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Comparison of the in-situ short-wave radiation measurements with bulk parameterizations: first MORE results.

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We present the results of the 2 years of Meridional Oceanic Radiation Experiment (MORE), which is a co-operative action of the P.P. Shirshov Institute of Oceanology RAS (Moscow) and Leibniz-Institut fuer Meereswissenschaften IFM-GEOMAR (Kiel). Short wave radiation measurements were performed during 3 cruises (2004-2005) in the Atlantic Ocean using Kipp&Zonen CNR-1 net radiometers along with the standard observations of meteorological variables (cloudiness, air temperature, humidity, SST). Further intercomparison of the in-situ observations with the computations form the existing short wave flux algorithms allowed for the quantification of systematic and random biases inherent in the bulk parameterizations. We considered 3 algorithms (Dobson and Smith 1988, Lumb 1964, Malevsky et al. 1992), based on the use of the total cloud cover and solar declinations. All three methods demonstrate quite reliable skills in simulating short-wave radiation flux under clear skies and small cloud cover and very high uncertainties of both random and systematic nature under the overcast. In order to improve the existing parameterizations, we analyzed different cloud types instead of fractional cloud cover and found that this approach may seriously improve the accuracy of bulk parameterizations. Altogether, cloud conditions were sorted into 12 categories, accounting besides the fractional cloud cover for cloud types and cloudiness of different atmospheric layers. The derived relationships allow for the improvement of the accuracy of empirical relationship and make it possible to suggest new bulk parameterizations for the massive computation of short-wave radiation. Although much more complicated, these algorithms can be applied in the future to the VOS data, currently providing extensive information on different cloud parameters.