

What can AMPS tell us about the warming in West Antarctica?

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The temperature observations from Byrd Station are the only instrumental temperature record in West Antarctica that goes back to the late 1950s. Since it is only partially complete, we recently reconstructed this dataset from 1957 onward and found, in particular, a long-term warming significantly larger than had been previously estimated. The large spatial footprint of Byrd temperatures suggest that the results likely apply to a significant portion of West Antarctica. Here, we attempt to shed some light on these results (and some of the questions raised) by taking advantage of high-resolution model output from the forecast archive of the Antarctic Mesoscale Prediction System (AMPS) Project. Our analysis focuses on the four years (2009-2012) during which the grid-spacing of the AMPS model was kept unchanged at 15 km over the Antarctic continent. Given the brevity of the AMPS data record, it cannot be used to investigate the long-term temperature trends per se. Nonetheless, this dataset can provide insight into some climatological features of West Antarctica that are relevant to these trends. Two issues are investigated. The first issue is the surprising difference that was found between Byrd near-surface temperatures and the borehole temperatures from WAIS Divide (160 km north-east of Byrd). Both show a significant increase in the annual mean temperature since the 1950s but they disagree on the timing of the warming (1980s at Byrd versus 1990s at WAIS Divide). The second issue is whether the small changes over time in the height of the temperature sensor above the surface (either because of changing observing practices or because of snow accumulation below the sensor) may have affected the consistency of the Byrd temperature record. This problem is directly related to the air stratification near the surface.