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## Improved treatment of snow over ice sheets in the NASA GISS climate model: towards ice sheet–climate coupling

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Representing the interactions between ice sheets and climate is essential for more accurate prediction of climate change and sea level rise. Ice sheets interact with the overlying atmosphere via the accumulation of snow and its compaction into firn, then ice, as well as the melting of surface snow and ice and the creation of runoff water. Getting an adequate representation of heat transfer, compaction, and melting processes is essential for an accurate representation of snow on land ice in global climate models. We are implementing an improved snow model on top of land ice as part of an effort to couple the NASA GISS climate model with the PISM ice sheet model. The new snow model includes additional layers and processes that are not currently incorporated (e.g., liquid water retention, percolation and refreezing, and snow densification), and mass and energy transfer methods that are consistent with both static ice sheets (with implicit iceberg fluxes) and interactive ice sheets (with explicit dynamics). We are tuning the densification scheme of this snow model with temperature and density data from common FirnCover and SumUp observations at locations in the accumulation zone of Greenland, and we compare the resulting density profiles to other SumUp density profiles in Greenland and Antarctica. We will assess the impact of this new snow model in climate model simulations with a static ice sheet compared with the previous (simpler) 2-layer snow model. Finally, we aim to use the non-coupled simulations as a baseline to assess the impact of dynamic coupling with an interactive ice sheet model.