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CM SAF CLARA-A1 and ERA-40 Reanalysis Data for Regional Climate Analyses: Solar Global Radiation in a clouded and cloud-free Atmosphere

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KLIWAS is a research program of the German Federal Ministry of Transport, Building and Urban Development (BMVBS) to investigate the potential consequences of climate change for navigation on inland and coastal waterways, e.g. by means of regional coupled climate models (RCMs). Here, clouds play a key role by influencing the cooling/heating of the atmosphere and the amount of SWR reaching the ground.

In coupled model systems, the atmosphere model calculates heat, freshwater and momentum fluxes and receives in turn sea surfaces temperatures from the ocean model. Therefore, the quality of cloud and radiation calculations defines to a great extent the quality of the results of the coupled Atmosphere-Ocean model runs. For the evaluation and assessment of the climate models reference data are needed, but cloud fraction and solar radiation over the oceans are not measured in-situ in a sufficient solution. However, in order to discern temporal trends from natural climate variability long time series of homogeneous high quality controlled measurements are necessary. Here, satellites provide the only data source.

The CM SAF (EUMETSAT's Satellite Application Facility on Climate Monitoring), which is a consortium of 6 international institutions with the German Meteorological Service as the leading entity, provides satellite-based long-term records of, for example, cloud properties and surface radiation. These Climate Data Records are derived from measurements of, amongst others, the Advanced Very High Resolution Radiometer (AVHRR), on-board NOAA and MetOp-A satellites, in a regional scale resolution of 0.25° on a daily basis, going back to 1982. Cloud cover products have been validated against globally distributed synoptic observations, solely on airports world-wide. They compare well on a global scale and show only small biases. They were additionally evaluated against other satellite cloud products (PATMOS-X, MODIS, ISCCP, A-Train) and show also good agreement.

Results of the comparisons between ERA-40 reanalysis data and CM SAF CLARA-A1 data over the North Sea area for the 1982-2002 period are presented. Daily means of cloud fraction and solar global radiation show higher values for CLARA-A1, indicating different cloud types and/or radiation parameterisations. In a second step, clear sky radiations are investigated to clarify these differences.