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Reconstructing the post-LGM decay of the Eurasian Ice Sheets with Ice Sheet Models; data-model comparison and focus on the Storfjorden (Svalbard) ice stream dynamics history

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The challenge of reconstructing palaeo-ice sheets past growth and decay represent a critical task to better understand mechanisms of present and future global climate change. Last Glacial Maximum (LGM), and the subsequent deglaciation until Pre-Industrial time (PI) represent an excellent testing ground for numerical Ice Sheet Models (ISMs), due to the abundant data available that can be used in an ISM as boundary conditions, forcings or constraints to test the ISMs results. In our study, we simulate with ISMs the post-LGM decay of the Eurasian Ice Sheets, with a focus on the marine-based Svalbard-Barents Sea-Kara Sea Ice Sheet. In particular, we aim to reconstruct the Storfjorden ice stream dynamics history by comparing the model results with the marine geological data (MSGLs, GZWs, sediment cores analysis) available from the area, e.g., Pedrosa et al. 2011, Rebesco et al. 2011, 2013, Lucchi et al. 2013. Two hybrid SIA/SSA ISMs are employed, GRISLI, Ritz et al. 2001, and PSU, Pollard&DeConto 2012. These models differ mainly in the complexity with which grounding line migration is treated. Climate forcing is interpolated by means of climate indexes between LGM and PI climate. Regional climate indexes are constructed based on the non-accelerated deglaciation transient experiment carried out with CCSM3, Liu et al. 2009. Indexes representative of the climate evolution over Siberia, Svalbard and Scandinavia are employed. The impact of such refined representation as opposed to the common use of the NGRIP δ18O index for transient experiments is analysed. In this study, the ice-ocean interaction is crucial to reconstruct the Storfjorden ice stream dynamics history. To investigate the sensitivity of the ice shelf/stream retreat to ocean temperature, we allow for a space-time variation of basal melting under the ice shelves by testing two-equations implementations based on Martin et al. 2011 forced with simulated ocean temperature and salinity from the TraCE-21ka coupled climate simulation. In this presentation, we will show work in progress, address open issues, and sketch future work. In particular, we invite the community to suggest possibilities for model-data comparison and integration.

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