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The evolution of ice-shelf buttressing in the Amundsen Sea over the next 150 years

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Glaciers in the Amundsen Sea are rapidly thinning and retreating as a result of ocean-induced changes in ice-shelf buttressing. Here we use area-wide projections of ice shelf thickness and velocities to investigate changes in buttressing over the next 150 years under two limiting scenarios, i.e. sustained warm and cold ocean conditions. Our results are based on simulations using an asynchronous coupling between a high-resolution regional configuration of the 3D ocean model MITgcm, and the state-of-the-art SSA ice flow model Úa, with a coupling timestep of 6 months. Results provide the first Amundsen Sea-wide projections of glacier dynamics that fully account for the important feedbacks between ice-shelf geometry and ocean-induced melting. Limited changes in buttressing occur for existing ice shelves in a cold ocean scenario. However, a regionally diverse response is found for ice shelves subjected to warm ocean forcing, with increasing areas of ice providing reduced buttressing as the grounding line retreats.