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Antarctic instability and possible associated contribution to sea-level rise

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Projection of the forthcoming Antarctic contribution to sea-level rise is seriously hampered by the poor ability of current ice sheet models to properly compute comprehensive dynamics of the grounding line. This is a a serious limitation as large sectors present a bedrock below sea level and marine ice sheet instability may occur with drastic inland retreat of the grounding line. In order to circumvent this restriction we prescribe the grounding line migration in the global ice sheet model GRISLI. All regions presenting a bedrock lying below sea level are considered as unstable and a range of plausible migration rates from 500 to 3000 m/yr are imposed. The resulting simulations of sea level change are moderated using projections of future ocean warming in individual regions of the ice sheet's coast. These latter estimates are based on results from the FESOM high-resolution, finite element ocean circulation model forced by sea-surface boundary conditions based on HadCM3 and ECHAM5 simulations under the A1B scenario. The probability distribution of projected sea-level contribution is estimated by incorporating uncertainty in the rates of grounding line retreat, the areas vulnerable to such retreat and the magnitude of ocean warming likely to trigger retreat.