Analysis of Long Time Series of Turbulent fluxes estimated from remotely sensed observations

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This study aims at using and investigating the quality and the content of the newly-estimated long time series of momentum, latent and sensible heat fluxes as well as of the associated bulk variables: surface wind speed and direction, air and sea surface temperatures, and specific air and sea humidities from several satellite missions covering more than 16 years (1992 – 2008). Remotely sensed data are from scatterometers onboard ERS-1, ERS-2, ADEOS-1, and QuikScat, and from radiometers onboard several Defense Meteorological Satellite Program (DMSP) satellites (Special Sensor Microwave/Imager [SSM/I] F10 – F15), are matched in combination with new NOAA daily sea surface temperature analysis. Data correction and screening are performed using the same method for all satellite instruments. The fluxes are estimated and daily (swath), weekly and monthly-averages calculated over global ocean with a spatial resolution of 1° in longitude and latitude. The quality of all satellite observations has been inspected to remove suspect data. The calculations of air-sea fluxes from satellite observations are accomplished using bulk formulas (COARE-3.0 model) that take atmospheric stability into consideration. The quality of the retrieved satellite fluxes is determined through comprehensive comparisons with moored buoy estimates at various oceanic sites including in-situ data from scientific experiments such as Fetch, Showex and Base. At global scale satellite gridded fluxes are compared to numerical model estimates provided by ECMWF operational analysis and re-analysis (ERA-40 and ERA Interim). Using the error analysis of the resulting flux fields, their contents are investigated in terms of monthly, seasonal, and inter-annual signals averaged over some oceanic basins of the Atlantic, Pacific, and Indian oceans. The main features are associated with the specific oceanic and meteorological patterns characterizing the geographical basins. However, significant differences are found between basins mainly related to the relationship between the turbulent flux and basic variable spatial and temporal variability.