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Assessing the role of vegetation feedbacks and initial conditions for the climate during MIS11.

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MoBidiC, an Earth system model of Intermediate Complexity designed in Louvain-la-Neuve (Belgium) was used to study the climate changes at the time of Marine Isotope Stage 11 (MIS11). More precisely, the purpose of this study is to better analyse the condition for a glacial inception. In particular, we want to analyse the role of vegetation feedbacks and to assess the importance of the strength of the thermohaline circulation.

All the simulations are started at 420 kyr BP from an equilibrium state at that time. Atmospheric CO2 concentration is 264,5 ppmv. The Northern Hemisphere ice-sheets are taken from a transient simulation performed with the LLN 2-D NH climate model. The initial state of the thermohaline circulation is close to the present-day one. The baseline transient simulation is run for 85 kyr. It is forced by the insolation distribution changes and the time evolution of the atmospheric CO2 concentration as measured in the Vostok ice core. Sensitivity experiments are performed using fixed prescribed vegetation cover. Three situations are analysed, i.e. (a) 60% of forested area north of 60°N, (b) 17% of forested area north of 60°N, (c) no forested area north of 60°N. Global annual mean temperature is 0.5°C lower when there is no forest in the high latitudes than in the baseline simulation. Besides, reduced forest extension as in (b) and (c) favours ice sheets extension. While there is almost no ice sheets in the Northern Hemisphere in the baseline and in simulation (a), they are larger than 25Œ106km3 at 342 kyr BP in (b) and (c).

Sensitivity experiments were also designed to assess the importance of the initial state of the thermohaline circulation. In addition to the present-day THC used for the baseline simulation, a reduced and an enhanced THC are also used as initial condition for

the transient simulation. Preliminary results suggest that an enhanced THC does not allow the build-up of Northern Hemisphere ice sheets during the transient simulation. Moreover, global annual mean temperature is then 2°C larger than in the baseline simulation.