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Ocean climate observations: Progress on direct observation and parameterization of air-sea fluxes

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Flux products quantifying exchanges between ocean and atmosphere are needed for forcing models, understanding ocean dynamics, investigating the ocean's role in climate, and assessing coupled models. Research experiments are essential to improve flux parameterizations, and longer research deployments are required to sample rare events. The continued development of flux products from satellites provides much-needed sampling. Continual intercomparisons among products and with high quality observations will lead to improved flux datasets. In this poster we report on a long-term effort to improve air-sea flux observational technologies, data, and products. The work emphasizes direct flux observations from ships. The fluxes of interest include turbulent fluxes of heat moisture, momentum, and trace gases; solar and IR radiative fluxes; and precipitation. These observations are used to improve a suite of flux parameterizations that are applied to convert indirect variables to fluxes either through in situ methods (buoys), satellite retrievals, or numerical models (e.g., operational NWP or GCM/climate simulations and reanalyses). The large volume of direct observations accumulated through repeated cruises also allows us to compile small regional climatologies for model and satellite intercomparisons. We will discuss recent updates for the COARE physically-based meteorological and gas transfer bulk turbulent flux algorithms. The current meteorological version COARE3.0 was compared with a collection of 26,700 covariance observations of drag and heat transfer coefficients (compiled from three independent research groups). The gas-transfer version (COARE30G) was compared to an ensemble of direct gas flux observations of CO2, DMS, and ozone from 6 research groups and 9 field programs. Efforts to improve observations of radiative fluxes from ships and buoys are also described.