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# Significant warming of West Antarctica in the last 50 years

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An outstanding question in Antarctic climatology is whether the strong warming of the Antarctic Peninsula has also occurred in continental West Antarctica, where there are no long terms records. We use the thermal infrared temperature data from the Advanced Very High Resolution Radiometer (AVHRR) satellite, and the quality-controlled weather station observations from the Antarctic 'READER' data set, to obtain a new assessment of temperature change in West Antarctica, and the rest of the Antarctic continent, over the last 50 years. We use statistical climate field reconstruction techniques to combine the complementary spatial and temporal information in these two data sets, taking advantage of the complete spatial coverage of the Antarctic continent in the satellite data.

We find that significant warming extends well beyond the Antarctic Peninsula to cover most of West Antarctica, an area much larger than previously reported. The rate of warming in West Antarctica exceeds 0.1 °C/decade, and is strongest in winter and spring. The mean temperature trend in continental East Antarctica is also positive, despite periods of substantial cooling during the 1980s and 1990s. Comparison with sea ice observations suggests that large magnitude warming in West Antarctica can

be attributed to the significant declines in sea ice in the Amundsen sea, at least since 1979. While the average trend in sea ice in East Antarctica has been positive over the same time period, simulations from the GISS Model E atmospheric model indicate that the net effect of observed sea surface temperature, sea ice changes, and atmospheric radiative forcing, should be overall warming, as we observe.

Several recent studies have emphasized the influence of changes in atmospheric circulation associated with the Southern Annual Mode (Antarctic Oscillation) in driving recent Antarctic temperature trends. The spatial and seasonal patterns of reconstructed temperature trends indicate that regional sea ice changes have played a comparable or larger role, at least in West Antarctica. Our results add further evidence that the failure of coupled models to reproduce the recent rapid warming of the Antarctic Peninsula (and West Antarctica) is largely due to inadequate representation of coupled atmosphere-ocean-sea ice dynamics.