In this newsletter we preview our up and coming Annual Conference on the 20th September. We feature some of the conference talks on page 4. The successful Feasibility Projects from our second Project Call are announced on pages 2 and 3. Mark Cutler describes his NERC-funded STEED Project (Spatio-TEmporal dynamics of forest response to ENSO Drought on page 5 and Ilaria Prosdocimi describes her experience at the recent TIES conference on pages 6 & 7.

**SECURE Annual Conference**

SECURE will hold its annual conference on the 20th September 2016 at the Glasgow Science Centre. This will be a one day meeting, open to all. It will include talks from Professor Louise Heathwaite, Professor Richard Chandler and Dr Murray Lark. The event will include a choice of workshops designed to facilitate the formation of collaborative projects. There will also be short presentations on the five feasibility projects that were funded on our first Feasibility call.

The event is free and there is still time to register. [https://secureannualconf.eventbrite.co.uk](https://secureannualconf.eventbrite.co.uk)

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**Event Calendar September 2016 – October 2016**

**7th September:** SECURE workshop, University of Bristol
“Modelling data from multi-scale data streams in ecological and environmental sciences” see page 7 for more information.

**20th September:** SECURE Annual conference, Glasgow Science Centre
9.30am -4.30pm

[Conference Programme](#)
SECURE Feasibility Projects

Each year the network commissions the best four or five Feasibility Projects submitted from Universities and institutions throughout the UK. The six month long projects need to have at least one partner from each of the statistical and environmental science communities.

SECURE announced its second Call for Feasibility Project Funding in February 2016. Thirteen applications were received with a wide distribution across UK research establishments. There was also a good spread across earth systems and environmental science for which statistical modelling would be required. We were delighted to fund the following five projects in this round and also to award workshop funding to an additional project.

Title: Improved approaches for mapping and modelling blanket peatland extent and depth

Lead Applicant: Dr Lauren Parry, School of Interdisciplinary Studies, Dumfries campus, University of Glasgow

Together with Dr Duncan Lee and Dr Surajit Ray from the Mathematics and Statistics department of the University of Glasgow the Glasgow University Team will be looking at the role of statistical methods in potentially improving estimation and mapping, and assessing the extent to which cutting edge statistical methodology can bridge the gap in peat depth model development, by new interdisciplinary collaboration between the environmental and statistical communities.

Title: Models of species’ population trends and climate change accounting for weather-related observation bias

Lead Applicant: Dr Peter Henrys, Centre for Ecology and Hydrology

Understanding the impact of climate change on species’ populations is important across many areas of science and policy. Despite recent model developments, many statistical issues surrounding interpretation remain. In this project we will develop methodology to combine distributed lag models of population indices with an observation detection process to control for potential weather-related sampling bias. The developed methods will be tested on high frequency moth data for which coincident metrological data is available.

Title: Modelling Extreme Melt events On the Greenland ice sheet (MEMOG)

Lead Applicant: Dr Amber Leeson, institution

Extreme melt events constitute a positive feedback contributing to ice loss and sea level rise but are poorly provided for in geophysical models used to forecast future ice sheet change. Using extreme value analysis together with observations and geophysical model output, we will improve our understanding of the past distribution of extreme melt events on Greenland and update our future predictions of associated ice loss.
Title: Modelling and visualisation tools for water quality in the Clyde Estuary
Lead Applicant: Professor Adrian Bowman, School of Mathematics and Statistics at the University of Glasgow
The aim of the project is to gain significant insight into the water quality changes in the Clyde Estuary over the last 40 years and to communicate these insights effectively to a wide range of stakeholders. The project will involve developing a model which describes the changes in water quality in the Clyde Estuary over the past 40 years. Second year PhD Student, George Vazanellis, from the school of Mathematics and Statistics at the University of Glasgow, will be working on the project. The Scottish Environment Protection Agency, through Alan Hills and Ted Schlicke, is a partner on this project.

Title: Efficiency modelling non-stationarity in ecological spatial models
Lead Applicant: Dr Esther Jones, University of St Andrews
Using movement data from seals and eagles, we will develop a statistical approach to account for non-stationarity in spatial ecology models, resulting in more realistic predictions of species distributions from point process models. The project will bring together an international group of collaborators who work on movement and spatial ecology and statistics development and implementation in a 2-day workshop.

Workshops at the Annual Conference

Delegates at the Conference will have the choice of one of the following two workshops:

**Workshop 1: Communicating uncertainty**

This working session will explore different approaches and experiences of delegates in communicating uncertainty, and will pull together any common themes and outstanding questions.

**Workshop 2: Innovative applications of new data streams to environmental monitoring**

This working session will explore the experience of attendees in the use of unstructured data, identify specific challenges and reflect on new developments integrating the different data sources.
Talks at the Annual conference

We have three invited speakers, and here we showcase two (the third speaker is Professor Louise Heathwaite, CSA to RERAD, and we will report on her session in our next newsletter).

Dr Murray Lark, an Environmental Statistician from the British Geological Survey gives us an insight into his conference talk:
“Sampling, modelling and uncertainty, statistical approaches to some environmental questions”

In this talk I will draw on my experience at the British Geological Survey, and previously at Rothamsted Research, where I have worked in partnership with soil scientists, geologists, geochemists and, recently, psychologists, to address questions for environmental science, management and policy. Example questions include:
how to sample the soil efficiently to provide information about variability at multiple spatial scales,
how to account for temporal variability of stream chemistry data in spatial mapping;
how to communicate the uncertainty about spatial predictions to a general audience and
how to combine data streams of varying quality in a continental (Africa)-scale metaanalysis of studies on groundwater recharge.

Professor Richard Chandler from UCL sets the scene for his talk:
“Model calibration with uncertain inputs”

Mathematical, statistical and computer models are ubiquitous in environmental science as elsewhere, and are often used to study the drivers of change or to infer the likely effects of some intervention in a system. At a generic level, most such models aim to represent the way in which some outputs of interest depend on a collection of inputs. In addition, the specification of most models involves quantities whose values are unknown but which must be determined from data: this process is sometimes referred to as model calibration. In practice however, data on both the input and output quantities are often imperfect – due, for example, to measurement error, sampling variation or difficulties in establishing precisely controlled conditions. The implications for calibration can be surprising, and are perhaps not widely appreciated. My aim in this talk is to highlight some of the subtle issues that can arise in the calibration of both statistical and non-statistical models in environmental applications; to consider when it is necessary to deal with them; and to review some of the methods that are available for tackling the problem in this case.
Mapping and understanding forest response to El Niño drought.
Dr Mark Cutler, University of Dundee

Tropical forests are an important economic and natural resource for many developing nations, as well as providing many ecosystem services for the global community. In addition to the well-documented exploitation of these forests for logging and agriculture, these fragile ecosystems also have to contend with short-term climate perturbations, such as the recent El-Niño Southern Oscillation (ENSO). This year's ENSO event was one of the strongest for many years and appears to be similar to the strong El-Niño experienced in 1996-97 in terms of duration and strength (Wolter 2016). During El-Nino events rainfall in SE Asia is markedly reduced leading to uncertain impacts on tree growth, mortality and the resilience of tropical forests to short-term changes in climate. To address this uncertainty, the NERC-funded STEED Project (Spatio-TEmporal dynamics of forest response to ENSO Drought) aims to provide evidence of the impact of the current ENSO event on the resilience of previously disturbed forests, and to do so by scaling up observations from local to regional scales. Led by Dr Mark Cutler (Dundee) in collaboration with Prof. David Burlsem (Aberdeen), Prof. Giles Foody, Dr Doreen Boyd and Dr Geertje van der Heijden (Nottingham), the project is using a mix of field and satellite observations to monitor the impacts of the recent ENSO-induced drought on forests in Sabah, Malaysia. Critically, this work makes use of a network of 52 in situ forest plots that were established at the end of the last strong ENSO event in 1996-97. In resurveying these plots in 2014/15 we have established a 20 year baseline of forest change along a post-logging disturbance gradient, during which time there have been only relatively mild ENSO conditions. Further monitoring of these plots will now help us to isolate the impacts of the current ENSO event. An important aspect of this work is the multi-scale approach (both temporal and spatial), where we will use in situ observations to inform and validate observations from drone-based, airborne and satellite sensors. High spatial resolution data (from both during and post-drought) will allow us to monitor impacts such as tree mortality and canopy dynamics (including liana growth), whilst from coarse spatial resolution sensors we will derive a 20 year time series of drought indices across the whole of Sabah, providing a picture of the regional impacts of the current El Niño. Begun in May 2016 the project will have to address key challenges behind the interpretation and extraction of spatial and temporal trends in remotely sensed data, as well as contribute to debates on the representativeness of sample plots in complex forest landscapes and how to effectively scale up detailed observations to larger spatial regions.

Dr Mark Cutler is a Reader in Geography, University of Dundee, and a member of the SECURE Feasibility Project Panel. Email: m.e.j.cutler@dundee.ac.uk

26th International Environmetrics conference (TIES)

SECURE was present at the 26th International Environmetrics conference (TIES) held in Edinburgh 18-22 July. As well as sponsoring a plenary lecture by Prof Brian Reichs of North Carolina State University, SECURE also organised an invited session on Sensors in the environment. Brian stood in at the last minute for Montse Fuentes who was not able to attend, and gave a presentation with two parts - the first on air pollution and health (specifically pregnancy outcome) and then a 2nd part about spatial variable selection. The SECURE session on sensors had four invited speakers, Amira Elayouty, University of Glasgow, Luigi Spezia, BioSS, Maria Franco Villoria, University of Turin and Francesco Finazzi, University of Bergamo. Their talks spanned earthquake epicentre estimation using a network of smart phones, markov switching models for high frequency times series from automatic monitoring of animals, quantile regression for functional data (with applications to extremes such as river flow or air quality) and time-varying dynamic functional principal components (with application to partial pressure of CO2 in rivers). Amira who was our first speaker, also shared the best student oral presentation of the conference.

SECURE conference funding : Ilaria Prosdocimi

SECURE has helped fund so far five scientists to attend both UK and International conferences where they are either presenting a poster or giving an oral presentation. Here Ilaria Prosdocimi describes her experience at the TIES conference.

Thanks to the support of the Secure network I attended The International Environmetrics Society (TIES) Annual Conference in Edinburgh between the 18th and the 22nd July. The conference brings together statisticians and scientists at large who have an interest in the development and use of statistical and quantitative methods in the environmental sciences. The range of expertise showcased at the conference and the spectrum of challenges discussed are therefore very wide, and sessions with topics as diverse as environmental impacts on health or climate extremes would take place at the same time. This gives participants the opportunity of finding out what are the latest developments in their field of interest, but it also possible to sit in sessions about topics one might be less familiar with, which is an excellent way to learn about different problems and be exposed to new methods and approaches. The plenary sessions also covered diverse aspects of the analysis of environmental data and were interesting and inspirational. The poster session of Tuesday evening was also a good moment to discuss directly with the researchers a very
wide range of topics and statistical approaches to very diverse problems. I personally really enjoy poster sessions, as they offer the opportunity to have a more direct discussion with the researchers presenting their work, and thought that the session at TIES was well organised and I discussed really interesting and varied topics with statisticians and environmental scientists. The poster session was well attended, and everybody enjoyed some tasty starters and a glass of wine. Surely the attendance was increased by the temptations of the evening program: a most Scottish dinner of haggis tatties and neeps and the possibility of learning how to dance traditional Ceilidh! I gave an oral presentation in one of the contributed sessions of Tuesday morning. I presented the results on the estimation of the frequency of short-duration rainfall events. This work was carried out within a larger Environment Agency funded project investigating the suitability of the current methods for flood risk estimation in small catchments. I received some interesting comments and feedback on my talk, which seemed to be of interest to at least some people in the audience. During the rest of the conference many other talks presented issues connected with the modelling of environmental extremes (floods, rainfall, droughts, etc.) and TIES was a great opportunity to catch up with some of the latest research on this topic. Overall the conference was quite enjoyable, both for the good science and the pleasant chats at coffee breaks and lunches: I am really glad I could attend.

SECURE Workshop, 7th September, University of Bristol

The last of the workshops funded by SECURE in its workshop call is: “Modelling data from multi-scale data streams in ecological and environmental sciences”; Lead Applicant: Dr Ben Swallow. **Keynote speakers:** Jonty Rougier (University of Bristol), Paul Blackwell (University of Sheffield) and Hartmut Boesch (University of Leicester). Registration link on SECURE website 3news section

Our next issue will appear in December 2016, if you would like to contribute an article then please contact Gillian Brown.