Geophysical Research Abstracts
Vol. 15, EGU2013-7416, 2013
EGU General Assembly 2013

A new framework for estimation and comparative assessment of air-sea turbulent fluxes in reanalyses and climate models

Sergey Gulev, Natalia Tilinina, and Konstantin Belyaev
IORAS, SAIL, Moscow, Russian Federation (gul@sail.msk.ru)

Reanalyses fluxes and flux-related variables at high temporal resolution are widely used forcing ocean general circulation models, for the case studies and estimation of regional energy budgets. In order to evaluate surface fluxes in modern era reanalyses and climate models we suggest a new approach based on two parametric modified Fisher–Tippett (MFT) distribution applied to turbulent heat fluxes. Two comparisons were performed – using direct surface turbulent flux output from different products (NCEP, NCEP-DOE, NCEP-CFSR, MERRA, JRA-25, ERA-Interim) and applying a single parameterization (COARE-3) to the reanalysis state variables. These allow for distinguishing between the impact of reanalysis surface parameterizations and variables onto surface turbulent fluxes. Statistical properties of surface turbulent fluxes were intercompared in terms of the distribution parameters (scale and location) and extreme fluxes derived from distribution tails.

In all reanalyses extreme turbulent heat fluxes amount to 1500–2000 W/m2 (for the 99th percentile) and can exceed 2000 W/m2 for higher percentiles in the western boundary current extension (WBCE) regions. Different reanalyses show significantly different shape of MFT distribution, implying considerable differences in the estimates of extreme fluxes. The highest extreme turbulent latent heat fluxes are diagnosed in NCEP-DOE, ERA-Interim and NCEP-CFSR reanalyses with the smallest being in MERRA. These differences may not necessarily reflect the differences in mean values. Analysis show that differences in statistical properties of the state variables are the major source of differences in the shape of PDF and estimates of extreme fluxes while the contribution of computational schemes used in different reanalyses is minor. The strongest differences in the characteristics of probability distributions of surface fluxes between different reanalyses is found in the Southern Ocean. Importantly, climate models, being capable of replicating general character of variability revealed by reanalyses considerably underestimate extreme fluxes and drastically change the character of the probability distribution that results in serous regional biases, especially in WBCE extension regions and high latitudes.