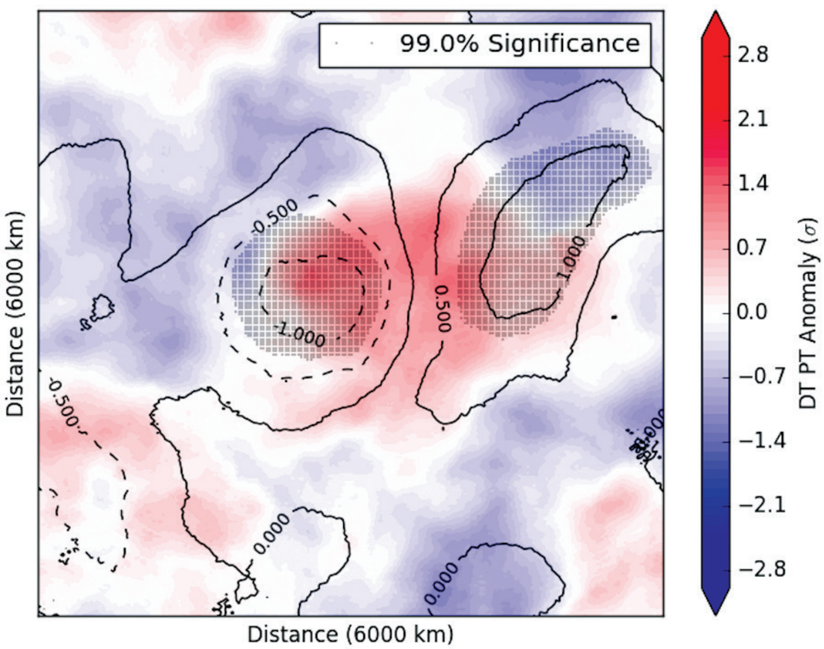
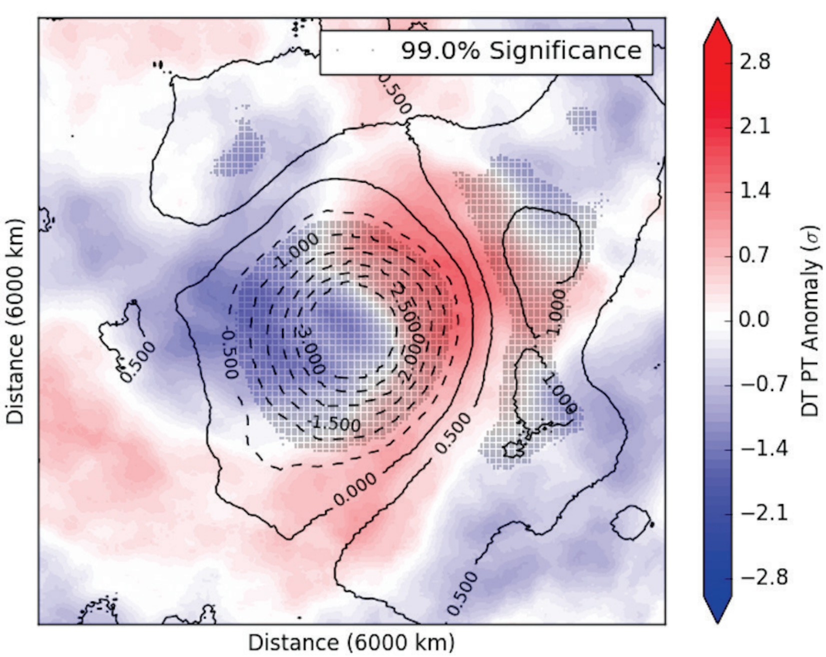


Summer Ice Centered Composite. **Composite mean of standardized anomalies of mean sea level pressure (MSLP, in hPa, black contours) and potential temperature (PT) on the dynamic tropopause (DT, shading) centered on the ice loss event. Grey stippling indicates statistical significance in the MSLP field based on bootstrap resampling.**



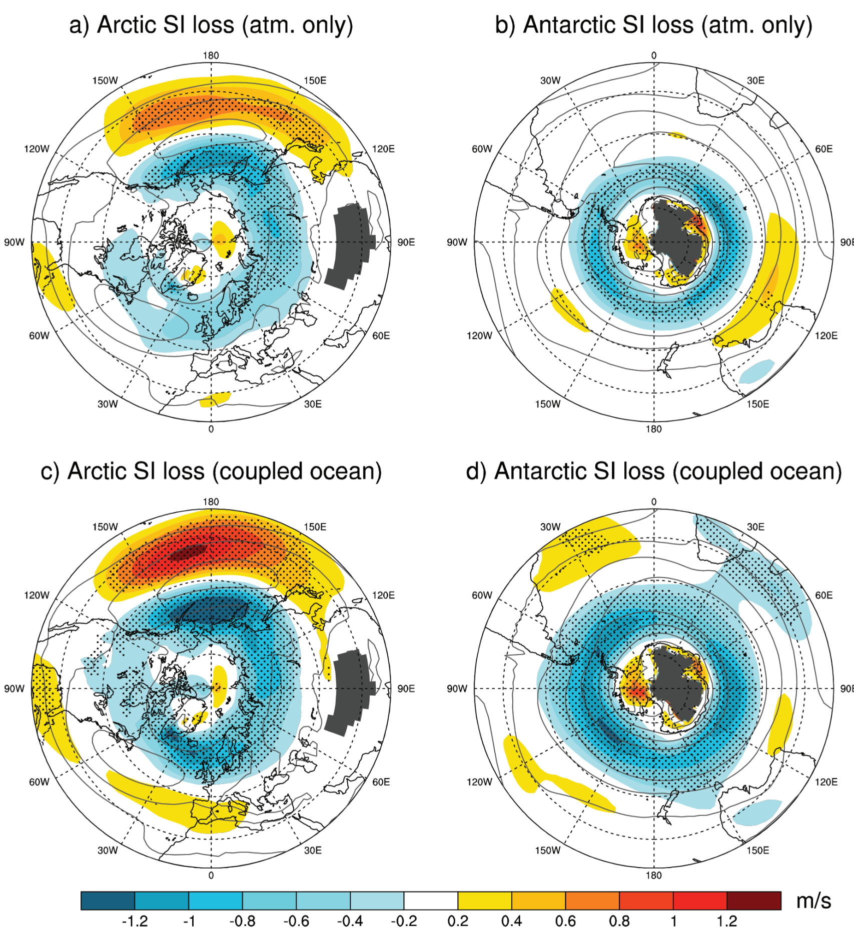
Summer MSLP Centered Composite. **Composite mean of standardized anomalies of mean sea level pressure (MSLP, in hPa, black contours) and potential temperature (PT) on the dynamic tropopause (DT, shading) centered on the closest local minima in MSLP to the ice loss event. Grey stippling indicates statistical significance in the MSLP field based on bootstrap resampling.**

work will focus on understanding why some surface cyclones lead to VRILEs but others do not.—Madeline Clark Frank (University of Oklahoma), and S. Cavallo, "Atmospheric conditions preceding very rapid sea ice loss events," presented at the 15th Conference on Polar Meteorology and Oceanography, 19–23 May 2019, Boulder, Colorado.

Large Climate Impacts of Future Antarctic Sea Ice Loss

By the end of this century, under the current trajectory of greenhouse gas emissions, climate models project a substantial decline in both Arctic and Antarctic sea ice extent. There has been much interest in understanding the impacts of future Arctic sea ice loss on the climate system; these include an intense warming of the Arctic, a slowdown and equatorward shift of the jet at midlatitudes, and a so-called "mini global warming" signal in the tropical upper troposphere. The impacts of future Antarctic sea ice loss, however, remain largely unexplored.

Aiming to fill that gap, we first performed experiments with an atmosphere-only model (WACCM4) with perturbed sea ice conditions. We compared long timeslice runs with historical sea ice concentrations to runs with future sea ice concentrations, taken from the late twenty-first century and specified in each hemisphere separately. The difference between the future and the historical runs can be understood as the atmospheric response to sea ice loss. We found that the magnitude of the atmospheric response to Antarctic sea ice loss is comparable to the response to Arctic sea ice loss. In addition, we found that the



***Jet Responses to Sea Ice Loss.* The 700-hPa zonal wind response in m s^{-1} to (left) future Arctic sea ice loss and (right) future Antarctic sea ice loss, using (top) an atmosphere-only model and (bottom) the same atmosphere model but coupled to fully interactive ocean and ice models. Stippling indicates that the response is significant at the 95% confidence level. Note (a) the equatorward shift of the northern midlatitude jet and (b) weakening of the southern midlatitude jet. (c,d) Coupling the atmosphere and ocean amplifies the response of the midlatitude jets to sea ice loss in both hemispheres.**

impacts of Antarctic sea ice loss are more zonally symmetric and have a smaller seasonal cycle than for Arctic sea ice loss. And whereas Arctic sea ice loss causes a clear equatorward shift of the northern midlatitude jet, Antarctic sea ice loss causes mostly a weakening of the southern midlatitude jet.

Building on the results of the atmosphere-only model, we additionally studied the impacts of future sea ice loss with an atmosphere–ocean coupled climate model, under the same perturbed sea ice conditions. We found that both Arctic and Antarctic sea ice loss have important global impacts. Interestingly, including the effects of coupling between the atmosphere and ocean amplifies the response of the midlatitude jet to sea ice loss in both hemispheres by more than 50%.

Our findings highlight two important concepts: 1) The impacts of future Antarctic sea ice loss are comparable to those of future Arctic sea ice loss, and 2) coupling to a dynamic ocean model is important for understanding the full response of the climate system to sea ice loss in either hemisphere. Hopefully, our initial results will spur further research into understanding the impact of future sea ice loss in the Antarctic.—Mark England (Columbia University), L. M. Polvani, L. Sun, and C. Deser, "Tropical impacts of polar sea ice loss in the twenty-first century," presented at the 15th Conference on Polar Meteorology and Oceanography, 19–23 May 2019, Boulder, Colorado.

A New Coupled Modeling System for Arctic Sea Ice and Climate Prediction

There is a rising demand for Arctic sea ice prediction at subseasonal-to-seasonal time scales, driven in particular by the increasing accessibility of the Arctic and the emergence of Arctic change impacts on midlatitude weather and climate. However, Arctic sea ice prediction is challenging. The Sea Ice Prediction Network (SIPN) showed that the median of predicted September sea ice extent by current dynamical models deviates substantially from observations. To resolve important processes and feedbacks in the Arctic and improve our capability to predict Arctic sea ice as well as climate, we have developed a new coupled modeling system configured for the Arctic with sufficient flexibility.

Specifically, the Los Alamos sea ice model (CICE) has been coupled with the Weather Research and Forecasting Model (WRF) and the Regional Ocean Modeling System (ROMS) within the Coupled Ocean–Atmosphere–Wave–Sediment Transport (COAWST) modeling system.