An observed negative trend in West Antarctic accumulation rates from 1975 to 2010: evidence from new observed and simulated records

Landon Burgener, Summer Rupper, Lora Koenig, Rick Forster, William Christensen, Jessica Williams, Michelle Koutnik, Clément Miége, Eric J. Steig, Durban Keeler, Laura Riley

Snow accumulation rate observations from five new firn cores show a statistically significant negative trend over the past several decades across the central West Antarctic ice sheet. A negative temporal trend in accumulation rates is unexpected in light of rising surface temperatures as well as model simulations predicting higher accumulation rates for the region. Both the magnitude of the mean accumulation rates and the range of interannual variability observed in the new records compares favorably to older records collected from a broad area of the West Antarctic ice sheet, suggesting that the new data may serve as a regional proxy for recent temporal trends in West Antarctic accumulation rates. The observed negative trend in accumulation is likely the result of a shift in low pressure systems over the Amundsen Sea region, dominated by changes in the austral fall season. Regional-scale climate models and reanalysis data do not capture the strong negative accumulation rate trend observed in these firn cores. Nevertheless the models and reanalyses agree well in both accumulation rate means and interannual variability, with no single model or dataset standing out as significantly more skilled at capturing the observed magnitude of and trend in accumulation rates in this region of the West Antarctic ice sheet.