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Comparison of upper-air observations from the German Atlantic Expedition 1925-27 with the Twentieth Century Reanalysis

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Between 16 April 1925 and 2 June 1927, the research vessel Meteor cruised the Atlantic Ocean from Wilhelmshaven, Germany (53.5°N) to almost 64°S in the framework of the German Atlantic Expedition, focussing on latitudes south of 20°N. Amongst others, the aim of this large-scale oceanographic and meteorological expedition was to systematically explore the vertical structure (temperature and circulation) of the atmosphere above the Ocean, from the northern subtropics via the inner Tropics to the southern high midlatitudes. To this end, the Atlantic was crossed in 14 profiles, stretching more or less from east to west, with latitudinal distances of about 7°. During the expedition, 801 pilot balloons, 217 kites and 7 registering balloons (including one during a test mission on 10 February 1925) were launched, probably the spatially most comprehensive upper-air probing of the atmosphere above the Atlantic to this day. The resulting upper-air data have been imaged and digitised in the framework of the European project ERA-CLIM. Here, we compare the early, historical data with the Twentieth Century Reanalysis, a totally independent dataset that is based on the assimilation of synoptic pressure and hurricane tracks only, using monthly sea surface temperature and sea ice as boundary conditions. We find that correlations between temperature anomalies in the observations and the reanalysis are relatively high in the subtropics of both hemispheres, and generally very high in the southern midlatitudes.