth-Science Reviews* **111:** S pp25-55
- 36. Luckman, A., Jansen, D., Kulessa, B., King, E.C., Sammonds, P. & Benn D.I. (2012) Basal crevasses in Larsen C Ice Shelf and implications for their global abundance. *The Cryosphere* **6**, pp113-123
- 37. Mansell, D., Luckman, A., & Murray, T (2012) Dynamics of tidewater surge-type glaciers in northwest Svalbard. *Journal of Glaciology* 10.3189/2012JoG11J058
- 38. Murray, T., James, T.D., Macheret, Y., Lavrentiev, I., Glazovsky, A. & Sykes, H. (2012) Geometric changes in a tidewater glacier in Svalbard during its surge cycle *Arctic*,

- Antarctic and Alpine Research 44: 3 pp359-367
- 39. Nick, F.M., Luckman, A., Vieli, A., Van Der Veen, C.J., Van as, D., Van De Wal, R.S., W., Pattyn, F., Hubbard, A.L. & Floricioiu, D. (2012) The response of Petermann Glacier, Greenland, to large calving events, and its future stability in the context of atmospheric and oceanic warming. *Journal of Glaciology* **58**
- 40. Parrenin, F., Barker, S., Blunier, T., Chappellaz, J., Jouzel, J., Landais, A., Masson-Delmotte, V., Schwander, J. & Veres, D. (2012) On the gas-ice depth difference (Δdepth) along the EPICA Dome C ice core. *Climate of the Past* **8**: 4, pp1239-125
- 41. Pettersson, R., Christoffersen, P., Dowdeswell, J.A., Pohjola, V.A., Hubbard, A. & Strozzi, T. (2011) Ice thickness and basal conditions of Vestfonna ice cap, eastern Svalbard. *Geografiska Annaler Series a-Physical Geography* **93A**
- 42. Rowan, A.V., Roberts, H.M., Jones, M.A., Duller, G.A.T., Covey-Crump, S.J. & Brocklehurst, S.H. (2012) Optically stimulated luminescence dating of glaciofluvial sediments on the Canterbury Plains, South Island, New Zealand. *Quaternary Geochronology* 8: S pp10-22
- 43. Schjoeth, F., Andresen, C.S., Straneo, F., Murray, T., Scharrer, K. & Korablev, A. (2012) Collaborative mapping of the bathymetry of a major Greenland Fjord *Eos* **93**: 14, pp141–151
- 44. Smeets, C., Boot, W., Hubbard, A., Pettersson, R., Wilhelms, F., Van Den Broeke, M.R. & Van De Wal, R.S.W. (2012) A wireless subglacial probe for deep ice applications. *Journal of Glaciology* **58**: S, pp841-848,
- 45. Souness, C. & Hubbard, B. (2012) Mid-latitude glaciation on Mars. *Progress in Physical Geography* **36**: S, pp238-261, (online:<Go to ISI>://WOS:000301517100005).
- 46. Telling, Jon, Anesio, A.M., Tranter, M., Stibal, M., Hawkings, J., Irvine-Fynn, T., Hodson, A., Butler, C.,
- 47. Van as, D., Hubbard, A.L., Hasholt, B., Mikkelsen, A.B., Van Den Broeke, M.R. & Fausto, R.S. (2012) Large surface meltwater discharge from the Kangerlussuaq sector of the Greenland ice sheet during the record-warm year 2010 explained by detailed energy balance observations. *Cryosphere* 6
- 48. Thompson, S. S., Kulessa, B. & Luckman A. (2012) Integrated electrical resistivity tomography (ERT) and self-potential (SP) techniques for assessing the structural integrity of glacier moraine dams. *Journal of Glaciology* **58**: 211, pp849-858, doi: 10.3189/2012JoG11J235
- 49. Thompson, S.S., Benn, D., Dennis, K & Luckman A. (2012) A rapidly growing moraine-dammed glacial lake on Ngozumpa Glacier, Nepal. *Geomorphology* 10.1016/j.geomorph.2011.08.015
- 50. Yallop, M. & Wadham, J. (2012) Controls on the autochthonous production and respiration of organic matter in cryoconite holes on high Arctic glaciers. *Journal of Geophysical Research-Biogeosciences* **117**
- 51. Yallop, M.L., Anesio, A.M., Perkins, R.G., Cook, J., Telling, J., Fagan, D., MacFarlane, J., Stibal, M., Barker, G., Bellas, C., Hodson, A., Tranter, M., Wadham, J. & Roberts, N.W.

(2012) Photophysiology and albedo-changing potential of the ice algal community on the surface of the Greenland ice sheet. *ISME Journal* **6**: 12, pp2302-2313.

C3W Marine and Atmospheric Climate Change bibliography 2011 – 2012 C3W employed scientists and those working in C3W Institutions and linked to research themes

- 1. Abbott, P.M., Davies, S. M., Austin, W. E. N., Pearce, N. J. G. & Hibbert, F. D. (2011) Identification of cryptotephra horizons in a North East Atlantic marine record spanning marine isotope stage 4 and 5a (~60,000-80,000 a b2k). *Quaternary International* **246**, pp177-189
- 2. Aguera, A., Trommelen, M., Burrows, F., Jansen, J.M., Schellekens, T. & Smaal, A. (2012) Winter feeding activity of the common starfish (Asterias rubens L.): the role of temperature and shading. *Journal of Sea Research* **72**, pp106-112
- 3. Ahmadian, R., Falconer, R. & Bockelmann-Evans, B. 2012, "Far-field modelling of the hydro-environmental impact of tidal stream turbines", Renewable Energy, vol. 38, no. 1, pp. 107-116.
- 4. Ahmadian, R., Falconer, R., Batten, W. 2012, "Assessment of array shape of tidal stream turbines on hydro-environmental impacts and power output", Renewable Energy. vol.44, pp.318-327. Assessment of array shape of tidal stream turbines on hydro-environmental impacts and power output 0960-1481 WOS:000302821800037
- 5. Al-Maslamani, I., Walton, M.E.M., & Le Vay, L. (2012) Sources of primary production supporting food webs in an arid coastal embayment. *Marine Biology* **159**: 8, pp1753-1762. DOI: 10.1007/s00227-012-1963-0
- Austin, W.E.N., Hibbert, F.D., Rasmussen, S.O., Peters, C., Abbott, P.M. and Bryant, C.L. (2012) The synchronisation of palaeoclimatic events in the North Atlantic region during Greenland Stadial 3 (ca 27.5 to 23.3 kyr b2k) *Quaternary Science Reviews* 36, pp154-163
- 7. Bevan, S.L., North, P.R.J., Los, S.O and Grey, W.M.F. (2011) A global datset of atmospheric aerosol optical depth and surface reflectance from AATSR. *Remote Sensing of Environment* DOI: 10.1016/j.rse.2011.05.024 YES
- 8. Burrows, M.T., Schoeman, D.S., Duarte, C.M., O'Connor, M.I., Buckley, L.B., Kappel, C.V., Parmesan, C., Halpern, B.S., Brown, C., Brander, K.M., Bruno, J.F., Pandolfi, J.M., Sydeman, W.J., Moore, P., Kiessling, W., Richardson, A.J. & Poloczanska, E.S. (2012) Invasive species unchecked by climate response. *Science* **335**: S pp538-539 (online:<Go to ISI>://WOS:000299769200019).
- Butler, P. G., Wanamaker, A.D., Jr., Scourse, J.D., Richardson, C.A., and Reynolds, D.R., (2012) Variability of marine climate on the North Icelandic Shelf in a 1357-year proxy archive based on growth increments in the bivalve Arctica islandica, Palaeogeography, Palaeclimatology, Palaeoecology,
- 10. Callaway, R., Shinn A.P., Grenfell, S.E., Bron, J.E., Burnell, G., Cook, E.J., Malham, S. et al., (2012) Review of climate change impacts on marine aquaculture in the UK and Ireland. *Aquatic Conservation-Marine and Freshwater Ecosystems* **22**, 3 pp389-421

- Carboni, E., Thomas, G. E., Sayer1, A. M., Siddans, R., Poulsen, C. A., Grainger, R. G., Ahn, C., Antoine, D., Bevan, S., Braak, R., Brindley, H., DeSouza-Machado, S., Deuzé, J. L., Diner, D., Ducos, F., Grey, W., Hsu, C., Kalashnikova, O. V., Kahn, R., North, P. R. J., Salustro, C., Smith, A., Tanré, D., Torres, O., & Veihelmann, B. (2012) Intercomparison of desert dust optical depth from satellite measurements. *Atmos. Meas. Tech.*, 5: 8, 1973–2002
- 12. Carreiras, J.M.B., Vasconcelos, M.J., Lucas, R.M. (2012): Understanding the relationship between aboveground biomass and ALOS PALSAR data in the forests of Guinea-Bissau (West Africa). *Remote Sensing of Environment* **121**: S pp426-442
- 13. Cobianchi, M., Luciani, V., Lupi, C., Mancin, N., Lirer, F., Pelosi, N., Trattenero, I., Bordiga, M., Hall, I.R. & Sprovieri, M. (2012) Pleistocene biogeochemical record in the south-west Pacific Ocean (images site MD97-2114, Chatham Rise). *Journal of Quaternary Science* **27**: 5, pp519-530.
- 14. Collins, L.G., Hounslow, M.W., Allen, C.S., Hodgson, D.A., Pike, J. & Karloukovski, V.V. (2012) Palaeomagnetic and biostratigraphic dating of marine sediments from the Scotia Sea, Antarctica: First identification of the Laschamp excursion in the Southern Ocean. *Quaternary Geochronology* 7: 1, pp67-75
- 15. Collins, L.G., Pike, J., Allen, C.S. & Hodgson, D.A. (2012) High-resolution reconstruction of southwest Atlantic sea-ice and its role in the carbon cycle during marine isotope stages 3 and 2. Paleoceanography **27**: 3
- 16. Fourqurean, J.W., Kennedy, H., Marba, N., Holmer, M., Mateo, M.A., Apostolaki, E.T., Kendrick, G.A., Krause-Jensen, D., McGlathery, K.J. & Serrano, O. (2012) Seagrass ecosystems as a globally significant carbon stock. *Nature Geoscience* **5**:7, pp505-509
- 17. Gasson, E., Siddall, M., Lunt, D.J., Rackham, O.J.L., Lear, C.H. & Pollard, D. (2012) Exploring uncertainties in the relationship between temperature, ice volume, and sea level over the past 50 million years. *Reviews of Geophysics* **50**: 1
- 18. Groner, F., Lenz, M. & Jenkins, S.R. (2011) Stress resistance in two colonial ascidians from the Irish Sea: The recent invader Didemnum vexillum is more tolerant to low salinity than the cosmopolitan Diplosoma listerianum. *Journal of Experimental Marine Biology and Ecology* **409**: 1-2, pp48-52
- 19. Hays, G.C., Bastian, T., Doyle, T.K., Fossette, S., Gleiss, A.C., Gravenor, M.B., Hobson, V.J. Humphries NE, Lilley MKS, Pade NG & Sims DW (2012) High activity and Lévy searches: jellyfish can search the water column like fish. *Proceedings of the Royal Society of London B* **279**, pp465–473
- 20. Hinder, S.L., Hays, G.C., Edwards, M., Roberts, E.C., Walne, A.W., Gravenor, M.B. (2012) Changes in marine dinoflagellate and diotom abundance under climate change. *Nature Climate Change* **2**, pp271–275
- 21. Hendry, K.R., Robinson, L.F., Meredith, M.P., S. Mulitza, C. Chiessi & H. Arz (2012). Abrupt changes in thermocline nutrients and biological productivity in the Atlantic over the last glacial cycle. *Geology*, doi: 10.1130/G32779

- 22. Hiddink, J.G. & Coleby, C. (2012) What is the effect of climate change on marine fish biodiversity in an area of low connectivity, the Baltic Sea? *Global Ecology and Biogeography* **21**: 6, pp637-646
- 23. Hiddink, J.G., Lasram, F.B. & Davies A.J. (2012) Keeping pace with climate change: what can we learn from the spread of Lessepsian migrants? *Global Change Biology* **18:** 7, pp2161-2172
- 24. Hoenisch, B., Ridgwell, A., Schmidt, D., Thomas, E., Gibbs, S., Sluijs, A., Zeebe, R., Kump, L., Martindale, R., Greene, S., Kiessling, W., Ries, J., Zachos, J., Royer, D., Barker, S., Marchitto, T., Moyer, R., Pelejero, C., Ziveri, P., Foster, G. & Williams, B. (2012) The Geological Record of Ocean Acidification. *Science* **335** pp1058-106
- 25. Hohbein, M.W., Sexton, P.F. & Cartwright, J.A. 2012, Onset of North Atlantic deep water production coincident with inception of the Cenozoic global cooling trend. *Geology* **40**: 3, pp255-258
- 26. Hollis, C., Taylor, K., Handley, L., Pancost, R., Huber, M., Creech, J., Hines, B., Crouch, E., Morgans, H., Crampton, J., Gibbs, S., Pearson, P., Zachos, J. (2012) Early Paleogene temperature history of the Southwest Pacific Ocean: Reconciling proxies and models. *Earth and Planetary Science Letters* **349** pp53-66
- 27. Kadiri, M., Ahmadian, R., Bockelmann-Evans, B., Rauen, W. & Falconer, R. (2012) A review of the potential water quality impacts of tidal renewable energy systems. *Renewable and Sustainable Energy Reviews* **16**: 1, pp329-341
- 28. Jones, C.A., Davies, S.J. & Macdonald, N. (2012) Examining the social consequences of extreme weather: the outcomes of the 1946/1947 winter in upland Wales, UK. *Climatic Change* **113**: S pp35-53
- 29. Jones, J.R., Mulville, J.A., McGill, R.A.R. & Evershed, R.P. (2012) Palaeoenvironmental modelling of δ 13C and δ 15N values in the North Atlantic Islands: Understanding past marine resource use, *Rapid Communications in Mass Spectrometry* **26**: 20, pp 2399-2406
- 30. Lu, Z.L., Rickaby, R.E.M., Kennedy, H., Kennedy, P., Pancost, R.D., Shaw, S., Lennie, A., Wellner, J. & Anderson, J.B. (2012) An ikaite record of late Holocene climate at the Antarctic Peninsula. *Earth and Planetary Science Letters* **325**, pp108-115
- 31. Maddison, E.J., Pike, J. & Dunbar, R. (2012) Seasonally laminated diatom-rich sediments from Dumont d'Urville Trough, East Antarctic Margin: Late-Holocene Neoglacial sea-ice conditions. *Holocene* **22**: 8, pp857-875
- 32. Mason-Jones, A., O'Doherty, D., Morris, C., O'Doherty, T., Byrne, C., Prickett, P., Grosvenor, R., Owen, I., Tedds, S. & Poole, R. (2012) "Non-dimensional scaling of tidal stream turbines". Energy. Vol. 44, pp.820-829.
- 33. Matthewman, R., Cotton, L.J., Martins, Z. & Sephton, M.A. (2012) Organic geochemistry of late Jurassic paleosols (Dirt Beds) of Dorset, UK. *Marine and Petroleum Geology* **37**: 1, pp41-52

- 34. Miettinen, A., Divine, D., Kocx, N., Godtliebsen, F. & Hall, I.R. (2012) Multicentennial variability of the sea surface temperature gradient across the subpolar North Atlantic over the last 2.8 kyr, Journal of Climate **25**: 12, pp4205-4219
- 35. Miller, K.G., Wright, J.D., Browning, J.V., Kulpecz, A., Kominz, M., Naish, T.R., Cramer, B.S., Rosenthal, Y., Peltier, W.R. & Sosdian, S. (2012) High tide of the warm Pliocene: Implications of global sea level for Antarctic deglaciation. *Geology* **40**: 5 pp407-410
- 36. Patino-Martinez, J., Marco, A., Quinones, L. & Hawkes, L. (2012) A potential tool to mitigate the impacts of climate change to the Caribbean leatherback sea turtle. *Global Change Biology* **18**:2, pp401-411
- 37. Perry, C.T., Smithers, S.G. Roche, R.C. & Wassenburg, J. (2011) Recurrent patterns of coral community and sediment facies development through successive phases of Holocene inner-shelf reef growth and decline. *Marine Geology* **289**:1-4, pp60-71
- 38. Pickering, M.D., Wells, N.C., Horsburgh, K.J. & Green, J.A.M. (2012) The impact of future sea-level rise on the European Shelf tides. *Continental Shelf Research* **35**, pp115
- 39. Pienkowski, A.J., England, J.H., Furze, M.F.A., Marret, F., Eynaud, F., Vilks, G., MacLean B., Blasco, S. & Scourse, J.D. (2012) The deglacial to postglacial marine environments of SE Barrow Strait, Canadian Arctic Archipelago. *Boreas* **41**: 2, pp141-179
- 40. Pienkowski, A.J., Mudie, P.J., England, J.H., Smith, J.N. & Furze M.F.A. (2011) Late Holocene environmental conditions in Coronation Gulf, southwestern Canadian Arctic Archipelago: evidence from dinoflagellate cysts, other non-pollen palynomorphs, and pollen. *Journal of Quaternary Science* **26**:8 pp839-853
- 41. Richardson, A.J., Brown, C.J., Brander, K., Bruno, J.F., Buckley, L., Burrows, M.T., Duarte, C.M., Halpern, B.S., Hoegh-Guldberg, O., Holding, J., Kappel, C.V., Kiessling, W., Moore, P.J., O'Connor, M.I., Pandolfi, J.M., Parmesan, C., Schoeman, D.S., Schwing, F., Sydeman, W.J. & Poloczanska, E.S. (2012) Climate change and marine life. *Biology Letters* 8: S pp907-909
- 42. Rodríguez-Sanz, L., Graham Mortyn, P., Martínez-Garcia, A., Rosell-Melé, A. & Hall, I.R. 2012, "Glacial Southern Ocean freshening at the onset of the Middle Pleistocene Climate Transition", Earth and Planetary Science Letters, vol. 345-348, pp. 194-202.
- 43. Sexton, P.F. & Barker, S. (2012) Onset of 'Pacific-style' deep-sea sedimentary carbonate cycles at the mid-Pleistocene transition *Earth and Planetary Science Letters* **321-322** pp81-94
- 44. Sheppard, C.R.C. & Yesson, C. et al (2012) Reefs and islands of the Chagos Archipelago, Indian Ocean: why it is the world's largest no-take marine protected area. *Aquatic Conservation-Marine and Freshwater Ecosystems* **22**: 2 pp232-261
- 45. Sosdian, S.M., Lear, C.H., Tao, K., Grossman, E.L., O'Dea, A. & Rosenthal, Y. (2012) Cenozoic seawater Sr/Ca evolution. *Geochemistry, Geophysics, Geosystems* **13**: 10
- 46. Stedmon, C.A., Thomas, D.N., Papadimitriou, S., Granskog, M.A. & Dieckmann, G.S. (2011) Using fluorescence to characterize dissolved organic matter in Antarctic sea

- ice brines. *Journal of Geophysical Research-Biogeosciences* **116**: G03027. DOI: 10.1029/2011JG001716
- 47. Tedesco, L., Vichi, M. & Thomas, D.N. (2012) Process studies on the ecological coupling between sea ice algae and phytoplankton. *Ecological Modelling* **226**, pp120-138
- 48. Van Landeghem, K.J.J., Bass, J.H., Mitchell, N.C., Wilcockson, D. & Wheeler, A.J. (2012) Reversed sediment wave migration in the Irish Sea, NW Europe: A reappraisal of the validity of geometry-based predictive modelling and assumptions. *Marine Geology* **295**, pp95-112 DOI: 10.1016/j.margeo.2011.12.004
- 49. Wanamaker, A.D., Butler, P.G., Scourse, J.D., Heinemeier, J., Eiriksson, J., Knudsen, K.L. & Richardson, C.A. (2012) Surface changes in the North Atlantic meridional overturning circulation during the last millennium. *Nature Communications* **3**: 899
- 50. Williams, A.P., Funk, C., Michaelsen, J., Rauscher, S.A., Robertson I., Wils, T.H.G, Koprowski, M., Eshetu, Z. and Loader, N.J. (2011) Recent summer precipitation trends in the Greater Horn of Africa and the emerging role of Indian Ocean sea surface temperatures. *Climate Dynamics*
- 51. Wilson, J.D., Barker, S. & Ridgwell, A. (2012) Assessment of the spatial variability in particulate organic matter and mineral sinking fluxes in the ocean interior: Implications for the ballast hypothesis. *Global Biogeochemical Cycles* **26**: 4
- 52. Xia, J., Falconer, R.A., Lin, B. & Tan, G. (2012) Estimation of annual energy output from a tidal barrage using two different methods. *Applied Energy* **93**, pp327-336
- 53. Xia, J., Lin, B., Falconer, R. & Wang, Y. (2012) Modelling of man-made flood routing in the lower Yellow River, China". *Proceedings of the Institution of Civil Engineers-Water Management* **165**: 7 pp377-391

C3W Terrestrial and Climate Change bibliography 2011 – 2012 C3W employed scientists and those working in C3W Institutions and linked to research themes

- 1. Abbott, P.M., and Davies, S.M. (2012) Volcanism and the Greenland Ice-cores: The Tephra Record. *Earth Science Reviews* **115**, pp173-19
- 2. Abbott, P.M., Davies, S.M., Steffensen, J.P., Pearce, N.J.G., Bigler, M., Johnsen, S.J., Seierstad, I.K., Svensson, A. & Wastegard, S. (2012) A detailed framework of Marine Isotope Stages 4 and 5 volcanic events recorded in two Greenland ice-cores. *Quaternary Science Reviews* **36**: S pp59-77
- 3. A'Bear, A., Boddy, L., Jones, T. & Thomas, H. (2012) Impacts of elevated temperature on the growth and functioning of decomposer fungi are influenced by grazing. *Global Change Biology*. **18**: 6 pp1823-1832
- 4. Alizai, A., Hillier, S., Clift, P.D., Giosan, L., Hurst, A., Vanlaningham, S. & Macklin, M. (2012) Clay mineral variations in Holocene terrestrial sediments from the Indus Basin. *Quaternary Research* 77: S pp368-381,
- 5. Ballantyne, C.K., McCarroll, D. & Stone, J.O. (2011) Periglacial trimlines and the extent of the Kerry-Cork Ice Cap, SW Ireland *Quaternary Science Reviews* **30**, pp3834-3845. doi:10.1016/j.quascirev.2011.10.006
- 6. Band, L.E., Hwang, T., Hales, T.C., Vose, J. & Ford, C. (2012) Ecosystem processes at the watershed scale: Mapping and modeling ecohydrological controls of landslides *Geomorphology* **137**: 1, pp159-167.
- 7. Bezemer, T.M. & Jones, T.H. (2012) The effects of CO₂ and nutrient enrichment on photosynthesis and growth of Poa annua in two consecutive generations. *Ecological Research* 27: 5, pp873-882.
- 8. Bowler, D.E., Buyung-Ali, L.M., Healey J.R., Jones, J.P.G., Knight, T.M. & Pullin, A.S. (2012) Does community forest management provide global environmental benefit and improve local welfare? *Frontiers in Ecology and the Environment* **10**, pp29-36
- Brown, C.J., Schoeman, D.S., Sydeman, W.J., Brander, K., Buckley, L.B., Burrows, M., Duarte, C.M., Moore, P.J., Pandolfi, J.M., Poloczanska, E., Venables, W. & Richardson, A.J. (2011) Quantitative approaches in climate change ecology. *Global Change Biology* 17: Spp3697-3713
- 10. Cage, A.G., Davies, S.M., Wastegård, S., Austin, W.E.N. (2011) Identification of the Icelandic Landnám Tephra (AD 871 ± 2) in Scottish fjordic sediment. *Quaternary International* **246**, pp168-176
- 11. Campbell, R., McCarroll, D., Robertson, I., Loader, N.J., Grudd, H. & Gunnarson, B. (2011) Blue Intensity in *Pinus sylvestris* tree-rings: A manual for a new palaeoclimate proxy *Tree Ring Research* **67**, pp127-134

- 12. Chakrabortya S, Jana BN, Bhattacharya SK and Robertson I. (2011) Carbon isotopic composition of fossil leaves from the Early Cretaceous sediments of western India. *Journal of Earth System Science* **120**: 4, pp703-711
- 13. Clewley, D., Lucas, R., Accad, A., Armston, J., Bowen, M., Dwyer, J., Pollock, S., Bunting, P., Mcalpine, C., Eyre, T., Kelly, A., Carreiras, J. & Moghaddam, M. (2012) An approach to mapping forest growth stages in queensland, australia through integration of ALOS PALSAR and Landsat sensor data. *Remote Sensing* **4**: S pp2236-2255
- 14. Comont, D., Abaigar, J.M., Albert, A., Aphalo, P., Causton, D.R., Figueroa, F.L., Gaberscik, A., Llorens, L., Hauser, M.T., Jansen, M.A.K., Kardefelt, M., Luque, P.D., Neubert, S., Nunez-Olivera, E., Olsen, J., Robson, M., Schreiner, M., Sommaruga, R., Strid, A., Torre, S., Turunen, M., Veljovic-Jovanovic, S., Verdaguer, D., Vidovic, M., Wagner, J., Winkler, J.B., Zipoli, G., Gwynn-Jones, D. (2012) UV responses of *Lolium perenne* raised along a latitudinal gradient across Europe: a filtration study. *Physiologia Plantarum* **145**: S, pp604-618
- 15. Constantine, J.A., Schelhaas, M., Gabet, E. & Mudd, S.M. (2012) Limits of windthrow-driven hillslope sediment flux due to varying storm frequency and intensity. Geomorphology **175-176**, pp66-73
- 16. Coffey, E.E., Froyd, C.A., and Willis, K.J. (2011) When is an invasive not an invasive? Macrofossil evidence of doubtful native plant species in the Galápagos Islands. *Ecology* **92**, pp805-812
- 17. Coffey, E.E., Froyd, C.A., and Willis, K.J. (2012) Lake or Bog? Reconstructing baseline ecological conditions for the protected Galápagos Sphagnum peatbogs *Quaternary Science Reviews* **52**, pp60-74
- 18. Cotton, L. & Pearson, P. (2012) Larger Benthic Foraminifera From The Middle Eocene To Oligocene Of Tanzania. *Austrian Journal of Earth Sciences* **105**: 1, pp189-199
- 19. Crittenden, P., Ellis, C., Vogt, K. & Boddy, L. (2012) Fungi and Global Change. *Fungal Ecology* **5**: 1 pp1-2.
- 20. Crowther, T.W., Littleboy, A., Jones, T.H. & Boddy, L. (2012) Interactive effects of warming and invertebrate grazing on the outcomes of competitive fungal interactions. *FEMS Microbiology Ecology* **81**: 2, pp419-426.
- 21. Daley, T.J., Thomas, E.R., Holmes, J.A., Street-Perrott, F.A., Chapman, M.R., Tindall, J.C., Valdes, P.J., **Loader, N.J.**, Marshall, J.D., Wolff, E.W., Hopley, P.J., Atkinson, T., Barber, K.E., Fisher, E.H., **Robertson, I**., Hughes, P.D.M. & Roberts, C.N. (2011) The 8200 yr BP cold event in stable isotope records from the North Atlantic region *Global and Planetary Change* **79**, pp288-302
- 22. Davies, S.M., Abbott, P.M., Pearce, N.J.G., Wastegard, S., Blockley, S.P.E. (2012e) Integrating the INTIMATE records using tephrochronology: rising to the challenge. *Quaternary Science Reviews* **36**: S pp11-27

- 23. de Bruyn, M., Hoelzel, A.R., Carvalho, G.R. et al. (2012) Faunal histories from Holocene ancient DNA. *Trends in Ecology & Evolution* **26**: 8, pp405-413 DOI:10.1016/j.tree. 2011.03.021
- 24. Deluca, T.H. & Boisvenue, C. (2012) Boreal forest soil carbon: distribution, function and modelling. *Forestry* **85**, pp161-18
- 25. DeLuca, T.H. & Zabinski, C.A. (2011) Prairie ecosystems and the carbon problem *Frontiers in Ecology and Environment* **9**: 7, pp407-413. DOI: 10.1890/100063
- 26. Dempster, D. N., Gleeson, D. B., Solaiman, Z. M., Jones D.L. & Muphy, D.V. (2012) Decreased soil microbial biomass and nitrogen mineralisation with Eucalyptus biochar addition to a coarse textured soil. *Plant and Soil* **354** pp311-324
- 27. Dempster, D. N.; Jones, D. L.; Murphy, D. V. (2012) Organic nitrogen mineralisation in two contrasting agro-ecosystems is unchanged by biochar addition. *Soil biology & biochemistry* **48**: 47-50.
- 28. Dempster, D.N.; Jones, D.L.; Murphy, D. V. (2012) Clay and biochar amendments decreased inorganic but not dissolved organic nitrogen leaching in soil. *Soil Research* **50**: 216-221.
- 29. Doerr, S.H. and Shakesby, R.A. (2012) Surface processes hydrological, geomorphological and geochemical responses to fire. *Fire in the Earth system*
- 30. Doerr, S.H. & Shakesby, R.A. (2011) Water repellency. In Huang, P.M., Li, Y., Sumner, M.E. (eds) *Handbook of soil sciences. Resource management and environmental impacts. Handbook of Soil Sciences* 19-1 19-8.
- 31. Don, A., Osborne, B., Hastings, A., Skiba, U., Carter, M.S., Drewer, J., Flessa, H., Freibauer, A., Hyvonen, N., Jones, M.B., Lanigan, G.J., Mander, U., Monti, A., Djomo, S.N., Valentine, J., Walter, K., Zegada-Lizarazu, W. & Zenone, T. (2012) Land-use change to bioenergy production in Europe: implications for the greenhouse gas balance and soil carbon. *Global Change Biology Bioenergy* **4**: S pp372-391,
- 32. Elmore, A.C., Sosdian, S., Rosenthal, Y. & Wright, J.D. (2012) A global evaluation of temperature and carbonate ion control on Mg/Ca ratios of ostracoda genus Krithe", Geochemistry, Geophysics, Geosystems, **13**: 9
- 33. Esteves T.C.J., Kirkby M.J., Shakesby R.A., Ferreira, A.J.D., Soares, J.A.A., Irvine B.J., Ferreira C.S.S., Coelho, C.O.A., Bento, C.P.M., Carreiras, M.A. (2012) Land degradation caused by wildfire: application of the PESERA model to fire-affected sites in central Portugal *Geoderma* **191**, pp40-50
- 34. Farrar, J., Boddy, E., Hill, P.W., & Jones, D.L. (2012) Discrete functional pools of soil organic matter in a UK grassland soil are differentially affected by temperature and priming *Soil Biology & Biochemistry* **49**, pp52-60
- 35. Fenner, N., Williams, R., Toberman, H., Hughes, S., Reynolds, B. & Freeman, C. (2011) Decomposition 'hotspots' in a rewetted peatland: implications for water quality and carbon cycling. *Hydrobiologia* **674**: 1, pp51-66 DOI: 10.1007/s10750-011-0733-1
- 36. Foerster, V., Junginger, A., Langkamp, O., Gebru, T., Asrat, A., Umer, M., Lamb, H. F., Wennrich, V., Rethemeyer, J., Nowaczyk, N., Trauth, M. H., Schaebitz, F. (2012)

- Climatic change recorded in the sediments of the Chew Bahir basin, southern Ethiopia, during the last 45,000 years. *Quaternary International* **274**: S pp25-37
- 37. Gagen, M., McCarroll, D, Robertson, I., Loader, N.J. & Jalkanen, R. (2012) Do tree ring stable carbon isotope series from Pinus sylvestris in northern Fennoscandia contain long-term non climatic trends? *Chemical Geology* DOI:10.1016/j.chemgeo.2008.01.013
- 38. Gagen, M., McCarroll, D., Jalkanen, R., Loader, N.J., Robertson, I. & Young, G.H.F. (2012) A rapid method for the production of robust millennial length stable isotope tree ring series for climate reconstruction. *Global and Planetary Change* **82**-83, pp96–103
- 39. Gagen, M., Finsinger, W., Wagner-Cremer, F., McCarroll, D., Loader, N. J., Robertson, I., Jalkanen, R., Young, G. and Kirchhefer, A. (2011) Evidence of changing intrinsic water use efficiency under rising atmospheric CO2 concentrations in Boreal Fennoscandia from subfossil leaves and tree ring o13C *Global Change Biology* 17, pp1064-1072
- 40. Gagen, M., McCarroll, D., Loader, N.J. & Robertson, I. (2011) Stable isotopes in dendroclimatology: moving beond potential. *Developments in Paleoenvironmental Research* **11**: 2 pp147-172
- 41. Garbuio, F.J., Jones, D.L., Alleoni, L.R.F., Murphy, D.V. & Caires, E.F. (2011) Carbon and nitrogen dynamics in an Oxisol as affected by liming and crop residues under notill. *Soil Science Society of America Journal* **75:** 5 pp1723-1730 DOI: 10.2136/sssaj2010.0291
- 42. Giesecke, T., K. D. Bennett, H. J. B. Birks, A. E. Bjune, E. Bozilova, A. Feurdean, W. Finsinger, C. Froyd, P. Pokorný, M. Rösch, H. Seppä, S. Tonkov, V. Valsecchi, & Wolters S. (2011) The pace of Holocene vegetation change testing for synchronous developments. *Quaternary Science Reviews* **52**, pp60-74
- 43. Ge, T.D., Yuan, H.Z., Roberts, P., Jones, D.L., Qin, H.L., Tong, C.L. & Huang, D.F. (2012) Amino acid and peptide dynamics in horticultural soils under conventional and organic management strategies. *Journal of Soils and Sediments* **12**: 3, pp323-333 DOI: 10.1007/s11368-011-0457-x
- 44. Glanville, H., Rousk, J., Golyshin, P. & Jones, D.L. (2012) Mineralization of low molecular weight carbon substrates in soil solution under laboratory and field conditions. Soil Biology & Biochemistry 48: pp88-95
- 45. Gregory, S.D., Brook, B.W., Goossens, B., Ancrenaz, M., Alfred, R., Ambu, L.N. & Fordham, D.A. (2012) Long-Term Field Data and Climate-Habitat Models Show That Orangutan Persistence Depends on Effective Forest Management and Greenhouse Gas Mitigation. *PLoS ONE* 7: 9
- 46. Haei, M., Rousk, J., Ilstedt, U., Oquist, M., Baath, E. & Laudon, H. (2011) Effects of soil frost on growth, composition and respiration of the soil microbial decomposer community. *Soil Biology & Biochemistry* **43**: 10, pp2069-2077

- 47. Hafner, P., Robertson, I., McCarroll, D., Loader, N.J., Gagen, M., Bale, R.J., Jungner, H., Sonninen, E., Hilasvuori, E. & Levanic, T. (2011) Climate signals in the ring widths and stable carbon, oxygen and non-exchageable hydrogen isotopic composition of Larix decidua growing in the Southeastern European Alps *Trees Structure and Function* **25**: 6, pp1141-1154
- 48. Hafner, P., Robertson, I., McCarroll, D., Loader, N.J., Gagen, M.H., Bale, R.J., Jungner, H., Sonninen, E., Hilasvuore, E. & Levanič, T. (2012) Climate signals in the ring widths and stable carbon, hydrogen and oxygen isotopic composition of *Larix decidua* growing at the forest limit in the South-eastern European Alps. *Trees Structure and Function* **25**, pp1141-1154
- 49. Handley, L., O'Halloran, A., Pearson, P.N., Hawkins, E., Nicholas, C.J., Schouten, S., McMillan, I.K. & Pancost, R.D. (2012) Changes in the hydrological cycle in tropical East Africa during the Paleocene-Eocene Thermal Maximum. *Palaeogeography, Palaeoclimatology, Palaeoecology* **329-330**, pp10-21.
- 50. Hector, A., Fowler, D., Nussbaum. R., Weilenmann, M and Walsh, R.P.D. (2011) The Future of south-east Asian Rainforests in a changing landscape and climate. *Philosophical Transactions of the Royal Society of Biological Sciences* **366**: 1582 pp3165-3167
- 51. Hegarty, M.J. (2012): Invasion of the hybrids. Molecular Ecology 21: S pp4669-4671,
- 52. Hendry, K. & Robinson, L. (2012) The relationship between silicon isotope fractionation in sponges and silicic acid concentration: Modern and core-top studies of biogenic opal. *Geochimica Et Cosmochimica Acta* **81** pp1-12.
- 53. Hill, P.W., Farrell, M. & Jones, D.L. (2012) Bigger may be better in soil N cycling: Does rapid acquisition of small L-peptides by soil microbes dominate fluxes of protein-derived N in soil? *Soil Biology & Biochemistry*, **48**, **pp**106-112 DOI: 10.1016/j.soilbio.2012.01.023
- 54. Hurrell, E.R., Barker, P.A., Leng, M.J., Vane, C.H., Wynn, P., Kendrick, C.P., Verschuren, D., Street-Perrott, F.A. (2011) Developing a methodology for carbon isotope analysis of lacustrine diatoms. *Rapid Communications in Mass Spectrometry* **15**: 25(11) pp1567-1574
- 55. Jones, D.L., Rousk, J., Edwards-Jones, G., DeLuca, T.H. & Murphy, D.V. (2012) Biochar mediated changes in soil quality and plant growth in a three year field trial. *Soil Biology & Biochemistry* **45**, pp113-124
- 56. Jones D.L., Willett, V.B., Stockdale, E.A. & Murphy, D.V. (2012) Molecular weight of dissolved organic carbon, nitrogen and phenolics in grassland soils. *Soil Science Society of America Journal* **76**: 1, pp142-150 DOI: 10.2136/sssaj2011.0252
- 57. Kachenchart, B., Jones, D.L., Gajaseni, N., Edwards-Jones, G. & Limsakul, A. (2012) Seasonal nitrous oxide emissions from different land uses and their controlling factors in a tropical riparian ecosystem. *Agriculture Ecosystems & Environment* **158**, pp15-30 DOI: 10.1016/j.agee.2012.05.008

- 58. Kadiri, M., Spencer, K.L. & Heppell, C.M. (2012) Potential contaminant release from agricultural soil and dredged sediment following managed realignment. *Journal of Soils and Sediments* **12**: 10, pp1581-1592.
- 59. Kauserud, H., Heegaard, E., Büntgen, U., Halvorsen, R., Egli, S., Senn-Irlet, B., Krisai-Greilhuber, I., Dämon, W., Sparks, T., Nordén, J., Høiland, K., Kirk, P., Semenov, M., Boddy, L. & Stenseth, N.C. (2012) Warming-induced shift in European mushroom fruiting phenology. *Proceedings of the National Academy of Sciences of the United States of America* **109**: 36 pp14488-14493.
- 60. Kim, S.Y., Freeman, C., Fenner, N. & Kang, H. (2012) Functional and structural responses of bacterial and methanogen communities to 3-year warming incubation in different depths of peat mire. *Applied Soil Ecology* **57**, pp23-30
- 61. Leppi, J.C., DeLuca, T.H., Harrar, S.W. & Running, S.W. (2012) Impacts of climate change on August stream discharge in the Central-Rocky Mountains. *Climatic Change* **112**: 3-4, pp997-1014
- 62. Loader, N.J., Young, G.H.F., Grudd, H & McCarroll, D. (2013) A stable carbon isotope chronology for Torneträsk, northern Sweden: AD 900-2008: A millennial length reconstruction of summer sunshine and its relationship to Arctic circulation. *Quaternary Science Reviews* **62**, pp97–113
- 63. Loomis, S E., Russell, J M., Ladd, B., Street-Perrott, F. A, Sinninghe D, Jaap S. (2012) Calibration and application of the branched GDGT temperature proxy on East African lake sediments *Earth and Planetary Science Letters* 357-358, 277-288.
- 64. Los, S.O., Rosette, J.A.B, Kljun, N., North, P.R.J., Chasmer, L., Suarez, J.C., Hopkinson, C., Hill, R.A., van Gorsel, E., Mahoney, C. and Berni, J.A.J. (2012) Vegetation height products between 60° S and 60° N from ICESat GLAS data *Geosci. Model Dev.* **5**, pp413-432
- 65. Lowe, D.J., Davies, S.M., Moriwaki, H., Pearce, N.J. & Suzuki, T. (2011) Enhancing tephrochronology and its application (INTREPID project): Hiroshi Machida commemorative volume. *Quaternary International* **246**, pp1-5
- 66. Macklin, M.G., Fuller, I.C., Jones, A.F. & Bebbington, M. (2012a) New Zealand and UK Holocene flooding demonstrates interhemispheric climate asynchrony. *Geology* **40**: S pp775-778
- 67. Macklin, M.G., Lewin, J. & Woodward, J.C. (2012b) The fluvial record of climate change. *Philosophical Transactions of the Royal Society a-Mathematical Physical and Engineering Sciences* **370**: S pp2143-2172
- 68. Millett, J., Godbold, D., Smith, A.R. & Grant, H. (2012) N-2 fixation and cycling in Alnus glutinosa, Betula pendula and Fagus sylvatica woodland exposed to free air CO2 enrichment. *Oecologia* **169**: 2, pp541-552 DOI: 10.1007/s00442-011-2197-4
- 69. Nakagawa, T., Gotanda, K., Haraguchi, T., Danhara, T., Yonenobu, H., Brauer, A., Yokoyama, Y., Tada, R., Takemura, K., Staff, R.A., Payne, R., Ramsey, C.B., Bryant, C., Brock, F., Schlolaut, G., Marshall, M., Tarasov, P. & Lamb, H. (2012) SG06, a fully continuous and varved sediment core from Lake Suigetsu, Japan: stratigraphy and

- potential for improving the radiocarbon calibration model and understanding of late Quaternary climate changes. *Quaternary Science Reviews* **36**: S pp164-176
- 70. Noponen, M.R.A., Edwards-Jones, G., Haggar, J.P., Soto, G., Attarzadeh, N. & Healey, J.R. (2012) Greenhouse gas emissions in coffee grown with differing input levels under conventional and organic management. *Agriculture Ecosystems & Environment* **151**, pp6-15
- 71. O'Connor, B., Dwyer, E., Cawkwell, F. & Eklundh, L. (2012) Spatio-temporal patterns in vegetation start of season across the island of Ireland using the MERIS Global Vegetation Index. *Isprs Journal of Photogrammetry and Remote Sensing* **68**: S pp79-94
- 72. Ormerod, S. J. & Durance I. (2012) Understanding and managing climate change effects on rivers ecosystems. *The Conservation and Management of Rivers*, Ed P. Boon and P. Raven, pp107-121
- 73. Pérez-Miñana, E., Krause, P.J. & Thornton, J. (2012) Bayesian Networks for the management of greenhouse gas emissions in the British agricultural sector. *Environmental Modelling and Software* **35**, pp132-148.
- 74. Quilliam, R.S., Marsden, K.A., Gertler, C., Rousk, J., DeLuca, T.H., Jones, D.L. (2012) Nutrient dynamics, microbial growth and weed emergence in biochar amended soil are influenced by time since application and reapplication rate. *Agriculture Ecosystems & Environment* **158** p192-199
- 75. Richards, P.J., Humphreys, G.S., Tomkins, K.M., Shakesby, R.A. & Doerr, S.H. (2011) Bioturbation on fire-affected southeast Australian sandstone hillslopes: spatial and temporal variation *Catena* **87**, pp20-30
- 76. Reynolds, G., Payne, J., Sinum, W., Mosigil, G. & Walsh R.P.D (2011) Changes in forest land use and management in Sabah, Malaysian Borneo, 1990–2010, with a focus on the Danum Valley region *Philosophical Transactions of the Royal Society of Biological Sciences* 366: 1582 pp3168-3176
- 77. Robertson I. (2011) Paleoclimates: Understanding Climate Change Past and Present *The Holocene* **21**, 1175
- 78. Roberts, P. & Jones, D.L. (2012) Microbial and plant uptake of free amino sugars in grassland soils. *Soil Biology & Biochemistry* **49**, pp139-149 DOI: 10.1016/j.soilbio.2012.02.014
- 79. Santín, C., Doerr, S.H., Shakesby, R.A., Bryant, R., Sheridan, G.J., Lane, P.N.J., Smith, H.G. (2012) Carbon loads, forms and sequestration potential within ash deposits from forest fires: new insights from the 2009 'Black Saturday' fires, Australia. *European Journal of Forest Research* **131**, pp1245-1253.
- 80. Seddon, A.W.R, Froyd, C.A., and Witkowski, A. (2011) Diatoms (Bacillariophyta) of isolated islands. New taxa in the genus *Navicula sensu stricto* from the Galápagos Islands. *Journal of Phycology* **47**, pp861-879

- 81. Sharifi, F., Samadi, S.Z. & Wilson, C.A.M.E. (2012) Causes and consequences of recent floods in the Golestan catchments and Caspian Sea regions of Iran. *Natural Hazards* **61**: 2, pp533-550
- 82. Shakesby, R.A. (2011) Post-wildfire soil erosion in the Mediterranean: review and future research directions *Earth-Science Reviews*, **105**, pp71-100 doi.org/10.1016/j.earscirev.2011.01.001)
- 83. Sommerville, M.M., Milner-Gulland, E.J., Jones, J.P.G. (2011) The challenge of monitoring biodiversity in payment for environmental service interventions. *Biological Conservation* **144**: 12, pp2832-2841 DOI: 10.1016/j.biocon.2011.07.036
- 84. Spagnolo, M., Clark, C.D., Hughes, A.L.C., Dunlop, P. (2011) The topography of drumlins; assessing their long profile shape. *Earth Surface Processes and Landforms* **36**, pp780-804
- 85. Stein, W.E., Berry, C.M., Hernick, L.V. & Mannolini, F. (2012) Surprisingly complex community discovered in the mid-Devonian fossil forest at Gilboa. Nature **483**: 7387, pp78-81
- 86. Tooth, S. (2012): Arid geomorphology: Changing perspectives on timescales of change. *Progress in Physical Geography* **36**: S pp262-284
- 87. Trachsel, M., Kamenik, C., Grosjean, M., McCarroll, D., Moberg, A., Brazdil, R., Buntgen, U., Dobrovolny, P., Esper, J., Frank, D.C., Friedrich, M., Glaser, R., Larocque-Tobler, I., Nicolussi, K. & Riemann, D. (2012) Multi-archive summer temperature reconstruction for the European Alps, AD 1053-1996 *Quaternary Science Reviews* 46, pp66-79. doi: 10.1016/j.quascirev.2012.04.021
- 88. Valentine, J., Clifton-Brown, J., Hastings, A., Robson, P., Allison, G. & Smith, P. (2012) Food vs. fuel: the use of land for lignocellulosic next generation' energy crops that minimize competition with primary food production. *Global Change Biology Bioenergy* **4**: S, pp1-19
- 89. van der Knaap, W.O., van Leeuwen, J.F.N., Froyd, C.A., & Willis, K.J. (2012) Detecting the provenance of Galápagos non-native pollen: The role of humans and air currents as transport mechanisms. *The Holocene* doi:10.1177/0959683612449763
- 90. Vaughan, I.P. & Ormerod, S.J. (2012) Large-scale, long-term trends in British river macroinvertebrates. *Global Change Biology* **18**: 7, pp2184-2194.
- 91. Vaughan, I.P. & Ormerod, S.J. (2012) A 20-year view of monitoring the ecological quality of English and Welsh rivers. The Conservation and Management of Rivers, Ed P. Boon and P. Raven, pp107-121
- 92. Walker, M.J.C., Lowe, J.J., Blockley, S.P.E., Bryant, C., Coombes, P., Davies, S.M., Hardiman, M., Turney, C.S.M. & Watson, J. (2012) A Lateglacial palaeoenvironmental record from Sluggan Bog, Northern Ireland: comparisons with the Greenland NGRIP GICC05 event stratigraphy *Quaternary Science Reviews* **36**, pp124-138
- 93. Walker, M., Lowe, J., Blockley, S.P.E., Bryant, C., Coombes, P., Davies, S., Hardiman, M., Turney, C.S.M. & Watson, J. (2012b) Lateglacial and early Holocene palaeoenvironmental 'events' in Sluggan Bog, Northern Ireland: comparisons with the

- Greenland NGRIP GICC05 event stratigraphy. *Quaternary Science Reviews* **36**: S pp124-138
- 94. Walker, M.J.C., Berkelhammer, M., Bjorck, S., Cwynar, L.C., Fisher, D.A., Long, A.J., Lowe, J.J., Newnham, R.M., Rasmussen, S.O. & Weiss, H. (2012a) Formal subdivision of the Holocene Series/Epoch: a Discussion Paper by a Working Group of INTIMATE (Integration of ice-core, marine and terrestrial records) and the Subcommission on Quaternary Stratigraphy (International Commission on Stratigraphy). *Journal of Quaternary Science* 27: S pp649-659
- 95. Wang, Z., Du, X., Yang, Y. & Ye, X. (2012) Surface clogging process modeling of suspended solids during urban stormwater aquifer recharge. *Journal of Environmental Sciences (China)* **24**: 8, pp1418-1424
- 96. White, T.A. & Perkins, S.E. 2012, The ecoimmunology of invasive species. *Functional Ecology* **26**: 6, pp1313-1323
- 97. Wils, T.H.G., Robertson, I., Eshetu, Z., Touchan R., Sass-Klaassen, U. & Koprowski, M. (2011) Crossdating Juniperus procera from North Gondar, Ethiopia. *Trees, Structure and Function* **25**, pp71–82
- 98. Woodley, E.J., Loader, N.J., McCarroll, D., Young, G.H.F., Robertson, I., Heaton, T.H.E., Gagen, M.H. (2012) Estimating uncertainty in pooled proxy time-series, including stable isotopes in tree rings. *Chemical Geology* **294** pp243-248. doi: 10.1016/j.chemgeo.2011.12.008
- 99. Woodley, E.J., Loader N.J., McCarroll D., Young G.H.F, Robertson I., Heaton T.H.E, Gagen, M.H, Warham J.O. (2012) High-temperature pyrolysis/gas chromatography/ isotope ratio mass spectrometry: simultaneous measurement of the stable isotopes of oxygen and carbon in cellulose *Rapid Communications in Mass Spectrometry* **26**, pp109–114. doi: 10.1002/rcm.5302
- 100. Williams, J., Los, S.O., Robertson, I. & Marsh, T. (2011) Using geostatistical methods to produce a spatial and temporal gridded dataset of historic river flow across Great Britain. *Procedia Environmental Sciences* **7**, pp128–133
- 101. Young G.H.F., McCarroll D., Loader N.J., Gagen M., Kirchhefer A.J., & Demmler J.C. (2011) Changes in atmospheric circulation and the Arctic Oscillation preserved within a millennial length reconstruction of summer cloud cover from northern Fennoscandia. *Climate Dynamics* 10.1007/s00382-011-1246-3.
- 102. Young G.H.F., Demmler J.C., Gunnarson B.E., Kirchhefer A.J., Loader N.J., & McCarroll D. (2011) Age trends in tree ring growth and isotopic archives: a case study of *Pinus sylvestris* L. from northwestern Norway. *Global Biogeochem Cycles* **25**, GB2020, doi:10.1029/2010GB003913
- 103. Young G.H.F., Loader N.J., & McCarroll D. (2011) A large scale comparative study of stable carbon isotope ratios determined using on-line combustion and low-temperature pyrolysis techniques. *Palaeogeogr Palaeoclimatol Palaoecol* **300**, pp23-28

104. Young, G.H.F, Bale, R.J., Loader, N.J., McCarroll, D, Nayling, N. & Vousdenn, N. (2012) Central England temperature since AD 1850: the potential of stable carbon isotopes in British oak trees to reconstruct past summer temperatures. *Journal of Quarternary Science* **27** pp606–614

C3W Human Dimension and Climate Change bibliography 2011 – 2012 C3W employed scientists and those working in C3W Institutions and linked to research themes

- 1. AlFarra, H., Abu-Hijleh, B. (2012) The potential role of nuclear energy in mitigating CO2 emissions in the United Arab Emirates. *Energy Policy* **42** pp272-285
- 2. Alyami, S.H. & Rezgui, Y. (2012) Sustainable building assessment tool development approach. *Sustainable Cities and Society* **5**: 1, pp52-62
- 3. Ampatzi, E. & Knight, I. (2012) Modelling the effect of realistic domestic energy demand profiles and internal gains on the predicted performance of solar thermal systems. *Energy and Buildings* **55** pp285-298
- 4. Anderson, J. (2012) Managing trade-offs in 'ecotopia': Becoming green at the Centre for Alternative Technology. *Transactions of the Institute of British Geographers* **37**: 2 pp212-225
- 5. Bagdanavicius, A., Jenkins, N. & Hammond, G. (2012) Assessment of community energy supply systems using energy, exergy and exergoeconomic analysis. *Energy* **45**: 1 pp247-255
- 6. Bailey, I., MacGill, I., Passey, R. & Compston, H. (2012) The fall (and rise) of carbon pricing in Australia: A political strategy analysis of the carbon pollution reduction scheme. *Environmental Politics* **21**: 5, pp691-711
- 7. Bleil De Souza, C. (2012) Contrasting paradigms of design thinking: The building thermal simulation tool user vs. the building designer. *Automation in Construction* **22**, pp112-122
- 8. Budde Christensen, T., Wells, P. & Cipcigan, L. (2012) Can innovative business models overcome resistance to electric vehicles? Better Place and battery electric cars in Denmark. *Energy Policy* **48**, pp498-505
- 9. Butler, C. Parkhill, K and Pidgeon, N. (2012) Briefing Note: Transforming the UK Energy System Public Values, Attitudes and Acceptability, Interim Findings Work Package 2. Understanding Risk Working Paper 12-01, Cardiff: School of Psychology
- 10. Cemesova, A., Hopfe, C.J. & Rezgui, Y. (2012) PassivBIM A new approach for low energy simulation using BIM. *eWork and eBusiness in Architecture, Engineering and Construction Proceedings of the European Conference on Product and Process Modelling* 2012, ECPPM 2012 pp29
- 11. Chaudry, M., Skea, J., Wang, X. & Jenkins, N. (2012) Modelling UK energy system response to natural gas supply infrastructure failures. *Proceedings of the Institution of Mechanical Engineers Part A-Journal of Power and Energy* **226** pp501-513.
- 12. Cooke, P. (2012) Transversality and Transition: Green Innovation and New Regional Path Creation. *European Planning Studies* **20**: 5 pp817-834.
- 13. Cowell R, Bristow G and Munday M (2012) *Wind Energy and Justice for Disadvantaged Communities*, Viewpoint produced for the Joseph Rowntree Foundation, JRF: York, ISBN 978-185935-916-7, pp44

- 14. Corner, A., Pidgeon, N. & Parkhill, K. (2012) Perceptions of geoengineering: Public attitudes, stakeholder perspectives, and the challenge of 'upstream' engagement. Wiley Interdisciplinary Reviews: *Climate Change* **3**: 5 pp451-466
- 15. Corner, A., Whitmarsh, L. & Xenias, D. (2012) Uncertainty, scepticism and attitudes towards climate change: Biased assimilation and attitude polarisation. *Climatic Change* 114: **3-4** pp463-478
- 16. Corner, A. (2012) Psychology science literacy and climate views. *Nature Climate Change* **2**: 10 pp710-711
- 17. De Laurentis, C. (2012) Renewable Energy Innovation and Governance in Wales: A Regional Innovation System Approach. *European Planning Studies* **20**: 12, pp1975-1996
- 18. Fouquet, R. & Pearson, P.J.G. (2012) Past and prospective energy transitions: Insights from history. *Energy Policy* **50** pp1-7
- 19. Gruenewald, P., Cockerill, T., Contestabile, M. & Pearson, P. (2012) The sociotechnical transition of distributed electricity storage into future networks-System value and stakeholder views. *Energy Policy* **50**, pp449-457
- 20. Guerra-Santin, O. & Itard, L. (2012) The effect of energy performance regulations on energy consumption. *Energy Efficiency* **5**: 3 pp269-282
- 21. Gupta, A., Hopfe, C.J. & Rezgui, Y. (2012) BIM and solar PV modeling, eWork and eBusiness in Architecture, Engineering and Construction Proceedings of the European Conference on Product and Process Modelling 2012, ECPPM 2012, pp113
- 22. Hall, J.W., Brown, S., Nicholls, R.J., Pidgeon, N.F. & Watson, R.T. (2012) Proportionate adaptation. Nature Climate Change. 2: 12 pp833-834
- 23. Hall, M.R., Najim, K.B. & Hopfe, C.J. (2012) Transient thermal behaviour of crumb rubber-modified concrete and implications for thermal response and energy efficiency in buildings. *Applied Thermal Engineering* **33-34**: 1 pp77-85.
- 24. Gerber, A., Qadrdan, M., Chaudry, M., Ekanayake, J. & Jenkins, N. (2012) A 2020 GB transmission network study using dispersed wind farm power output. *Renewable Energy* **37**: 1 pp124-132
- 25. Gill, S., Chatha, G., Tsolakis, A., Golunski, S. & York, A. (2012) Assessing the effects of partially decarbonising a diesel engine by co-fuelling with dissociated ammonia. *International Journal of Hydrogen Energy* **37**: 7, pp6074-6083
- 26. Heley, J. & Jones, L. (2012) Relational rurals: Some thoughts on relating things and theory in rural studies. *Journal of Rural Studies* 28: S pp208-217
- 27. Meredith, M.P., Mulitza, S., Chiessi, C.M. & Arz, H. (2012) Abrupt changes in high-latitude nutrient supply to the Atlantic during the last glacial cycle. *Geology* **40**: 2 pp123-126
- 28. Lau, C.S., Allen, D., Tsolakis, A., Golunski, S.E. & Wyszynski, M.L. (2012) Biogas upgrade to syngas through thermochemical recovery using exhaust gas reforming. *Biomass and Bioenergy* **40** pp86-95

- 29. Li, Y., Cleall, P., Ma, X., Zhan, T. & Chen, Y. (2012) Gas Pressure Model for Layered Municipal Solid Waste Landfills. *Journal of Environmental Engineering-ASCE* **138**: 7 pp752-760
- 30. Liang, J., Gomis-Bellmunt, O., Ekanayake, J., Jenkins, N.& An, W. (2012) A multi-terminal HVDC transmission system for offshore wind farms with induction generators. *International Journal of Electrical Power & Energy Systems* **43** pp54-62
- 31. Markusson, N., Kern, F., Watson, J., Arapostathis, S., Chalmers, H., Ghaleigh, N., Heptonstall, P., Pearson, P., Rossati, D. & Russell, S. (2012) A socio-technical framework for assessing the viability of carbon capture and storage technology. *Technological Forecasting and Social Change* **79**: 5 pp903-918
- 32. Marsden, T. & Sonnino, R. (2012) Human health and wellbeing and the sustainability of urban-regional food systems. *Current Opinion in Environmental Sustainability* **4**: 4 pp427-430
- 33. Marsden, T. (2012) Sustainable place-making for sustainability science: the contested case of agri-food and urban-rural relations. *Sustainability Science* pp1-14
- 34. Marsden, T. (2012) Towards a Real Sustainable Agri-food Security and Food Policy: Beyond the Ecological Fallacies? *Political Quarterly* **83** pp139-145
- 35. McLeod, R.S., Hopfe, C.J. & Rezgui, Y. (2012) An investigation into recent proposals for a revised definition of zero carbon homes in the UK. *Energy Policy* **46** pp. 25-3
- 36. Newman, D. (2012) The Geography of Mobilities: Practices, Spaces, Subjects. *Urban Geography* **33**: 8 pp1249-1251
- 37. Newton, J., Franklin, A., Middleton, J., Marsden, T. (2012) (Re-)negotiating access: The politics of researching skills and knowledge for 'sustainable communities'. *Geoforum* **43**: 3, pp585-594
- 38. Nieuwenhuis, P., Beresford, A. & Choi, A.K. (2012) Shipping or local production? CO 2 impact of a strategic decision: An automotive industry case study. *International Journal of Production Economics* **140**: 1 pp138-148.
- 39. Paddock, J. (2012) Marking the Boundaries: Position Taking in the Field of Alternative Food Consumption in A. Viljoen and J.S.C. Wiskerke, Eds.) Sustainable Food Planning: Evolving Theory and Practice, Wageningen Academic Publishers
- 40. Papadopoulos, P., Skarvelis-Kazakos, S., Grau, I., Cipcigan, L.M. & Jenkins, N. (2012) Electric vehicles' impact on British distribution networks. *IET Electrical Systems in Transportation* **2**: 3 pp91-102.
- 41. Pearson, P.J.G. & Foxon, T.J. (2012) A low carbon industrial revolution? Insights and challenges from past technological and economic transformations. *Energy Policy* **50** pp117-127
- 42. Pidgeon, N. & Demski, C.C. (2012) From nuclear to renewable: Energy system transformation and public attitudes. *Bulletin of the Atomic Scientists* **68**: 4, pp41-51
- 43. Pidgeon, N. (2012) Climate Change Risk Perception and Communication: Addressing a Critical Moment? *Risk Analysis* **32**: 6, pp951-956

- 44. Pidgeon, N. 2012, Public understanding of, and attitudes to, climate change: UK and international perspectives and policy. *Climate Policy* **12**: SUPPL. 1, ppS85-S106
- 45. Pidgeon, N., Corner, A., Parkhill, K., Spence, A., Butler, C. & Poortinga, W. (2012) Exploring early public responses to geoengineering. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* **370**: 1974 pp4176-4196
- 46. Poortinga, W., Spence, A., Demski, C. & Pidgeon, N.F. (2012) Individual-motivational factors in the acceptability of demand-side and supply-side measures to reduce carbon emissions. *Energy Policy* **48** pp812-819
- 47. Shahidan, M.F., Jones, P.J., Gwilliam, J. & Salleh, E. (2012) An evaluation of outdoor and building environment cooling achieved through combination modification of trees with ground materials. *Building and Environment* **58** pp245-257
- 48. Shukla, A., Nkwetta, D.N., Cho, Y.J., Stevenson, V. & Jones, P. (2012) A state of art review on the performance of transpired solar collector. *Renewable and Sustainable Energy Reviews* **16**: 6, p3975-3985
- 49. Spence, A., Poortinga, W. & Pidgeon, N. (2012) The Psychological Distance of Climate Change. *Risk Analysis* **32**: 6 pp957-972
- 50. Stallworthy, M. (2011) Climate change policy in the European Union- Confronting the dilemma's of mitigation and adaptation. *Journal of Environmental Law* **2393**: pp537-541
- 51. Szarka J, Cowell R, Ellis G, Strachan P A and Warren C eds (2012) *Learning from Wind Power. Governance, Societal and Policy Perspectives on Sustainable Energy*, Palgrave: Basingstoke, Hants, ISBN: 978-0-230-29874-3.
- 52. Tsanas, A. & Xifara, A. (2012) Accurate quantitative estimation of energy performance of residential buildings using statistical machine learning tools. *Energy and Buildings* **49** pp560-567
- 53. Turner, K., Munday, M., McGregor, P. & Swales, K. (2012) How responsible is a region for its carbon emissions? An empirical general equilibrium analysis. *Ecological Economics* **76** pp70-78
- 54. Walker, H. & Brammer, S. (2012) The relationship between sustainable procurement and e-procurement in the public sector *International Journal of Production Economics* **140**: 1 pp256-268
- 55. Wells, P. & Zapata, C. (2012) Renewable Eco-industrial Development: A New Frontier for Industrial Ecology? *Journal of Industrial Ecology* **16**: 5 pp665-668
- 56. Wells, P. & Nieuwenhuis, P. (2012) Transition failure: Understanding continuity in the automotive industry. *Technological Forecasting and Social Change* **79**: 9 pp1681-1692
- 57. Whitmarsh, L. (2012) How useful is the Multi-Level Perspective for transport and sustainability research? *Journal of Transport Geography* **24** pp483-487
- 58. Wilson, K. & Lee, A.F. (2012) Rational design of heterogeneous catalysts for biodiesel synthesis. *Catalysis Science and Technology* **2**: 5, pp884-897

- 59. Woods, M. (2012) Rural geography III: Rural futures and the future of rural geography. *Progress in Human Geography* **36:** S pp125-134
- 60. Wright, C., Kiparoglou, V., Williams, M., Hilton, J. & Dagli, C. (2012) A Framework for Resilience Thinking. Conference on Systems Engineering Research. *Procedia Computer Science* **8**, pp45-52.
- 61. Xenias, D. & Whitmarsh, L. (2012) Dimensions and determinants of expert and public attitudes to sustainable transport policies and technologies. *Transportation Research Part A: Policy and Practice*.