Joint IMA Meeting – speakers, titles and abstracts

Rebecca Killick - Lancaster University
Change and the Environment: A journey of statisticians and environmental scientists

Climate Change is a phrase we hear a lot, from the media, government, experts, and general public. It is a general phrase that can mean different things to different people. This talk will introduce my statistical view of what I interpret Climate Change to mean and my ongoing work in assessing environmental change. As we discover more about statistical determination of change together, I will touch on collaborating with environmental scientists, the positives and frustrations of publishing in environmental journals, and ethical quandaries

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Vera Melinda Galfi — Vrije Universiteit Amsterdam
Mathematical insights into climate extremes

The climate is a complex, high-dimensional, non-linear and chaotic system. It is a coupled system comprised of several interacting sub-systems: the atmosphere, the hydrosphere, the cryosphere, the lithosphere and the biosphere. The dynamics of this system are intricate, and its extreme events often occur unexpectedly, with significant impacts on society. Understanding and predicting weather and climate extremes - whether deterministically or probabilistically - can save lives and prevent damage. In this talk, I will introduce the fundamental properties of the climate system, with a focus on extreme events. I will also explore some of the most important mathematical tools available for analysing these extremes, such as extreme value theory and large deviation theory, and discuss the insights we can gain by applying them. Finally, I will discuss the implications of global warming on statistical properties of extreme events, as well as its impact on the application of the above mentioned mathematical tools.

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Christina Cobbold — University of Glasgow
The role of individuals and their traits in determining the impacts of environmental change: from blowflies to mosquitoes.

Environmental change is having profound effects on populations, from dramatic global declines in biodiversity to increased incidence and geographical spread of vector borne diseases, such as dengue and chikungunya. Predicting complex species-environment interactions is crucial for guiding conservation and disease mitigation strategies in a dynamically changing world. Many species can rapidly

respond to their changing environment through phenotypic plasticity, where variable traits are expressed depending on environmental conditions experienced. For individuals, the effects of phenotypic plasticity can be quantified by measuring environment–trait relationships, but it is often difficult to predict how phenotypic plasticity affects dynamics at the level of the population. I will present a mathematical framework for capturing the interaction of environment, individuals and their traits to establish the role of phenotypic plasticity in mitigating the effects of climate change. I will show how this new mathematical framework leads to both interesting mathematical questions and novel dynamics and can be used to study

the vector borne disease, dengue, spread by mosquitoes, helping to explain the location, magnitude and timing of historical and recent dengue outbreaks.