# Impact of Tasman Sea temperature warming on Antarctic Peninsula warming

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The Antarctic Peninsula of West Antarctica was one of the most rapidly warming regions on the Earth. The increases in air temperature over Antarctica are related to enhanced warm advection associated with changes in the atmospheric circulations over the Southern Ocean. (e.g., the Amundsen Sea Low [ASL] or the Southern Annular Mode [SAM]). The El Niño-Southern Oscillation (ENSO) modulates the position and strength of the ASL. Previous studies examined relationships between atmospheric circulation over the Southern Ocean and tropical oceanic variability, often called 'tropical-polar teleconnections'. However, no previous study has reported the impact of change in sea surface temperature (SST) into the Southern Hemisphere mid-latitudes on Antarctic climate variability. Various studies reported warming sea temperature in the Tasman Sea in recent years. A warming Tasman Sea has strengthened the westerlies between high and mid-latitudes, and thus has influenced cyclone tracks over the Southern Ocean. Therefore, these atmospheric circulation changes related to anomalous SST warming over the Tasman Sea would contribute to recent anomalous warm AP winters.

In this study, we reveal that increases in winter SST in the Tasman Sea modify Southern Ocean storm tracks. This, in turn, induces warming over the Antarctic Peninsula and sea ice retreats over the Bellingshausen Sea and Drake Passage via planetary waves triggered in the Tasman Sea. We show that atmospheric response to SST warming over the Tasman Sea deepen the ASL, leading to warm advection over the Antarctic Peninsula, even in the absence of anomalous tropical SST forcing.

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