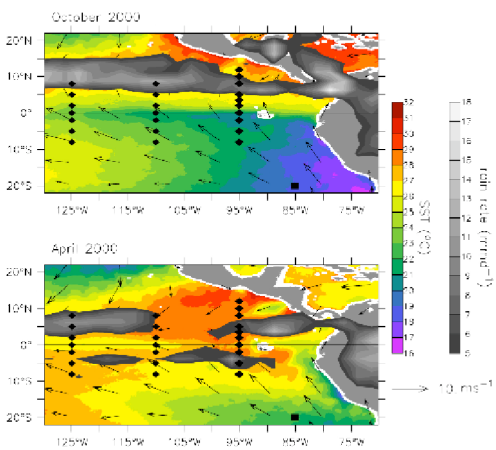
# Air-Sea Heat Fluxes in the Stratocumulus Deck / Cold Tongue / ITCZ Complex of the Eastern Tropical Pacific


**Meghan F. Cronin** (1)
**Chris Fairall** (2)
**Michael J. McPhaden** (1)
**Robert A. Weller** (3)

(1) NOAA Pacific Marine Environmental Laboratory, 7600 Sand Point Way, Seattle WA USA (*Meghan.F.Cronin@noaa.gov*)
(2) NOAA Environmental Technology Laboratory, 325 Broadway, Boulder CO USA
(3) Woods Hole Oceanographic Institute, Woods Hole MA USA


**Introduction:** Data from the Eastern Pacific Investigation of Climate Processes (EPIC) enhanced monitoring array are used to analyze the structure and evolution of the air-sea heat fluxes and their relation to underlying sea surface temperature (SST) and overlying clouds within the stratocumulus deck / cold tongue / ITCZ complex.

**Data** EPIC enhanced monitoring array began in Nov1999. TAO enhanced moorings along 95W (large diamonds) and the IMET mooring at 20S, 85W (square) are shown in relation to the Apr and Oct 2000 TMI SST, QuikSCAT winds, and TRMM rainfall. TAO/EPIC moorings were visited by a NOAA ship twice per year for routine maintenance. The ship was also used as a platform for oceanic and atmospheric boundary layer measurements.




**Flux Calculation:**

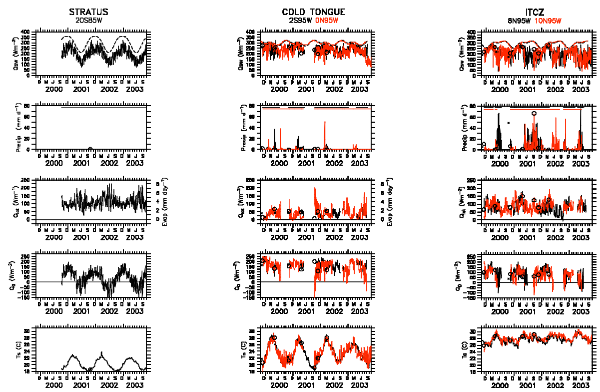
$$Q_0 = Qsw - Qlw - Qlat - Qsen$$

$Q_0$ = net surface heat flux into the ocean
Qsw = net solar radiation into the ocean
Qlw = net longwave radiation out of the ocean
Qlat = latent heat loss
Qsen = sensible heat loss

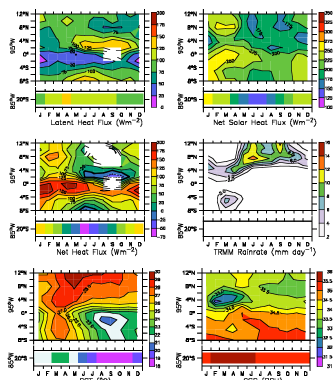
Qlat and Qsen are computed using the COARE v3.0 bulk flux algorithm (Fairall et al. 2003) with hourly data or telemetered daily averages when high resolution data were not available. Required variables include winds relative to surface currents, air temperature, relative humidity, and skin temperature. Bulk SST was extrapolated to the surface using the algorithm's warm-layer and cool skin models.


Fairall, C. W., E. F. Bradley, J. E. Hare, A A. Grachev, and J. B. Edson, 2003: Bulk parameterization of air-sea fluxes: Updates and verification for the COARE algorithm. J. Climate, 16, 571-591.


**Time Series:** 3-day smoothed buoy time series and corresponding ship values along 95W (o) and 110W (x).

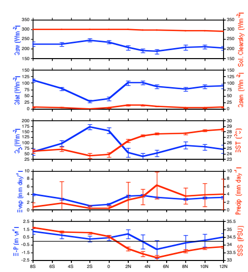



**Seasonal Cycle:** The stratus deck / cold tongue / ITCZ complex has a strong annual cycle, even though the Sun is directly over the equator twice per year.



*The ocean loses heat to the atmosphere from May-Aug in the stratus deck region south of 8S, and from June - Oct in the frontal region north of the developing cold tongue and south of the intensifying ITCZ.*

**Mean Section:** Mean values, estimated over the EPIC monitoring period. Error bars represent 95% confidence limits in the mean assuming a 10-day integral time scale.



*Air-sea interactions change dramatically across the cold tongue front.*

**Conclusion:** These data will be used as benchmarks for evaluating fluxes from numerical weather products and their biases on general circulation models.

These data will also be used to analyze air-sea interaction physics that couple the ocean and atmosphere in the eastern Pacific stratus deck / cold tongue / ITCZ complex.