Summary of the talk given by Wolfgang Cramer, Peyresq, Sept. 19, 2005

Basic impact of anthropogenic climate change

This talk gave an outline about the basic impact of anthropogenic climate change on various eco-systems. Wolfgang clearly stated that different eco-systems respond differently to the same "range" of changes of climate drivers. However, to analyse or prescribe the different sensitivities of eco-system responses, he rose the main questions. 1) Is there any evidence for impacts of anthropogenic climate change (CC) having already occurred? 2) Are there other impacts of anthropogenic CC to be expected? Can we see any change in the natural systems and, if so, can we attribute it or partly to CC?

Many changes in eco-systems have been observed such as the substantial decline in the Arctic sea ice extent from 1979 to 2003, the bleaching of coral reefs, changes in the length of the growing season at Northern high latitudes or the recession of most glaciers. Following these observations one wants to know how these changes can be linked with CC. Basically, there are two problems. One is the different sensitivity responses of different climate systems and another one is related to the highly non-linear functioning of eco-systems which are strongly governed by thresholds (e.g. acceleration of chemical and physical processes above a certain temperature), confounding factors (land use, pollution) and the temporal and spatial variability. Additionally, gradual and abrupt changes both occur in eco-systems and regular disturbances may alter their frequencies. For this reason, it is also important to distinguish several key drivers and to constrain the problem: 1) Specify the confounding factors, focus on 2) the changes that matter, 3) the eco-system goods and services and 4) on the adaptive capacities.

Wolfgang listed CO_2, net radiation, temperature, evapotranspiration, precipitation, soil moisture, land management, deforestation and pollution as the key confounding factors. The major feedback mechanisms and threshold-concepts should also be accounted for when defining what really matters in the eco-system. Eco-system goods and services describe the value for other eco-systems, society, animals, etc. in providing services (food, water, fibres, etc.), in regulating services (climate, floods, diseases, etc.) or cultural services (aesthetic, spiritual). Adaptation to changes in eco-system services can be endogenous or managed adaptation but we need to understand the functioning of the eco-system, e.g. such as the interactions between the climatic driving forces and the biogeochemistry at different scales.

The only alternative to have any ideas about how eco-systems may possibly unfold in the future for different scenarios are models (e.g. LPG model) as illustrated by modelling results.

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