A Rossby Wave Bridge from the Tropical Atlantic to West Antarctica

Xichen Li,
Scripps Institution of Oceanography,

David Holland, Edwin Gerber, Changhyun Yoo
New York University

Antarctica has experienced a series of dramatic climate changes on regional scales in recent decades. Surface air temperature observations of the Antarctic Peninsula and West Antarctica reveal rapid warming trends. In contrast to the sea ice decline over the Arctic, Antarctic sea ice has not declined, but rather exhibiting a perplexing redistribution, with increases in the Ross Sea and decreases in the Amundsen-Bellingshausen Sea. While changes in radiative forcing from greenhouse gases and ozone have played important roles in Antarctic surface temperature change, these regional scale changes are strongly influenced by changes in the atmospheric circulation, and is linked to the tropical Ocean through tropical – polar teleconnections. In this study, we used different observational and reanalysis datasets, as well as a hierarchy of atmospheric models with different complexity, to establish a teleconnection between the Atlantic Ocean and Antarctic climate. We show that the Sea surface temperature warming related to Atlantic Multi-decadal Oscillation generates Rossby wave trains propagating to the polar region, induces a positive phase response in the Southern Annular Mode, strengthens the Amundsen Sea Low, projects onto the observed dipole-like sea-ice redistribution between the Ross and Amundsen Seas, and contributes to Peninsula warming. This teleconnection depends critically on the Rossby wave dynamics and is pronounced in all seasons except austral summer.

- Climate and accumulation (*It Never Rains in California)*