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# Possible sea level contribution of the East Antarctic ice sheet : MIS11 and beyond.

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Evolution of the Antarctic ice sheet is one of the key issues in predicting sea level response to global warming. Instability of West Antarctica has often been suggested but very few studies have been done on the dynamics of East Antarctica. We propose here a modelling approach to this point and we focus on the MIS-11 period because a high sea-level stand was hypothesized at that time.

To assess whether the evolution of the Antarctic ice sheet could explain such a high sea-level stand during MIS-11 we use a model (Ritz et al. 2001) which simulates the evolution of geometry and physical characteristics of the Antarctic ice sheet in response to climatic forcings. The model, GRISLI, is time-dependent, three-dimensional and thermomechanically coupled (it accounts for coupling between ice flow and temperature fields). It incorporates also the various types of ice flow found in Antarctica: inland ice, zones of ice streams and ice shelves. These different regions are coupled together making it possible to predict the grounding line migration. Another feature has been implemented recently and the model calculates now the basal water pressure at the interface between ice and bedrock. Ice streams location is based on a criterion of high basal water pressure. This feature allows the simulation of ice streams far inland on the ice sheet as is observed on the present Antarctic ice sheet. We expect that the impact of outlet glaciers on the inland ice sheet is better accounted for with this approach. However, basal drag below outlet glaciers is a key characteristic that is not well estimated and the global response of Antarctica to climatic change is sensitive to this parameter.

The model is forced by prescribing atmospheric temperature and precipitation, sea-

level and basal melting below the ice shelves. These forcings are derived from various climatic records extracted from ice cores and marine cores. With the former version of the model we had already shown that the West Antarctic ice sheet is very sensitive to basal melting below the ice shelves and that reasonable values of this forcing during MIS11 may lead to an almost complete disappearance of this ice sheet (Raynaud et al. 2003). In these experiments East Antarctica was not affected and a sea level stand as high as 20 m above present could be accounted for only by assuming that MIS11 was very dry over Antarctica. However another possibility must be considered. Recent observations demonstrate that substantial acceleration of outlet glaciers can occur both in Greenland and Antarctica and this process was not taken into account in our previous experiments. To assess the possible impact of outlet glaciers dynamics, we present sensitivity experiments with different values of the basal drag and we study the response in term of changes in the total volume of East Antarctica during the MIS11 event. It appears that for low basal drag values, outlet glaciers are much more active, leading to a substancial contribution of East Antarctic ice sheet (up to 6 m sea level equivalent). From these results we will infer some bounds on the possible evolution of this ice sheet in the context of future climatic change.