PALAEOCLIMATES

WEDNESDAY 18 JANUARY 2006

Extreme warm climates in earth history – Prof David Beerling, University of Sheffield
Abstract not available

Pliocene climates and El-Nino – Dr Alan Haywood, British Antarctic Survey
The Pliocene, an epoch of geological time spanning an interval from ~ 5 to 2 million years before present (Ma BP), represents the last time in geological history when the climate of the Earth was significantly warmer than today over a period longer than any interglacial stage of the Quaternary. The Pliocene immediately precedes the initiation of Northern Hemisphere glaciation at ~ 2.7 Ma BP. It has been the subject of intense scientific study by geologists and palaeoclimatologists for a number of years. The research has focussed on exploring the dynamics of past warm climates and the use of this interval as a test best for the evaluation of numerical climate models that are currently utilised for future climate change prediction. In this talk we will briefly examine the evidence for Pliocene warmth and place the warmth of the Pliocene in the climatic context of the last 5 million years. We will then focus on a particular interval of the Pliocene, the mid Pliocene warm period (~3 Ma BP), and explore the character and behaviour climate system through the use of a combined data and modelling approach. We will investigate what the mid Pliocene world was like, and consider the potential role that El-Nino may have played in sustaining this last great warm event.

The ice core record of earth system change – Dr Eric Woolf, British Antarctic Survey
Ice cores are very powerful tools in palaeoclimate because both the climate response and many climate forcing factors (including greenhouse gases) can be viewed in the same core. Antarctic records now extend some 800,000 years (from Dome C), and they show the extremely close relationship between greenhouse gases and climate that has persisted throughout this period. I will discuss the major climate changes that can be seen in the record. Greenland records extending 120,000 years show that very rapid climate changes are common in glacial times. Showing that we understand the past behaviour of the Earth System, as seen in ice cores, is key to convincing ourselves that we can understand how it might behave in the future.

Modelling glacial-interglacial cycles – Dr Tim Lenton, University of East Anglia
The climate of the last million years is characterized by regular oscillations between cold glacial and warm interglacial states, thought to be paced by variations in the Earth's orbit around the sun. Sources of ancient climate data, such as marine and lake sediments and air trapped in polar ice cores reveal a remarkable behaviour; the climate behaves as a system of interlinked parts, changing in a complex but ordered way, in a sequence which recurs, with variations, like the themes in a symphony. The individual parts making up this composition are affected by changes in the physical circulation of the atmosphere

and ocean, the coverage of vegetation, ice sheets and sea ice, the marine biota, concentrations of carbon dioxide, methane, dust, and precipitation around the world. This behaviour suggests that the system is predictable, and the talk will introduce attempts to model it.

Understanding the climate of the last glacial maximum – Dr Michel Crucifix, Hadley Centre, Met Office

The Last Glacial Maximum (LGM) occurred about 21,000 years ago. This is the last time that the continental ice volume reached a maximum, with big ice sheets (up to 3,000 m-thick) over Northern America and Scandinavia. The global mean temperature was about 5o less than today, and the concentration of greenhouse gases was reduced, too. There is an increasing amount of data available for this period, which makes it particularly appropriate to understand the mechanisms of climate response and change. I will first show how, in practice, the climate of this period can be modelled: what are the boundary conditions and what sort of models can be used. I then focus on a few specific examples, such as the stability of the Atlantic ocean circulation and the impact of vegetation changes on the atmospheric circulation. The lecture concludes with an outlook on new methods aiming at extracting quantitative constraints out of paleoclimate records on the future evolution of climate.

Testing climate and earth system models using palaeoenvironmental observations from the past 21,000 years - Dr Sandy Harrison, BRIDGE, School of Geographical Sciences, University of Bristol

A wealth of geomorphological, sedimentary, isotopic and biostratigraphic data provide records of changes in environmental conditions through time. These palaeoenvironmental observations provide a detailed record of what has happened in the geological past, when the changes in climate were both as large and as rapid as the changes expected as a consequence of anthropogenic activities. Continental to global-scale syntheses of palaeo-observations document major changes in regional environments which can be used to evaluate specific components of earth system models (e.g. global vegetation models, hydrological models, trace gas and aerosol emissions models). Within certain constraints, palaeoenvironmental data can also be used to reconstruct climatic parameters for direct evaluation of climate models. This talk will illustrate the use of palaeo-benchmarks both in the Palaeoclimate Modelling Intercomparison Project and for the broader purpose of understanding the mechanisms of climate change.