

Intercomparisons of Air-Sea Heat Flux over the Southern Ocean

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Abstract

Consistency and discrepancy of air-sea latent and sensible heat fluxes (LHF and SHF) in the Southern Ocean for current-day flux products is analyzed from climatology and interannual-to-decadal variability perspectives. Five flux products are examined, including the National Oceanography Centre Southampton flux data set version 2 (NOCS2), the National Centers for Environmental Prediction Reanalysis II (NCEP2), the European Centre for Medium-Range Weather Forecasts 40-year Reanalysis (ERA40), the new version of Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data (HOAPS3), and the Objectively Analyzed air-sea Fluxes (OAFLUX).

Our comparisons suggests that most data sets show encouraging agreement in the spatial distribution of the annual mean LHF, the meridional profile of the zonal averaged LHF, the leading empirical orthogonal function (EOF) mode of the LHF and SHF, and the large-scale response of the LHF and SHF to the Antarctic Oscillation (AAO) and El Niño-Southern Oscillation (ENSO). However, substantial spatiotemporal discrepancies are noteworthy. The largest across-data scatter is found in the central Indian sector of the Antarctic Circumpolar Current (ACC) for the annual mean LHF, and in the Atlantic and Indian sectors of the ACC for the annual mean SHF, which is comparable to and even larger than their respective interannual variability. The zonal mean of the SHF is much diverse across the data sets in the ACC. There is a large spread in the seasonal cycle for the LHF and SHF among the data sets, particularly in the cold season. The data sets show interannual variability of various amplitudes and decadal trends of different signs. The discrepancies of the LHF and SHF trends among the data sets are largely attributed to the trends of sea-air humidity and temperature differences. The flux variability of the NOCS2 is substantially different from the other data sets.