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Energy Fluxes Over the Oceans: The Role of Radiative Fluxes in Net Ocean-Atmosphere Heat Exchange Uncertainty and Variability

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The net ocean-atmosphere heat flux is central to understanding variations in the ocean heat budget but poorly determined by the current range of observation-based datasets. Inter-product estimates of the global mean net heat flux have a very large range varying between -15 and 25 Wm-2 (where a positive value implies ocean heat gain). The relative contributions of radiative and turbulent heat fluxes to this uncertainty will be reviewed. Factors limiting the ability of datasets to reliably estimate both the long term mean surface heat exchange and its variability at interdecadal to interannual timescales will be discussed. Particular attention will be paid to the use of flux mooring and research ship data to identify sources of uncertainty. The potential for progress using residual techniques (e.g. DEEP-C) and ocean reanalyses (ORA-IP) will also be explored. In addition, recent research using high resolution coupled ocean-atmosphere models that indicates a primary role for radiative flux uncertainty in the Southern Ocean will be highlighted. Finally, the relative roles of radiative and turbulent heat fluxes in driving major ocean surface signals from the Tropics to mid-high latitudes (e.g. the North Atlantic cold anomaly, also known as the Big Blue Blob) will be considered.