Geophysical Research Abstracts
Vol. 13, EGU2011-8424, 2011
EGU General Assembly 2011

Intercomparison of the last nine interglacials in response to insolation and CO2

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From numerical simulations, analysis of the relative contribution of CO2 and insolation for all the interglacials of the last 800 ka show that CO2 plays a dominant role on the variations of the annual temperature averaged over the globe and over the southern high latitudes, whereas, insolation plays a dominant role on the variations of the tree fraction and of the northern high latitude temperature and sea ice. The relative importance of CO2 and insolation on the warmth intensity varies from one interglacial to another. For the warmest (MIS-9 and MIS-5) and coolest (MIS-17 and MIS-13) interglacials, CO2 and insolation reinforce each other. MIS-11 (MIS-15) is a warm (cool) interglacial due to its high (low) CO2 concentration, its insolation contributing to a cooling (warming). MIS-7, although with high GHG concentrations, can not be classified as a warm interglacial due to it large insolation-induced cooling. Related to these two forcings, MIS-19 appears to be the best analogue for MIS-1. In the response to insolation, the annual mean temperatures averaged over the globe and over southern high latitudes are highly linearly correlated with obliquity. However, precession becomes important in the temperature of the northern high latitudes and controls the tree fraction globally. Over the polar oceans, the response during the local winters, although the available energy is small, is larger than during the local summers due to the summer remnant effect. As warm interglacials provide potential analogues for our future warm climate, a special comparison between MIS-1, MIS-5, MIS-9 and MIS-11 will be made in terms of their forcings, global and region responses.