Session: B8 Oral presentation

Interdecadal climate variability over Antarctica and linkages to the tropics: Analysis of instrumental data and ice core and coral records for the past 100-200 years

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The Antarctic continent holds nearly 90% of the global ice. The mass balance of Antarctic ice sheets can potentially impact global sea level and ocean circulation in a changing climate. The nature and cause of Antarctic climate variability is, however, poorly understood beyond interannual time scales due to the paucity of long, reliable meteorological observations. The present study analyzes low-frequency climate variability over Antarctica and linkages to the tropics using various instrumental data and annually-resolved ice core and coral records for the past 100-200 years. During the 20th century, Antarctic ice core records indicate strong linkages to tropical sea surface temperature (SST) variations associated with Pacific Decadal Oscillation (PDO) and Atlantic Multidecadal Oscillation (AMO). Antarctic surface temperature anomalies inferred from the ice cores are consistent with the associated changes in atmospheric circulation and thermal advection. A set of atmospheric general circulation model experiments supports the idea that the decadal SST variations in the tropics force atmospheric teleconnections that affect Antarctic surface temperatures. When coral records are used as proxies of tropical SSTs, similar Antarctic-tropical linkages are identified for the past two centuries. Over the past 50 years, changes in the phase of PDO and AMO may have contributed to the rapid warming of the Antarctic Peninsula and West Antarctica. The strong Antarctic-tropical linkages also suggest the important role of the tropical oceans in basin-scale climate variability on interdacadal time scales.