EPIC2001 Ronald H. Brown
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The RHB has been on station at 10 N 95 W for 17 days and we plan to depart tonight. We have been conducting oceanographic and atmospheric operations as planned. The CTD, the MMP (University of Washington modular microstructure profiler), the SPMR (University of California at Santa Barbara solar radiative flux ocean profiler), and the balloon soundings are the primary externally deployed systems in operation. We are doing one CTD (around local noon), about 50 MMP s, about 7 SPMR s, and 6 balloon soundings per day. The success rate for winds on the balloon soundings is very good (about 5/6). We have also been capturing one or two SEAWIFS overpasses every day around noon. On September 19 we began a schedule of XCP (expendable current profiler) drops every 8 hours. The launches were concluded on September 25 with 18 of 20 completely successful.

In the past 8 days the weather has been predominantly very active convectively with only a short break in the disturbances on September 25. In that 8-day period we received about 270 mm of rain, average net heat flux into the ocean was about -100 W/m^2, and the ocean cooled about 0.5 C.

Mike Gregg reports that during the last week MMP profiles show mixing increased in the lower part of the thermocline, and the data record grew long enough to show convincing evidence of mixing following the vertical propagation of near-inertial motions. Simultaneously, the thermocline thickened and isolines of salinity and oxygen descended, suggesting that the mixing may have been responsible. Oxygen and salinity changes, however, also were found deeper in the water column. Advection is the only feasible reason for these changes. Determining how much of the thermocline changes resulted from mixing and how much from advection will require detailed analysis.

The UCSB ocean radiant heating group continues to measure profiles of in water spectral irradiance, and collect water samples for chlorophyll and nutrient analysis. A preliminary look at the in-water solar flux data shows spectral diffuse attenuation coefficients that are mostly invariant within the upper ocean mixed layer (~30 m). This suggests that the fraction of the incident solar flux that passes beyond 30 meters is changing only slightly during the sampling period. However, we see more substantial changes in the solar flux divergence (normalized to surface values) near the top of the thermocline. The heating rate of a 10 m thick layer at the top of the thermocline (30 to 40 m) varies by more than 10 W m^2 (based on a climatological surface value of 170 W m^2). Such changes in (surface normalized) ocean radiant heating follow variations in chlorophyll concentration within the "deep chlorophyll maximum" (~40m). Chlorophyll concentration at 40 meters ranges from near 0.2 to more than 0.6 mg m^3.
A doubling of chlorophyll concentration (from ~0.15 to just over 0.3 mg m^3) within the mixed layer was just recently observed (9/28). We expect a noteworthy change in the (surface normalized) solar flux at the mixed layer base. A large amount of cloud variability needs to be sorted out before reporting on these data. We will begin CTD/Rosette/SPMR data collection

along the 95W line (from 10N to the equator) shortly.

Amparo Martinez reports continued good measurements with the air aerosol/chemistry system. A pump problem with the SO2 system was fixed. The system has a small unexplained negative bias, but seems to be indicating reasonable temporal variability and shows noticeable sensitivity to the ship s plume. Good phytoplankton samples have also been obtained. The chromatograph continues to have problems and efforts to repair it have been for nought. Samples are still being stored for later analysis.

The CSU group is getting good C-band radar data and balloon launches are going very well (see their separate daily reports on JOSS). The cloud radar/microwave radiometers are fully function; the upward pointing IR is still down for lack of a power supply. The mini-MOPA lidar is operating almost about 60% of the time, distributed through the day. Range performance for Doppler is 4-6 km and for water vapor is 0.5-1.0 km depending on aerosol and humidity.

Some problems were discovered in logging of some of the SCS events around September 28 and 1 or 2 days of data may not be archived. Jonathon Shannahof is investigating.

The C-band radar operated continuously through the period without significant problems. Solar calibration checks indicated that errors in the radar azimuth and elevation pointing angles are within 0.3 degrees. At low elevation angle, the sea clutter pattern changes as the ship heading changes (i.e., the ship repositions) but there does not appear to be a deleterious effect on data collection. The sea clutter effect appears to be due to a combination of low pointing angle (0.5 degree) and the fact that the antenna platform is not perfectly horizontal (level checks indicate that the platform has a sine-wave pattern as a function of azimuth with an amplitude of about 0.4 degrees). In heavy seas (8 ft swells) we have documented one instance (3 consecutive volume scans) where the INU did not appear to be fully compensating for the ship pitch and roll. This was revealed by cross sections showing a sloping bright band as a function of range.

To date, we have released approximately 127 of the 180 sondes allocated for EPIC IOP 1. Our plan is to continue sonde releases at 6/day frequency until we cross the cold tongue near 2N. The most persistent issue for the sondes has been loss of winds above the surface, despite adequate satellite lock (4 or more) at the time of release. We have not found any consistent pattern to account for the loss of winds. We estimate that ~ 15% of the sondes have not returned winds. The other sonde issue over the last week has been loss of data prior to penetration of the tropopause. The major culprit for the data loss has been meteorological conditions: heavy rain at launch time preventing the balloon from ascent and/or icing of the balloon/sensor after penetrating the melting level.

During the past week, we have documented the complete passage of one easterly wave and we are currently sampling another wave passage (see attached Figure 1). These time series, as well as time series of humidity, indicate that the wave signal is first detectable in the middle troposphere about 1 day before the signal arrives at the surface. Preliminary analysis of the sounding thermodynamic data suggest a diurnal signal in parcel thermal buoyancy and mixed layer wet bulb potential temperature with maximum values between 04-08 UTC(22-02 L). This is

consistent with the time series of radar echo coverage which shows the largest fraction of convective coverage around 12 UTC (06L) and stratiform coverage around 15 UTC (09L). Preliminary analysis of rainfall totals also show a similar diurnal pattern.

General Status report on Measurement Systems for September 14 - 21

1	Air-sea flux system	99%
2	Solar and IR fluxes	100%
3	Bulk meteorology	100%
4	Ceilometer	100%
5	0.92 GHZ wind profiler	95%
6	Raingauges (4 epic)	100%
7	35 GHZ cloud radar	100 %
8	20, 31 Ghz radiometers	100 %
9	90 GHZ radiometer	100 %
10	IR thermometer (upward)	Out
11	Mini-MOPA Doppler/H2O lidar	100%
12	Aerosol and air chemistry	75%
13	MMP	50/day
14	SPMR	8/day
15	Rawindsondes: thermodynaics	6/day
16	Rawindsondes: winds	~5/day
17	C-band Doppler radar	100%
18	CTD	1/day
19	ADCP	100%
20	Terrascan	100%
21	IMET	100%
22	SCS	100%
23	Thermosalinograph	100%
24	AOML CO2 system	25%
25	Flourometer	?
26	CIRMS (APL IR SST)	100%
27	APL 2-m sea temperatuere	100%
28	Portable radiation package (BNL)	100%

Figure 1. Time height cross section of wind components from September balloon soundings: upper pane, U (westerly); lower panel, V (southerly).