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Closure of the regional and global-scale ocean surface energy budget using probability density distributions of surface fluxes

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Using the 2-dimensional probability density distributions of surface turbulent fluxes in the coordinates of the key-parameters (e. g. air-sea temperature differences and wind speed for the heat flux), we suggest a statistical approach for the regional estimation of surface energy budgets for different ocean areas. For the computational procedures of statistical parameters of PDFs effective algorithms were developed. It allows for the parametric description of the surface fluxes and effectively accounts for the poor sampling in individual ocean areas. Characteristics of the probability density distributions were first estimated using the regularly sampled fields from the NCEP/NCAR and ERA-40 reanalyses. Estimates, based on VOS data form the ICOADS archive (1948-2002) are presented for the Northern subpolar Atlantic Ocean and for the regions of the Southern ocean. Analysis shows significant improvement of the closure of the energy budgets for different area using the approach suggested. In particular for the subpolar North Atlantic the uncertainty minimization varies form 2 to 6 times. Finally the role of atmospheric synoptic variability in forming regional energy balances is discussed.