Climate Change: From Basic Nonlinear Physics to Policy-relevant Science.

Tim Palmer
Department of Physics, University of Oxford

Abstract

Climate change is one of the defining issues of our time: it's becoming relevant to almost every aspect of national and international policy, not to mention daily life. At its heart, climate change is a problem in basic physics: how are the statistical properties of the nonlinear system we call climate affected by our emission of greenhouse gases. The problem is complicated by two related factors: internal feedback processes which can either amplify or damp the direct radiative impacts of these emissions, and the fact that climate is a very high-dimensional chaotic dynamical system. Because of these factors, current projections of climate change are uncertain, especially on the regional scale. To make progress, climate scientists attempt to study climate with a hierarchy of models, from simple idealised mathematical representations of climate, to comprehensive Earth System models running on the world's largest supercomputers. In this talk I will describe models lying at the two ends of the spectrum, how they can inform each other, and what is needed to reduce uncertainty about future climate change.