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When will the Antarctic ice shelves not be viable anymore?

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The Antarctic contribution to sea-level rise in the coming centuries remains very uncertain, due to the possible triggering of instabilities such as the Marine Ice Sheet Instability (MISI) and Marine Ice Cliff Instability (MICI). These instabilities are mainly linked to the evolution of the floating ice shelves, which usually buttress the ice flow from the ice-sheet to the ocean. However, these are currently thinning. Better understanding the evolution of ice shelves in the next decades to centuries is therefore important and crucial to better anticipate the evolution of sea-level rise.

In this study, we investigate the viability of ice shelves for a number of climate models and scenarios. This is estimated from the emulation of the surface and basal mass balance of MAR and NEMO respectively, and from high-end dynamical ice flows obtained through Elmer/Ice. We then use a Bayesian calibration to give weight to members closer to observations. We find that large uncertainties remain, mainly because of the uncertainty in basal melt, and that viability limits vary largely depending on the ice-shelf location.