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Can temperature extremes in East Antarctica be replicated from ERA interim reanalysis?

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Based on daily minimum, maximum and mean surface air temperature (T_{\min} , T_{\max} , T_{mean}) from European Centre for Medium-Range Weather Forecasts (ECMWF) reanalysis from 1979 onwards (ERA Interim), the accuracy of daily 2-meter T_{\min} and T_{\max} from ERA Interim reanalysis is assessed against in-situ observations from four Automatic Weather Stations (AWS; Zhong shan, EAGLE, LGB69 and Dome A) in East Antarctica for 2005 to 2008. ERA Interim generally shows a warm bias for T_{\min} and a cool bias for T_{\max} , with an underestimation of the diurnal temperature range. The reanalysis explains more than 84% of the daily and annual variance, and has annual root mean square errors of 2.4 °C, 2.6 °C, 3.0 °C and 4.3 °C for daily T_{\min} , and 2.2 °C, 3.1 °C, 3.4 °C and 4.9 °C for daily T_{\max} at Zhong Shan, LGB69, Eagle and Dome A, respectively. ERA Interim shows little seasonal variability, except at Dome A with better performance in the austral spring and worse in winter and autumn. An analysis spatial distribution of temperature and wind field shows that ERA Interim can replicate the progress of temperature extremes developing, occurring and disappearing. The weather events extracted from ERA Interim occur on the same day as the observation with high cross-correlation coefficient ($R \geq 0.287$, $N \geq 1131$, $P < 0.001$). Both in the daily and annual performance of T_{\min} and T_{\max} and in the ability of prediction, ERA Interim shows the obvious regional differences, with errors tending to increase from the coast to the interior of the East Antarctica ice sheet. ERA Interim is, despite its limitations and deficiencies, a powerful tool for weather and climate studies in the Antarctica region. However, more in situ observations and projections are required for both scientific and recreational purposes.

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