Examinations of turbulent heat budgets obtained from satellites

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Turbulent heat fluxes are one of the major flux components that constitute the
atmospheric heat budget (AtmHB). Its accuracy is very critical for the estimation of
the global heat balance, an active research area of the NASA Energy and
Water Cycle Study (NEWS) program.

The oceanic turbulent heat fluxes used in this study are from the
Goddard Satellite-based Surface Turbulent Fluxes (GSSTF), the Hamburg
Ocean Atmosphere Parameters and Fluxes from Satellite Data (HOAPS),
Japanese Ocean Flux data with Use Remote sensing Observations (J-OFURO),
and the Remote Sensing Systems (REMSS) data set. The first three data sets
all show a significant increase in the annual means of the turbulent fluxes
during 1988-2005 period. REMSS is the only one that stays relatively
constant over these years.

To understand the significant trend in turbulent fluxes, we have further analyzed

AtmHB. AtmHB includes both radiation and turbulent heat fluxes. The
radiation data sets used in this study include the International Satellite Cloud
Climatology Project Flux Data (ISCCP-FD), the Global Energy and Water Cycle
Experiment (GEWEX) Surface Radiation Budget (SRB), and the Clouds and the
earth's Radiation System (CERES). Since the changes in radiation fluxes at
top-of-atmosphere, surface, and atmosphere at annual mean level over globe,
oceanic, and terrestrial regions from these radiation data are either negligible
or very small, the annual increase shown in GSSTF, HOAPS, and J-OFURO data
sets are likely to be unrealistic. Otherwise, the energy and water cycles
are far from balanced.