Understanding the role of tropical forcing on the high latitude circulation and temperature trends in austral spring

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Recent studies have identified significant warming trends across West Antarctica and the Antarctic Peninsula, which is likely linked to tropical forcing. Consistent with the warming trends are significant changes in sea ice concentration in the Ross, Amundsen, and Bellingshausen Seas. This talk investigates the role tropical forcing play in circulation changes across the South Pacific, and the role these changes have on the temperature trends in West Antarctica and the Antarctic Peninsula during austral spring.

Based on ERA-Interim reanalysis, a statistically significant deepening of the Amundsen Sea Low in the Ross Sea region and increases in pressure/geopotential height to the northeast of the Antarctic Peninsula during austral spring over the period 1979-2012 is detected. Consistent with these trends are a strengthening of the meridional winds, with increased warm (cold) air advection onto western West Antarctica (the Ross Sea) associated with the deepening pressure in the Ross Sea region, and increased warm air advection onto the western Antarctic Peninsula associated with the strengthening high pressure to the northeast of the Peninsula. The ASL trends in the Ross Sea are likely related to outgoing longwave radiation (OLR) in the Niño 1+2 region in the far eastern tropical Pacific, while the pressure/geopotential height trends to the northeast of the Antarctic Peninsula are likely associated with trends in the Southern Oscillation Index (SOI), a measure of ENSO variability. Based on these connections, more than half of the warming along the Antarctic Peninsula is congruent with trends in the SOI (towards more La Niña-like conditions), while nearly half of the warming across western West Antarctica is congruent with trends in the Niño 1+2 region.

This talk will also discuss the spatial and temporal dependency regarding the impacts that SAM and ENSO have on the Antarctic Peninsula during austral spring; namely, relationships with ENSO and Antarctic Peninsula climate are persistent and statistically significant across the western Peninsula, while relationships with the SAM are persistent and statistically significant across the northeastern Peninsula. Other ENSO/SAM-Peninsula temperature correlations appear weak over the full period of record as they vary temporally, fluctuating in response to changing correlations between the SAM index and SOI in austral spring. Changes in the SOI-SAM correlations are due primarily to the 1988 La Niña/SAM negative event, which significantly altered the location of the ENSO teleconnection in the South Pacific Ocean and, therefore, its influence on the regional climate.