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Sensitivity of ice shelf basal melt rates to a varying thickness distribution

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Simulations of ice shelf basal melting for several of the IPCC's future climate change scenarios have revealed the potential of a rapidly increasing basal mass loss particularly for the large Filchner-Ronner Ice Shelf (FRIS) in the Weddell Sea. Basal melt rates in some of these simulations exceed 15 m/yr near the deep grounding lines in the southernmost part of the cavity; modeled basal mass loss rises to more than 1500 Gt/yr in the warmest and freshest scenario. These findings are consistent between two independent sea ice - ice shelf - ocean models forced with identical atmospheric data sets. However, they assume a steady-state ice shelf geometry. To study ice-ocean interaction in a more consistent way, the ice flow model RIMBAY has been configured in a model domain that comprises the FRIS and the grounded ice in the relevant catchment area up to the ice divides. At the base of the model ice shelf, melt rates from the finite-element sea ice – ice shelf – ocean model FESOM are prescribed. With FESOM's increasing melt rates modelled for future climate warming scenarios, the ice model projects an accelerated grounding line retreat between the Möller and Institute Ice Streams. We use the ice shelf thickness evolution derived from RIMBAY to investigate the effect of a dynamically varying cavity geometry on simulated basal melt rates. A two-way coupling between the two models will be conducted as a natural next step.