

Future Projections of David Galcier-Drygalski Ice Tongue under Idealized Scenarios

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We employ the ISSM to evaluate the response of David Glacier (DG) to various climate forcings, including the SMB, sub-ice shelf melting rate, and retreat of ice front position with two different geometry data set (Bedmap2 and BedMachine). Various climate forcing scenarios have some impacts on the acceleration of ice shelf velocity (SMB < 5%, floating ice melting rate < 5%, ice front retreat < 13%). Uncovering the subglacial ridge near the grounding line in BedMachine simulation reduces a mass discharge compared to the Bedmap2 simulation, although DG continuously loses its mass in different surface mass balance forcing conditions. The trend in sea level contribution shows the clear distinction in two simulations. Although the high sub-ice shelf melting rate and the fast retreat of ice front position display the local acceleration of the ice velocity near the grounding line, DG is remarkably stable because the current grounding line is located on the upsloping bed toward the hinterland. When we employ the extremely fast melting condition to identify the behavior of grounding line, the elevation of subglacial ridge above sea level prevents the grounding line retreating toward the hinterland. Based on our results, it is crucial to obtain more high-resolution geometry dataset, which could improve the future projection of Antarctic ice sheet to the climate forcings.