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Climatology and long-term changes in cloud cover and short-wave radiation over the world oceans

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We analyze cloud cover characteristics and short-wave radiation over the world oceans for the last several decades (1950-onwards). Visual estimates of the cloud cover were derived from the ICOADS Voluntary Observing Ship (VOS) collection. For the statistical analyses of cloud cover we propose a new 3-parameter probability density distribution. This PDF allows for the approximation of all possible frequency distributions of both total and low cloud cover. For the analysis of short-wave radiation we apply a new parameterization accounting for the non-linearity of the dependence of the atmospheric transmission on solar altitude under clear skies for the impact of cloud types under the conditions close to the overcast. Application of this parameterization resulted in a new long-term climatology of SW radiation over the global oceans. We present the analyzes of the climatology of the parameters of PDF for total and low cloud cover as well as interannual to decadal changes (linear trends and shorter term variations) in the PDF parameters. Next, changes in the cloud cover characteristics over the world oceans were associated with the variability of short-wave radiation fluxes. In the most regions short wave radiation is decreasing over the last decades and cloud cover tends to increase. The increasing cloud cover is associated with the decrease in the frequency of the clear sky conditions and the increasing frequency of the overcast. Also, we discuss the changes in the shape of the cloud cover PDF during the last decades.