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Modeling the response of Lambert Glacier–Amery Ice Shelf system, East Antarctic, to uncertain climate forcing over the 21st and 22nd centuries

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The interaction between the climate system and the large polar ice sheets regions is a key process in global environmental change. We carried out ice dynamic simulations of one of the largest drainage systems in East Antarctica: the Lambert Glacier–Amery Ice Shelf system, with an adaptive mesh ice sheet model. The ice sheet model is driven by surface accumulation and basal melt rates computed by two ocean and two atmosphere models. The change of the ice thickness and velocity in the ice shelf is
mainly influenced by the basal melt distribution, but, although the ice shelf thins in the most of the simulations, there is little grounding line retreat. We find that the Lambert Glacier grounding line can retreat as much as 30 km if there is sufficient thinning of the ice shelf south of Clemence Massif, but none of the ocean models provide sufficiently high melt rates in that region. Overall, the increased accumulation computed by the atmosphere models outweighs ice stream acceleration so that the net contribution to sea level rise is negative.