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# Surface and air temperatures in the East Antarctic Plateau in Winter: are near-surface gradients affected by local and regional topographic setting?

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Recent analyses of weather station data and satellite thermal mapping of the upper East Antarctic Plateau in winter has revealed several sites with surface snow temperatures below -95°C. These sites are found near but not on the ice divide ridge, particularly on the upper southern flank at elevations above 3800 m, within local topographic depressions of a few meters depth and a few kilometers horizontal scale. Although no weather stations exist in the coldest temperature locations, nearby automated weather stations (AWS) at Pole of Inaccessibility, Plateau B, and Dome A, record conditions that broadly corroborate the satellite thermal mapping, although they indicate very strong near-surface air temperature gradients due to intense thermal air inversion. Given that the conditions leading to inversion are common in Antarctic winter throughout the continent, and that snowfall constantly changes the measurement height on automated weather stations (until they are reset by a visiting team), we explore the potential for automated station data to appear to present cooling trends as snow accumulation moves the temperature sensor closer to the surface. Moreover, we examine the potential for local topography to control the near-surface gradient by causing the coldest air to pool (in a topographic low) or flow rapidly away (in a local topographic dome or ridge). A parameterization of the air gradients in winter conditions is likely necessary to understand AWS data when used for climate trend analysis. Moreover, AWS on ice sheets should include snow height measurement sensors and dual temperature sensors at different heights to allow estimation of, and correction for, the air temperature gradient.