1st Climate Change Forum 2019
Abstract Review- Poster Presentations

Title: Climate research at UCL Geography
Main Author: Chris Brierley
Job title: Associate Professor
Affiliation: University College London
Other Authors: Dr David Thornalley, Prof. Mark Maslin, Prof. Richard Taylor, Prof. Julian Thompson
Abstract Submission Number: 1
Abstract:
Through their Environmental Change Research Centre at University College London has an strong expertise on the mechanisms and impacts of current and future climate change. Here we provide a brief overview into the research activities and interests of geographers at London's global university.

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Title: GloSAT: a new global surface air temperature climate record
Main Author: Elizabeth Kent
Job title: Research Scientist
Affiliation: National Oceanography Centre
Other Authors: Ed, Hawkins, University of Reading, David, Berry, National Oceanography Centre Carla, Sands, National Oceanography Centre, Timothy, Osborn, University of East Anglia, David, Lister, University of East Anglia, Craig, Wallace, University of East Anglia, Clive, Wilkinson, University of East Anglia, Nick, Rayner, Met Office Hadley Centre, John Kennedy, Met Office Hadley Centre Colin Morice, Met Office Hadley Centre, Gabriele Hegerl, University of Edinburgh, Andrew, Schurer, University of Edinburgh, Stuart, Middleton, University of Southampton, Kevin, Cowtan, University of York
Abstract Submission Number: 2
Abstract:
GloSAT is a major new project that aims to more accurately estimate how the global climate has changed over the industrial era, as well as shedding more light on the causes of natural climate variations. GloSAT, will generate new estimates of global surface air temperature to help policymakers make a more informed assessment of the success of measures intended to limit increases in the Earth's surface temperature to well below 2˚C, in-line with the landmark Paris Agreement.

Current observational estimates of temperature change are a blend of sea-surface temperature over the ocean, air temperature above land and ice. This mixture of air and water temperatures can be complex to interpret and introduces some inconsistencies, especially when comparing observed temperature changes with those predicted by climate models. GloSAT will improve the consistency by constructing a new observational record using air temperature over the ocean instead of sea-surface temperature.

Using ship's observations of air temperature has a huge advantage because air temperature was measured on ships for decades before sea-surface temperature, meaning scientists can extend the data record back further in time. One source of early marine air temperature observations is the fleet of the English East India Company between 1789–1834 along trade routes from Europe to India and Southeast Asia. There are also observations from land stations before 1850 that have not yet been used in global datasets and the citizen science project WeatherRescue.org will rescue more observations for analysis and evaluation of our temperature records.

GloSAT will also analyse the new global surface air temperature climate record, so scientists can more confidently estimate temperature change over more than two centuries. This longer record will give a better understanding of natural climate variability generated internally within the climate system, as well as that due to external factors, such as increasing greenhouse gas concentrations, volcanic eruptions and solar changes.

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Title: Thames Estuary 2100 and Southampton University; Detection of Sea Level Rise Acceleration
Main Author: Andy Beverton
Job title: Thames Estuary 2100 Adviser
Affiliation: Environment Agency
Other Authors: Ivan Haigh
Abstract Submission Number: 3
Abstract:
The Thames Estuary 2100 Plan (the Plan) takes an adaptive pathways approach to managing tidal flood risk and climate resilience in the Thames Estuary to the end of the century and beyond. The Plan comprises a series of recommended interventions for the Thames Estuary flood defences. Interventions are scheduled to occur before water levels in the estuary reach specific thresholds. The estimated timing of interventions is governed by climate change projections. The Plan is reviewed at 5 yearly intervals. During each review the Plan is assessed against latest climate change projections and the intervention dates, or recommended interventions, can be revised appropriately.

The Plan's interventions require significant lead times; following the Plan's current climate change projection (Defra06) it is expected that a new Thames barrier will be required in 2070 to maintain a suitable standard of protection. The preparatory work required to install a new barrier is estimated to take a minimum of 20 years, meaning that our decision point for building a new barrier is actually 2050.

The impacts of climate change on projected water levels within the estuary are currently dominated by the rate of relative mean sea level rise (SLR) although changes in other parameters are also impactful (.e.g. changes in storm surges or astronomical tides). With the recent release of UKCP18 and the upcoming 10-year review of the Plan in 2020, we have an excellent opportunity to compare the Plan's original projection of SLR (Defra06) against UKCP18 and identify if intervention timings should be adapted.

However, detecting accelerations in the rate of SLR is not straightforward as the tidal signal contains a lot of noise, due mainly to the inter-annual variability evident in sea level at regional/local scales. This noise 'swamps' the smaller underlying acceleration signal. As a result, disguising between futures SLR projections presents a complex problem. This presents a significant problem for the Plan, when will Defra06 and UKCP18 projections be different enough to confidently distinguish between them? The timing of future water level thresholds being reached is a fundamental aspect of the Plans adaptive pathways approach. If we cannot confidently predict when we need a new barrier, we risk missing the decision point.

The University of Southampton and the Environment Agency have developed an interactive web-based toolbox that can combine various SLR projections with natural variability to simulate future mean sea level time-series. The toolbox selects the most appropriate statistical method which is able to distinguish between the "noisy" projections and provide a level of confidence on when it will be possible to confidently distinguish between differing sea level rise projections. Having the ability to state with confidence when we will be able to discern between projections of SLR provides an anchor point for decision making within the Plan.

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Abstract Review- Poster Presentations

Title: The impact of the 2018 drought on water balance and carbon capture of two major UK forest types

Main Author: Georgios Xenakis
Job title: Climate change scientist
Affiliation: Forest Research
Other Authors: Matthew Wilkinson, Forest Research, Mike Perks, Forest Research, James Morison, Forest Research

Abstract Submission Number: 4

Abstract:
Forests and woodlands play a vital role in regulating global temperatures and water and carbon cycles by removing carbon dioxide from the atmosphere, evaporating water and absorbing radiation. This interdependent relationship with climate means future changes such as drought will create feedbacks limiting growth (and hence carbon dioxide capture) and accelerate global warming. Over the past four years there have been an array of extreme weather events in the UK and around the world that have put forests under immense pressure. Last year in the UK, we have seen weather ranging from heavy snow and low temperatures in February and March to hot weather in late April, a very dry summer and several major storms such as Ali & Bronagh (September 2018), Callum (October 2018) and Deidre (December 2018) (UK Met office website). In this study, we present results of the water balance and carbon sequestration at Forest Research's two long-term greenhouse gas flux monitoring sites – Harwood forest, Northumberland and Alice Holt Forest, Surrey – and discuss the impact of the 2018 summer drought on two major UK forest species, Sitka spruce and English oak. For the spruce site annual precipitation in 2018 was 14% lower than the mean for 2015-2017. Losses of water through transpiration were 70% higher than the previous 3 year mean. Net carbon capture (uptake by the forest) was 30% less than the previous three years. A similar response was observed at the oak site, in 2018 net carbon capture was reduced by approximately 12% compared to the long-term mean. The results suggest that future hotter, drier summers will increase water losses from forests and limit their carbon capture. In addition, tree recovery from drought may not be immediate and any increase in the frequency of droughts and heat waves will result in high risk of mortality and forest loss.

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Title: Illustrations of extreme value analyses from the ETI Natural Hazards project.
Main Author: Kate Brown
Job title: Senior Scientist
Affiliation: Met Office
Other Authors: Erika Palin, Met Office, Kate Salmon, Met Office, Michael Sanderson, Met Office Emilie Vanvyve, Met Office
Abstract Submission Number: 5
Abstract:
We expect our infrastructure to be robust against natural hazards. When it isn't, this tends to make headline news, as exemplified by the strong winds experienced in the UK on the February 12th. These winds caused many trees to fall and left over 100,00 homes and businesses without power. The Cumbrian floods of 2015-2016 which left 45,000 properties without electricity and caused several road bridges to collapse. On the rare occasions when infrastructure fails and affects us, our expectations are that this is only a temporary situation with no or little long-term impacts. To ensure such resilience requires an understanding of the natural hazard of concern, as well as an understanding of how we can model future extreme hazards and the uncertainty associated with such models.

Recently, the first edition of Enabling Resilient UK Energy Infrastructure: Natural Hazards Characterisation Technical Volumes and Case Studies (www.imeche.org/eti) have been published. The technical documents focus on a set of natural hazards relevant to UK energy industry infrastructure and provide an overview of the latest techniques used to characterise the hazard. The case studies support the technical documents and illustrate how the techniques could be applied to a particular site, for a set of hazards.

This presentation will use the case study for Trawsfynydd, Wales, to illustrate two approaches for calculating magnitudes and return periods of extreme events: the characterisation of extreme minimum temperatures, and the co-occurrence of high temperatures and low summer rainfall.

The extreme value analysis approach described in the technical documents is used to model minimum temperature at Trawsfynydd. A step-by-step approach illustrates the fit of a suitable model, and how it can be improved, by including a covariate in the model and by removing correlated extremes. Return levels are provided accordingly at each stage, showing the effect that the distribution of the covariates may have on the return levels. In the second example, a joint probability analysis using a copula is applied to characterise the combination of high temperatures and low summer rainfall at Trawsfynydd. The copula represents the strength of the dependence between low summer rainfall and high temperatures and once this is known estimates of the joint probability of very low rainfall and high temperatures can be derived.

Acknowledgements

The first edition of Enabling Resilient UK Energy Infrastructure: Natural Hazard Characterisation Technical Volumes and Case Studies has been funded by the ETI and authored by the EDF Energy R&D UK Centre, with the Met Office and Mott MacDonald Limited.

Title: Infectious diseases, stillbirth and climate change: the role of the introduction of Zika virus in a population affected by Dengue Fever on birth outcomes

Main Author: Ana De Menezes
Job title: PhD Candidate
Affiliation: The London School of Economics and Political Science (LSE)
Other Authors:

Abstract Submission Number: 6

Abstract:
Vector-borne diseases, such as Zika Syndrome (ZIKV) and Dengue Fever (DENV), are not a new phenomenon in tropical and subtropical areas; however, the extent to which it may affect populations worldwide due to climate change is an unprecedented event. As a specific risk factor, DENV infection during pregnancy has been found as doubling the odds of stillbirth. However, the causal relationship of pre-existing DENV immunity on birth outcomes in human populations has not yet been thoroughly evaluated. Therefore, the objective of this research is two-fold: firstly, it aims to identify the causal effect of the introduction of ZIKV in a population already heavily affected by DENV on weight of new-borns and stillbirth rates; secondly, it intends to project the incidence of DENV and its associated stillbirth according to climate change scenarios. This research uses municipality-level monthly Dengue Fever cases, livebirth and mortality data from 2001 to 2017 for all 5,570 Brazilian municipalities. Differences-in-differences techniques are used to identify the causal relationship between pre-existing high DENV incidence in a population with risk of stillbirth once ZIKV is introduced. The robustness of the causal inference is tested with regression discontinuity and events analysis techniques. After the inference analysis, a model will be constructed to project the number of cases and stillbirth according to scenarios of climate change. In a preliminary research, I have modelled historical DENV incidence and projected its future incidence for all Brazilian municipalities. The spatio-temporal model projected Dengue Fever incidence for the period between 2030 and 2060. I found that higher temperature, low average income per capita and higher precipitation leads to higher Dengue Fever incidence in Brazil. If the incidence of ZIKV increases due to higher temperature caused by climate change, an increase in stillbirth might be expected throughout the century if adaptive measures are not taken place.

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Title: Climate Service Ethics and the Need for Professionalisation

Main Author: Jillian Schacher
Job title: Postgraduate Researcher
Affiliation: University of Leeds
Other Authors: Suraje Dessai, University of Leeds, Marta Bruno Soares, University of Leeds. Rob Lawlor, University of Leeds

Abstract Submission Number: 7

Abstract:
Climate services are broadly understood as the development of tailored climate science into usable tools and information to assist decision-making, reduce climate-related risks, and help society plan and adapt to climate change. As such, they can play a powerful role in shaping climate policy, and they influence planning and development across sectors as diverse as energy, food security, industry, and global health. However, climate services currently operate without enforced quality standards and or an established code of ethics, which exposes the field to significant ethical issues as the field commercialises. By existing in what is essentially a free market, increasingly privatised climate services run the risk of shifting provider incentives away from the public interest and towards the ongoing pursuit of profit. This would fail to effectively protect society from climate change impacts and would increase inequality in climate change adaptation. These findings show that the climate service field has already begun experiencing a shift away from its foundational public service orientation, and that implementing protective regulations in the form of climate service professionalisation would be both beneficial and achievable. Our interdisciplinary research draws on extensive literature reviews in climate science, medicine, engineering, water, and philosophy, examining the current state of climate services and drawing parallels from the development of the UK medical/engineering professions and the privatisation of the water sector. Our poster intends to spark ethical discussions within the wider climate research community, and inspire climate service providers to consider the benefits and disadvantages of a professional UK climate service field – complete with institutional leadership, a code of ethics, and a defined public service orientation. This discourse will shape the building blocks from which we can enact impactful, nationwide change, and will act as a prelude to the climate service workshops we will hold later this year.

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Title: Assessing the business implications of the physical impacts of climate change in emerging economies

Main Author: Richard Hewston
Job title: Head of Strategy, Environment and Climate Change
Affiliation: Verisk Maplecroft
Other Authors:

Abstract Submission Number: 8

Abstract:

Climate change and variability has the potential to significantly affect livelihoods and economies across the globe. Changes in regional climate regimes, including the shifting pattern of extreme climate events, will have implications for ecosystems, human health, physical assets, industrial operations, supply chains and infrastructure. The continuing integration of the global economy means that an increasing number of stakeholders are exposed to the disruptive effects of climate-related events. A key challenge facing decision makers across public, private and civil society sectors in addressing climate change is the absence of a consistent framework to identify, understand, manage and monitor climate change vulnerability.

Verisk Maplecroft responds to these challenges by providing organisations with robust climate data and innovative risk management decision support tools. Here, we present our Climate Change Vulnerability Index (CCVI) which assesses the susceptibility of human populations to the impacts of climate variability and change across the globe. The CCVI evaluates the physical impacts of climate variability and change; the sensitivity of societies to those impacts; and governmental capacity to adapt to climate change. Many of the locations most vulnerable are found in sub-Saharan Africa and South East Asia and are also expected to undergo significant economic and population growth in the coming years. Operations, supply chains and consumer bases in these locations are therefore exposed to heightened risks. We assess the degree to which economies are exposed to physical climate risk and how well placed they are to mitigate those risks.

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Title: Empowering and supporting scientists to connect with policy
Main Author: Inika Taylor
Job title: Climate scientist
Affiliation: Met Office
Other Authors: Cathy Cole, catherinecole24@hotmail.com, Met Office (until recently)
Abstract Submission Number: 9
Abstract:
Scientists have both an opportunity, and a responsibility, to actively communicate and translate their science to ensure that policy-makers are informed by the best available evidence. We propose a model for empowering and supporting scientists to bring their science to the attention of policy-makers, using the Met Office Hadley Centre Climate Programme (MOHCCP) 2018-2021 as an example. We present findings from a survey of scientists working within the MOHCCP; from consultations with organisations involved in the process of translating science into policy, both nationally and internationally; and from a review of the science communication literature. We identify the main challenges in communicating science for policy and explore opportunities to overcome them.

Based on this collection of evidence, we present recommendations for connecting scientists with policy based on five key principles: 1) Time, engagement and recognition; 2) Building and maintaining relationships; 3) a Tiered delivery approach, from underpinning science to highlights; 4) Facilitating a scientist-led visualisation capability; and 5) Promoting scientists visibility. Scientists are supported by an experienced scientific communications team to translate and deliver their science and co-develop policy relevant science questions with policy-makers.

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Abstract Review- Poster Presentations

Title: Resolving London's Greenhouse Gas Emissions
Main Author: Daniel Hoare
Job title: PhD Student
Affiliation: University of Bristol
Other Authors:
Abstract Submission Number: 10
Abstract:
The Intergovernmental Panel on Climate Change's Special Report on 1.5^{o}C Warming highlights the need for rapid reduction in greenhouse gasses such as carbon dioxide and methane. Cities and urban areas are some of the largest and most concentrated emitters, but city governments have opportunities to reduce emissions not present at the national level.

Currently, the UK government uses a small network of measurement sites over the UK to estimate greenhouse gas emissions at the national level each year. These estimates are used to verify the emissions reported under international treaties. However, this national scale is too coarse to resolve cities and cannot aid city governments. This work will use a new, dense network of atmospheric observation sites throughout London, combined with data from the latest generation of satellites to estimate emissions within the city.

Existing models will be developed to take advantage of these new sites. In order to fully resolve the features in the data, the resolution of the models will be increased by an order of magnitude, and additional urban scale effects will be examined. We will show some preliminary comparisons between the model and some urban and national scale data. Our results will eventually be used to verify emission estimates from the Greater London Authority.

For this research to be effective and impactful, collaboration between policy makers and academia is important. Dialogue is required to ensure that emission verification methods are useful for policy, and for policy teams to respond appropriately to new evidence on emissions.

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Title: UK climate change resilience and communication (RESILRISK): Public understanding of climate impacts, risks and adaptation strategies

Main Author: Katharine Steentjes
Job title: Research Associate
Affiliation: Cardiff University
Other Authors: Nick Pidgeon, Cardiff University, Christina Demski, Cardiff University, Adam Corner, Climate Outreach

Abstract Submission Number: 11

Abstract:

Building resilience towards the impacts of a changing climate is gaining prominence on the political agenda for many nations. However, to date there is limited evidence on how citizens view climate risk adaptation and we have a limited understanding of how these views are related to climate risk perceptions and communication strategies. Our research project (RESIL-RISK) aims to address these knowledge gaps.

Therefore we will conduct an online study with a sample of around 3 000 respondents with six demographically matched over-samples.

With this large survey, we will measure public perceptions of climate change impacts, risks and strategies to reduce or avoid these risks. Furthermore, we will test theoretically driven communication strategies within a nationally representative UK sample.

One important research question we will aim to answer is whether stressing the relevance of preparing for climate change within public discourse bears the danger of reducing motivations to mitigate climate change (mitigation deterrence).

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Title: Projecting how climate change risks accrue with increasing levels of global warming in six countries

Main Author: Rachel Warren
Job title: Professor of Global Change and Environmental Biology
Affiliation: Tyndall Centre for Climate Change Research and School of Environmental Sciences, University of East Anglia, Norwich
Other Authors:

Abstract Submission Number: 12

Abstract:
The Tyndall Centre and its partners is projecting climate change impacts for global warming levels of between 1.5-4°C in 2100, focusing on six countries, specifically China, Egypt, Ethiopia, Ghana, India and Brazil. Projections are expressed in physical metrics to describe the implications for meteorological drought, water security, coastal and fluvial flooding, heat stress, and crop yields in these countries as compared with a 1961-1990 baseline period. These are complemented by estimates of global aggregate economic damages from the PAGE integrated model (1). Year 2100 climate change anomalies for each level of warming are based on pattern scaled outputs corresponding to over 20 alternative global circulation model patterns produced by CLIMGen (2), in order to explore uncertainties in regional climate projection. Most impacts projections are derived from monthly projected climate change anomalies relative to a 1961-1990 observed baseline, whilst for fluvial flooding, the climate projections are further disaggregated to resolve variability on a daily timescale. Sea level projections for 2100 are derived from the WASP earth system model (3) itself driven by global temperature time series, which themselves originate from the IMAGE integrated assessment model (4). Projected impacts are derived from existing spatially explicit simulation models well established in the literature. Projections are produced at a spatial scale of 0.5x0.5 degrees, and for a 30 year time period centred on 2100 in order to average out inter-annual variability.

Title: Scientific challenges in understanding the climate system and its interactions with society - a vision for the Climatic Research Unit

Main Author: Clare Goodess
Job title: Senior Research Fellow
Affiliation: Climatic Research Unit, University of East Anglia
Other Authors: Timothy Osborn, Nans Adoor, Colin Harpham, Ian Harris, Phil Jones, Manoj Joshi, David Lister, Satyaban Ratna, Craig Wallace, Ben Webber - all Climatic Research Unit, Unviersity of East Anglia

Abstract Submission Number: 13

Abstract:
The Climatic Research Unit (CRU) was established at the University of East Anglia back in 1972. The Vision of CRU has recently been reviewed and updated to better reflect the ever-increasing emphasis of our research on the scientific challenges which are most pressing for society. This research is directed towards two key questions: (i) How and why does our climate change – past, present and future – and what are the implications? (ii) How can we quantify, reduce and communicate the uncertainty in the climate information that is developed for society? CRU is best known internationally for its datasets built from instrumental observations. These are used world-wide for monitoring climate change and evaluating the performance of climate models. We also use a number of other approaches to address the two key questions above. These include learning from the more distant past (the palaeoclimate record) and understanding how the atmosphere, oceans and ice interact. These interactions result in critical feedbacks which affect the Earth system, climate variability and climate change. By better understanding the dynamics of the climate system and how well these dynamics are captured by climate models, climate scientists should be able to make better (i.e. less uncertain) predictions and projections for the future. Some specific examples of work on these different topics will be presented, focusing on the risks of weather and climate extremes and water cycle risks. Work on the development of climate services and the provision of appropriate and reliable climate information for assessment of climate impacts will also be highlighted.

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Title: Coastal Impacts of Climate Change for Small Island Developing States in the Caribbean
Main Author: Judith Wolf
Job title: Physical Oceanographer
Affiliation: National Oceanography Centre
Other Authors: Sveta Jevrejeva, Jenny Brown, Lucy Bricheno, Michela De Dominicis, David Byrne, Ben Phillips
Abstract Submission Number: 14
Abstract:
Small Island Developing States (SIDS) are at risk of coastal flooding and erosion due to extreme water levels and waves, driven by tropical cyclones. Sea level rise exacerbates the impact of hurricane events in the Caribbean, increasing the effective return period of extreme water levels and waves. Waves can contribute to sea level change by setup and runup and also cause damage to beaches, coral reefs, mangroves, and offshore structures. Locally-generated wind-sea and long-period swells, generated by remote storms, can cause different types of coastal impacts. Steep volcanic islands such as those in the Lesser Antilles of the Caribbean, e.g. Saint Vincent, with no shelter from neighbouring landmasses, may be threatened by long swell waves several times per year, as well as occasional direct hurricane impact on annual to decadal time-scales. Direct impacts from individual hurricanes are quite infrequent, especially south of the main hurricane track. The effects of climate change are causing sea level rise and an increased incidence of hurricanes. The slow changes due to increasing sea level (due to global warming) combine with occasional storm-induced surges, waves and regular tides, to modify the return period of extreme water levels and the duration and frequency for which waves impact the coast.

We have used regional hydrodynamic and wave models to provide offshore boundary conditions for waves and surges due to hurricanes in the Caribbean Sea. The NEMO model has been used in pseudo-2D mode to generate surges, driven by the inverse barometer effect and local winds in shallow water (which have a limited contribution in steep volcanic islands). The WWIII wave model is used to accurately capture a variety of wave conditions in the Caribbean Sea, including large significant wave heights observed during hurricane events. We have compared different forcing fields from reanalysis and synthetic storms to test the worst-case scenarios. Downscaling the wave model to local scale using the SWAN wave model can capture nearshore wave processes and wave setup. We have also applied the XBeach model transform the waves across the beach profile to determine wave run-up and cross-shore morphodynamic change. These simulations were performed under wind wave and swell regimes and different antecedent beach conditions, to bring the storm impacts to the relevant local level.

With limited resources, SIDS have a need for information on climate change impacts, but a paucity of local observational data. Through collaboration with local stakeholders in St Vincent and the Grenadines (SVG), we have identified particular areas at risk from changing water level and wave conditions. The Caribbean Sea, particularly the Lesser Antilles, suffers from limited observational data due to a lack of coastal monitoring, making numerical models even more valuable to fill this gap. Our current project brings together improved access to tide gauge observations and local wave data, as well as global, regional and local water level, wave and storm impact modelling to provide useful tools for coastal planners.

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Title: Quantifying financial impacts of sea level rise risk on the insurance sector
Main Author: Nicola Howe
Job title: Risk Management Solutions
Affiliation: Lead Catastrophe Risk Modeller
Other Authors: Joss Matthewman, Alex, Guerrero, RMS Ltd
Abstract Submission Number: 15
Abstract:

Climate change, and society's response to it, presents significant financial risks to the general insurance market, especially the natural and catastrophe risk sector. The Bank of England's Prudential Regulation Authority (PRA) is responsible for regulating firms and making sure they are adequately protecting policyholders. In a recent assessment they found a lack of guidance to firm's trying to identify and manage their current and future risk due to physical climate change.

Risk Management Solutions (RMS) is a catastrophe risk modelling company helping financial institutions and public agencies understand, quantify and manage their risk from natural and man-made hazards. This presentation examines a case study developed by RMS for the PRA as part of their efforts to help insurers develop and apply climate change scenarios to their business. Scenario analysis involves selecting or developing a range of climate change scenarios leading to a reasonable diversity of different physical risk outcomes and in this case includes short- and long- term assessments on the underlying business.

We look at the impact of sea level rise (SLR) due to climate change on the likelihood of loss due to storm surge in two towns on the United States East Coast. We use an existing catastrophe model – the RMS North Atlantic Hurricane Model – and apply different SLR scenarios. We discuss the results, the limitations of the study and how we can apply a similar approach to European Windstorm modelling to help the UK insurance market quantify their risk.
This study will be published in the 2019 PRA report "A framework for assessing financial impacts of Physical Climate Change risk for the general insurance sector".

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Title: Assessing the financial impact of climate change on flood risk using catastrophe models
Main Author: Sarah Jones
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Affiliation: JBA Risk Management
Other Authors: Emma, Raven, BSc MSc PhD, emma.raven@jbarisk.com, JBA Risk Management; Ian, Millinship, BSc MSc CGeog(GIS), ian.millinship@jbarisk.com, JBA Risk Management; Rob, Lamb, BA MA PhD MBCS, rob.lamb@jbatrust.org, JBA Trust
Abstract Submission Number: 16
Abstract:
"Flood damage causes financial losses of between £250 million and over £1 billion annually in the UK and nearly 20% of all buildings in England and Wales are at significant risk to flooding. In the future, projections suggest that the number of properties exposed to frequent flooding will increase by ~20% by the 2050s. It is therefore important to analyse how financial losses may change with flood risk in the future.

We have used data available from national research projects to develop the UK's first climate change flood catastrophe model. The national research projects, including the UK Climate Change Risk Assessment, have assessed the regional impact of climate change on river flows, extreme rainfall and sea level rise and have contributed to the development of a series of climate change allowances. We have used these allowances to adjust the intensity of the river, surface water and coastal flood hazard within our catastrophe model, a physical-statistical hybrid model predominantly used to estimate potential loss from extreme and wide-impact events.

By comparing outputs from our climate change model against model outputs representing present-day risk in the UK, we can assess the potential impact of climate change on financial loss by 2040. Results suggest there may be a 25-30% increase in Annual Average Loss across the UK by 2040, and highlight regional variability, with some areas experiencing a decrease in future flood risk.

Our climate change model provides users, typically from the (re)insurance, bank or asset management sectors, with a better understanding of future flood risk, including helping to identify areas that are more (or less) susceptible to changes in flood risk in the future. The model can also be useful in proactive planning, focusing on mitigation, damage prevention and damage reduction, for example by those involved in planning flood defences."

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Title: Context, drivers, and impacts of observed 2018 summer temperatures in Scotland and implications for climate change adaptation

Main Author: Sabine Undorf
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Affiliation: University of Edinburgh
Other Authors: Kathleen, Allen, A.K.N.Allen@sms.ed.ac.uk; Joseph, Hagg, Joseph.Hagg@ed.ac.uk; Marc J., Metzger, marc.metzger@ed.ac.; Simon. F. B., Tett, Simon.Tett@ed.ac.uk

Abstract Submission Number: 17

Abstract:

Temperature extremes are a key aspect of climate and weather, both in terms of fundamental characteristics of the climate system and in terms of climate change adaptation globally. The relevance of adaptation measures in general has been politically acknowledged in the UK, but it is still unclear to which degree hot temperature events need to be included in the considerations in regions like Scotland, where projected absolute temperatures might stay moderate despite substantial relative changes in frequency and magnitude of its extremes. Assessing the need for adaptation to hot temperature extremes is urgent given the implementation time of measures, including the lifespan of, e.g., infrastructure elements, and relies on a thorough understanding of both the projected climate changes and the expected impacts.

Here, we therefore present results from an interdisciplinary study using the anomalously warm summer 2018 as a proxy for future high temperature events. Observed temperatures across the Northern UK and Scotland are examined in the context of regional past, present, and projected future climate, and impacts in Scotland surveyed. The climatological analysis focuses on the hottest day of the summer, the hottest 5-day period, the warmest night, and the 5-day period with the warmest nights. To assess the anthropogenic contribution to changes in the likelihood of the observed temperatures, we perform an event attribution study using a CMIP6-generation global climate model (HadGEM3A-GA6). To analyse future changes in the likelihood of these temperatures, we analyse regional climate projections recently provided by the Met Office as part of the UK Climate Projections (UKCP18) project.

We find that the values observed in summer 2018 were moderately rare events given the recent climate (1960-2010), with night-time temperatures more unusual than daytime temperatures. All extremes were made more likely by anthropogenic climate change since 1850, with the observed warm night-time temperatures by factors of at least about 5. A preliminary impact analysis suggests that the most severe negative impacts were related to water stress and occurred especially in the agricultural sector, and also identified positive impacts and missed benefits. Stakeholder interviews highlight an increased projected adaptation need if more than one summer with 2018 temperatures occurred in a row; and climate projections suggest every other summer in Scotland to have periods as least as warm as those observed in 2018 as early as in 20-30 years. These results show that hot temperature extremes can not be disregarded in the climate change adaptation context in Scotland, and call for more work on the expected impact of even higher temperatures than those observed in 2018.

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Title: How can we manage the risk of crossing climate thresholds?
Main Author: Richard Wood
Job title: Head, Oceans, Cryosphere and Dangerous Climate Change
Affiliation: Senior Climate Scientist
Other Authors: Laura Jackson, PhD, laura.jackson@metoffice.gov.uk, Met Office Hadley Centre
Abstract Submission Number: 18
Abstract:
There is evidence that the climate system can change into states that are very different to the present. A well-known example is the so-called 'ocean conveyor belt circulation', which plays a crucial role in warming the climate of western Europe. The circulation is believed to have collapsed at various points in the past. Current climate models suggest that such a collapse is very unlikley during the 21st Century, but modelling such an extreme event is a challenge for climate models and confidence is low in longer term projections. Can we nevertheless use climate science to help us manage the risks from such a low probability, but high impact event?

In this study we show how climate models can be used in two ways to help manage the risk of a conveyor belt collapse, despite low confidence in their longer term projections:

-First we can use models to develop observable indicators of when a threshold is passed. By observing these indicators in the real world we can get early warning of approaching thresholds to inform mitigation or adaptation action.

-Secondly we can use models to understand circumstances that might trigger a collapse. For example, in heading for a particular climate change target (such as 1.5 or 2 deg C global warming), does it matter whether we temporarily overshoot the target? Would this increase the chances of a possibly irreversible circulation collapse?

In this poster we show how these appraoches may be feasible for the conveyor belt circulation. The method may also be applicable to other climate-related thresholds (e.g. sustainability of tropical forests).

1st Climate Change Forum 2019
Abstract Review- Poster Presentations

Title: The North Atlantic Climate System Integrated Study
Main Author: Rowan Sutton
Job title: Director of Climate Science
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Other Authors: Jon Robson, Scott Osprey, Bablu Sinha, Lesley Gray, Alex Archibald
Abstract Submission Number: 19
Abstract:
Major changes are occurring across the North Atlantic Climate System: in ocean and atmosphere temperatures and circulation, in sea ice thickness and extent, and in key atmospheric constituents such as ozone, methane and aerosols. Many changes observed in recent decades are unprecedented in instrumental records. Changes in the North Atlantic directly affect the UK's climate, weather and air quality, with major economic impacts on agriculture, fisheries, water, energy, transport and health. The North Atlantic also has global importance, since changes here drive changes in climate, hazardous weather and air quality further afield, such as in N. America, Africa and Asia.

Whilst the impact of greenhouse gases is well established as the dominant influence on global climate over the last century, factors influencing regional changes over the next 10-20 years are far less well understood. The North Atlantic Climate System Integrated Study (ACSIS) is a 5-year research program that brings together multi-disciplinary expertise of 6 NERC research centres and the UK Met Office to improve our understanding of North Atlantic change. ACSIS combines state-of-the-art observations, modelling studies and climate predictions to tackle critical questions: how and why is the North Atlantic changing? How will it change in the future and what will be the consequences for climate risks in the UK and elsewhere? This poster will provide an overview of ACSIS and some recent key results.

Title: Urban Stormwater Design in India in a post Paris world

Main Author: HAIDER ALI
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Abstract Submission Number: 20

Abstract:
Urban areas in India face frequent flooding due to increase in short-duration precipitation extremes. However, it remains unknown how short-duration precipitation extremes that are relevant to urban storm water designs change under the 1.5° and 2.0° warming worlds. Here using the data from climate models and observations, we show that 3-hourly precipitation maxima at 100-year return interval are projected to increase by 20% (25%) if the global mean temperature rises above 1.5° (2.0°) from the preindustrial level. Under the nonstationary assumption, short duration precipitation extremes are projected to rise more than that of under stationary assumption. Moreover, sub-daily precipitation extremes are more sensitive to warming than daily extremes. Our findings provide new insights for urban storm water designs in India.