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Analysis of observations and ERA5 comparison in the data sparse Arctic Ocean

Analysis of observations and ERA5 comparison in the data sparse Arctic Ocean

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R/V Mirai conducts observational campaigns to the Arctic Ocean annually. Observations in the data sparse ocean often provides new insights into the atmosphere and oceanic physics, and can help identify possible problems in numerical models. During the summer of 2016, R/V Mirai deployed drifting wave buoys for 2 months in ice-free waters, which recorded two large storms. The wave data were compared against ECMWF ERA5 wave reanalysis, which compared well in general; however, during one of the storms, a conspicuous model underestimation bias was found, which was possibly caused by wind accuracy due to reduced barometric pressure observations. This identified the significance of observations in the data sparse Arctic Ocean for wave models. In the late autumn of 2018, R/V Mirai sailed the Chukchi Sea and collected shipboard data in the refreezing waters. Repeat marginal ice zone (MIZ) transects were conducted between the 9th and the 20th of November with a view to better understand how the warming sea surface temperatures of the Arctic Ocean may affect the sea ice refreezing processes. The ECMWF forecast was extensively used for this voyage, which enabled the vessel to remain near the MIZ and provided an opportunity to ground-truth ECMWF predicted sea ice cover with the shipboard observations. During the last two days, very cold off-ice winds led to air temperatures below -10 degrees C. Despite the cold air mass, measured sea surface temperatures (SST) elevated to positive degrees C. The ERA5 reanalysis data suggest the model was unable to reproduce these elevated SSTs. We are currently analysing this phenomenon with a view of identifying possible missing physics or model errors and how SST accuracy may affect the forecast and reanalysis of sea ice cover.

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