



## **Grounding-line flux formula applied as a flux condition in numerical simulations fails for buttressed Antarctic ice streams**

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Currently, several large-scale ice-flow models impose a condition on ice flux across grounding lines using an analytically motivated parameterisation of grounding-line flux. It has been suggested that employing this analytical expression alleviates the need for highly resolved computational domains around grounding lines of marine ice sheets. While the analytical flux formula is expected to be accurate in an unbuttressed flow-line setting, its validity has hitherto not been assessed for complex and realistic geometries such as those of the Antarctic Ice Sheet. Here the accuracy of this analytical flux formula is tested against an optimised ice flow model that uses a highly resolved computational mesh around the Antarctic grounding lines. We find that when applied to the Antarctic Ice Sheet the analytical expression provides inaccurate estimates of ice fluxes for almost all grounding lines. Furthermore, in many instances direct application of the analytical formula gives rise to unphysical complex-valued ice fluxes. We conclude that grounding lines of the Antarctic Ice Sheet are, in general, too highly buttressed for the analytical parameterisation to be of practical value for the calculation of grounding-line fluxes.