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Numerical modelling of paleo-ice streams within the Antarctic Peninsula ice sheet

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Geophysical, geomorphologic and new marine geologic data reveal the extent, spatial dynamics and patterns of large-scale ice-flow features and ice streams that existed within the Antarctic Peninsula ice sheet at the Last Glacial Maximum (LGM). Here we present a detailed model study on the reconstruction of the LGM ice sheet covering the Antarctic Peninsula (AP) region with the 3D thermomechanical ice-sheet model of Pattyn (doi:10.1029/2002JB002329). Only grounded ice flow is considered at this point (ice shelves and grounding lines are not dealt with explicitly). The basic experiments consist of simulating the present AP ice distribution as well as an LGM sized ice mass by adjusting the surface mass balance regime and letting the ice sheet expand across the continental shelf. Comparison with paleo-reconstructions show that most ice streams are reproduced with the model as enhanced ice flow features. These enhanced flow features are mainly topographically controlled, filling the large subglacial trenches. Calculated ice thickness, driving and basal shear stresses are compared with estimates based on morphological interpretations, and linked to erosional and depositional features.