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Homogenizing visually observed cloud cover over global oceans with implications for reconstructions of radiative fluxes at sea surface

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We consider here the potential of Voluntary Observing Ship (VOS) observations available form the ICOADS for estimating ocean surface heat budget at centennial time scales. VOS provide the longest coverage of the World Ocean by in-situ meteorological observations in time going back to the mid 18th century. We concentrate here on the shortwave and longwave radiative fluxes, largely relying on cloud cover. Visually observed cloud cover reports from Voluntary Observing Ships (VOS) and assimilated in ICOADS are were used to build long-term time series of cloud cover and short-wave radiation characteristics over the ocean for the last century. Cloud cover reports from VOS are subject for a number of inhomogeneities and uncertainties. Considering the centennial perspective, in 1949, WMO changed the practice of reporting cloud cover from tenths to octas. Moreover, some additional uncertainties were inherent in the early 20th century reports. This resulted in a definite break in cloud cover time series which further propagate to the inhomogeneity of the reconstructed time series of shortwave and longwave radiative fluxes. This inhomogeneity was associated with (while not limited to) the biased convertionconversion of tens to octas when developing ICOADS records using IMMA (and earlier generation formats). In this convertionconversion octa values “2” and “6” consolidated values corresponding to 2 and 3 tens and 7 and 8 tens respectively, thus making the fractional cloud cover distribution peaked to 2 and 6 octas. In order to remove correct this bias and to homogenize cloud cover time series we developed a new method based upon a discrete probability distribution for fractional cloud cover. Applying analytical distribution, we provide the correction of cloud cover reports and arrive to homogeneous time series of cloud cover. Further homogenized times series of cloud cover were used for computing radiative fluxes over the global ocean for the period from 1900 onwards.