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Validation of atmospheric reanalyses over the Weddell Sea, Antarctica, using observations from drifting buoys

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Global atmospheric reanalyses are frequently used to drive ocean-ice models but few data are available to assess the quality of these products in the Antarctic sea ice zone. We utilise measurements from three drifting buoys that were deployed on sea ice in the southern Weddell Sea in the austral summer of 2016 to validate the representation of near-surface atmospheric conditions in the ERA-Interim and ERA5 reanalyses produced by the European Centre for Medium Range Weather Forecasts (ECMWF). The buoys carried sensors to measure atmospheric pressure, air temperature and humidity, wind speed and direction, and downwelling shortwave and longwave radiation. One buoy remained in coastal fast ice for most of 2016 while the other two drifted northward through the austral winter and exited the pack ice during the following austral summer. Comparison of buoy measurements with reanalysis data indicates that both reanalyses represent the surface pressure field in this region accurately. Reanalysis temperatures are, however, biased warm by around 2 °C in both products, with the largest biases seen at the lowest temperatures. We suggest that this bias is a result of the simplified representation of sea ice in the reanalyses, in particular the lack of an insulating snow layer on top of the ice. We use a simple surface energy balance model to investigate the impact of the reanalysis biases on sea ice thermodynamics.