

The AIMES OSC, Edinburgh, 10-13 May 2010

## ***“Earth System Science: Climate, Global Change and People”***

The AIMES Open Science Conference will present recent advances in the understanding of Earth system dynamics and highlight new directions in analysing the interactions between humans and their environment. It is intended to help in the building of needed bridges: between the natural sciences, the social sciences and the humanities, and between policy, assessment and research.

The conference will be structured around three broad themes, as follows.

*1 Earth system modelling: from observations and process understanding to prediction and risk assessment.* Climate models have evolved to include interactions among atmospheric composition, biogeochemical cycles and the physical climate system. With this development has come the need to integrate understanding from many disciplines not traditionally linked to climate science. The application of models fulfils distinct objectives, including near-term climate forecasting, assessment of climate change impacts and risks, and quantifying the effects of climate policies. This theme will include recent advances in the integration of Earth system components in models, the application of diverse observations to evaluate and improve them, and the applications of models to project the consequences of different policy options for the physical, chemical and biological environment.

*2 Dynamics of biogeochemical cycles and climate: transitions, instabilities and feedbacks.* Natural archives attest to abrupt changes involving different aspects of the Earth system (physical and biogeochemical) apparently in response to smoothly varying forcing—the signature of a highly non-linear system. Concern is growing that human pressures could activate one or more of a host of potential positive feedbacks leading to an acceleration of climate change. The work needed to quantify feedbacks in the Earth System, based on observations and models, has only begun. This theme will deal with attempts to understand abrupt transitions in the past, and to move from speculation to prediction in assessing the risks of meeting thresholds and “tipping points” in the future.

*3 People and resources—perspectives on the relations among environment, ecosystems and human needs.* Sufficient, secure and safe supplies of water, food and energy are key human needs that underpin the UN’s Millennium Development Goals. But increasing pressures on the underlying natural resources—potentially compounded by climate change—are creating obstacles to their attainment. This theme will highlight the growing interdisciplinary field that strives to understand human-environment interactions through the concept of socio-ecological systems. This field aims to achieve an understanding both of the drivers of change in the use of land

and marine resources, and the consequences of changing resource use patterns for ecosystem services and human well-being.

Some “golden threads” run through all themes.

- *A view across scales and domains.* The Earth system cannot be adequately understood from the perspective of individual compartments or time scales of study. Models of the Earth System now include the physics, chemistry and biology of the oceans, atmosphere and land, while palaeoclimatic observations on Cenozoic, Quaternary and Anthropocene time scales—as well as rich information from contemporary observations—all contribute to our understanding of its dynamics.
- *Reciprocal relationships between people and environment.* Through millennia, people have relied on natural resources, while altering their natural environment in diverse ways: some beneficial, others not. Today these interactions extend to the global scale. The study of historical and present uses of land and marine resources has taken on a new vitality, as scholars try to synthesize perspectives from the social and natural sciences.
- *Exchange of ideas and knowledge between science and policy.* The high profile of Earth System science today rests mainly on worldwide recognition that many aspects of global change, including climate change, biodiversity loss and the depletion of natural resources, require urgent action to limit or reverse them. AIMES is charged with encouraging the development of an “Applied Earth System Science” which recognizes and embraces the pivotal role of societal drivers in posing intellectually challenging questions for fundamental research, as well as the role of research and assessment in policy formation.