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Meridional Energy Transport from Midlatitudes towards the Arctic

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Meridional Energy Transport, both in the ocean (OMET) and atmosphere (AMET), is one of the key aspects for the climate system. This study focuses on the AMET & OMET from mid-latitudes to the Arctic. The quantification of AMET & OMET is based on the reanalysis products, which include ERA-Interim, MERRA2, JRA55 for the atmosphere and ORAS4, GLORYS2V3, SODA3 for the ocean. The mean heat transports in all datasets agree well, whereas the spatial distribution and temporal variation of AMET & OMET, deviate substantially. This results in a large difference in the low frequency variability of AMET & OMET at certain latitudes. Only after 2010 multiannual variations in the reanalysis products agree well. Moreover, the AMET from reanalysis is compared with the output from high resolution EC-Earth climate model simulations (∼50 km resolution), with SST and sea ice prescribed. The OMET from reanalysis is compared with the measurements at key locations in the Atlantic, which includes RAPID/MOCHA in the subtropical gyre, OVIDE and OSNAP in the subpolar gyre and the Greenland-Scotland Ridge. The results show that the decline of sea ice, the variation of sea surface temperature and sea surface pressure have a close relation with the change of AMET & OMET. We also study the interaction between the atmosphere and ocean by analyzing the heat transport compensation between ocean and atmosphere at annual to decadal time scales.