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Comparison of water cycle components over global oceans from HOAPS-3 with reanalysis data and climate model results

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The water cycle is an important part of the climate system as its knowledge and understanding is crucial for many processes. A fundamental part is determined by air-sea interactions over the global oceans. The only possibility for observations at remote ocean areas with a high spatial and temporal resolution is given by satellite remote sensing. Climate models and reanalysis data sets give another possibility to gain homogeneous data fields for remote areas.

The Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data set (HOAPS-3) provides a global climatology of sea surface evaporation and precipitation as well as related sea surface and atmospheric state parameters. For the period from 1987 to 2005 all variables, except for the NODC/RSMAS Pathfinder SST, are derived from passive microwave SSM/I satellite data. Monthly means on a 1 x 1 degree grid of this 18-year climatology will be analyzed in its global and regional development since 1988 and compared to water cycle parameters from reanalysis and model data sets.

On a global scale, HOAPS-3 shows an increasing evaporation over the global ice-free oceans since 1988, while precipitation exhibits no significant linear trend for the same time period. This leads to an increasing freshwater flux from oceans into the atmosphere. Regionally, the increase in evaporation concentrates on the subtropics, resulting from increased wind speed and SST in these regions. Precipitation rates show

a decrease over the subtropics and a substantial increase over southern mid latitude oceans.

Similar data fields from ERA40 and NCEP-R2 Reanalysis, as well as data fields from the climate model 20th century control runs of ECHAM5/MPI-OM for the IPCC scenarios will be compared to HOAPS-3 satellite data for this period. These different information sources show significant similarities and differences in global average and regional development of the water cycle parameters. The distribution of the global averaged values among these data sets is remarkably broad for the freshwater flux. Consistencies among some of these data sets indicate an intensification of the hydrological cycle in the studied period. However, differences in the development of the water cycle parameters since 1988 on regional and global scale limit the draw of conclusions. These circumstances will be shown in detail and discussed for the water cycle parameters from the different data sets.