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Transient simulation of the last inception (128 to 115ka BP): cryosphere and climate interactions

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When studying glacial / interglacial climate evolution, one of the most standing issue is ice-sheets evolution and its relation to climate. While we have a good knowledge of the ice-sheet retreat during the last deglaciation (from different ice-sheet reconstructions, see https://pmip3.lsce.ipsl.fr/wiki/doku.php/pmip3), ice-sheet evolution over the last glacial inception is less well-known. There is some well-established evidence that sea-level was standing 3 to 5 meters above present-day levels, with a substantial part coming from melting of the Greenland ice-sheet. Also the dynamics of the inception is complex with inception starting in northern Canada and in northern (east) Siberia (Svendsen et al., 2004).

In this paper, we use the LOVECLIM coupled atmosphere—ocean—vegetation model newly coupled to the GRISLI ice-sheet and ice-shelves dynamic model, in a set-up for the northern hemisphere, forced by changing insolation parameters from 128 ka BP to 115 ka BP. We then perform an ensemble of coupled climate –cryosphere simulations with varying crucial parameters in ice-sheet processes such as flowing law, basal melting of the ice-shelves etc. In order to disentangle the effect of coupling an ice-sheet model to climate we also compare our simulations to the same parameter setup with an offline ice-sheet setup.

We finally discuss the impacts of our results in the frame of existing data for the inception but also in terms of shape and location of the ice-sheets, the observed flows and role of ice-shelves in the inception.