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Validation of iceberg evolution model by ICESAT altimetry

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Antarctic tabular icebergs are important active components of the ice - ocean system. To investigate the relevance of inherent ice dynamics and temperature profile development to iceberg evolution, we developed a numerical model based on the fundamental equations of ice-shelf flow and heat transfer, forced by environmental parameters of the ice-ocean-atmosphere system. The model results indicate that mass release to the ocean due to basal melting is the primary cause of change in iceberg geometry during drift, whereas strain thinning associated with iceberg spreading is largely negligible. Thus, the reliability of our model depends strongly on the accuracy of the forcing data determining basal melting along the drift trajectories. Recently published ICESAT altimetry data now enable validation of our model results for the evolution of the tabular icebergs A38A and A38B. The data obtained in September to November 2003 contain several tracks across these and other tabular icebergs, which already reached their mid- to late stage of evolution after crossing the Scotia Sea. First comparisons show that the modeled iceberg thickness is about 10% smaller than the thickness obtained by ICESAT altimetry data. The measured freebord profiles of the icebergs now provide the opportunity to improve the accuracy of model forcing parameters, especially concerning the basal erosion.