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TOPAZ4b: a new version of the ocean and sea-ice Arctic reanalysis

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The second version of the Arctic ocean and sea ice reanalysis is based on the coupled ensemble data assimilation system (TOPAZ4b). Compared to its predecessor (Xie et al. 2017) it has benefited from enhancements to observation, model vertical resolution, and forcing datasets. TOPAZ4 relies on version 2.2 of the HYCOM ocean model and the ensemble Kalman filter data assimilation using 100 dynamical members. A 30-years reanalysis of the Arctic ocean and sea ice has been completed starting in 1991, and made available as the multi-year physical product by the Arctic Marine Forecasting Center (ARC MFC) under the Copernicus Marine Environment Monitoring Service. Contrary to the previous version of the Arctic reanalysis, the systematic errors due to fragmented time series of assimilated observations have been removed by using consistent ESA CCI data. The comparison to in situ profiles shows that the temperature and salinity stratification has been considerably improved by the increased vertical resolution in HYCOM, for example in the East Greenland Sea, the temperature root mean square error (RMSE) from surface to 1400 m has been reduced by 50%. These improvements encourage the use of this Arctic reanalysis for climate studies.