

Amundsen Sea Influence on the West Antarctic Ice Sheet

S Jacobs, A Jenkins & H Hellmer

West Antarctica (WAIS) is a marine ice sheet, grounded below sea level in a warming ocean. Its mass balance in a changing climate hinges on the balance between surface accumulation, iceberg calving and in situ melting under its fringing ice shelves. In the Amundsen Sea, those ice shelves are melting orders of magnitude faster than elsewhere around Antarctica, fueled by massive intrusions of Circumpolar Deep Water (CDW) onto the continental shelf. Remote sensing studies have correlated that melting with thinning ice shelves, accelerating ice streams and drawdown of the adjacent ice sheet. Melting of the WAIS into the Amundsen Sea may also account for a substantial part of observed ocean freshening downstream, and of recent sea level rise. We will undertake a multiyear study of seasonal and interannual variability in CDW access to the Amundsen Sea continental shelf and the regional ice shelves. The project will expand the network of coastal automatic weather stations and evaluate the role of the atmosphere in moisture flux, and in deep water upwelling along the shelf break and coastline. The perennial sea ice thickness will be mapped in relation to the ocean mixed layer, heat transport and meltwater content. Swath mapping of the sea floor will concentrate on the deep troughs that funnel warm, salty seawater to vulnerable ice shelf grounding zones. These varied measurements will be used in the modeling of ocean properties and circulation, the atmospheric forcing and sea ice cover, and their influences on the WAIS. This work will necessitate multiple cruises, robust instrumentation, cooperation with complementary Amundsen Sea Embayment projects (ASEP), and enhanced logistic support to reach key areas typically inaccessible to ice-strengthened research vessels.