P1.37

PRECIPITATION STRUCTURES OBSERVED IN CAMEX HURRICANES

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1.INTRODUCTION

The Fourth Convection and Moisture Experiment (CAMEX-4) featured multiple aircraft missions in two tropical storms (Chantal and Gabrielle) and two hurricanes (Erin and Humberto). Observations of the precipitation fields (as seen by a variety of sensors) of the two hurricanes will be presented at the conference. Much of the data is still being quality controlled and analyzed at the time of this preprint. Preliminary brightness temperatures from the Advanced Microwave Precipitation Radiometer (AMPR) are presented below, along with radar, passive microwave, and lightning observations from the TRMM satellite.

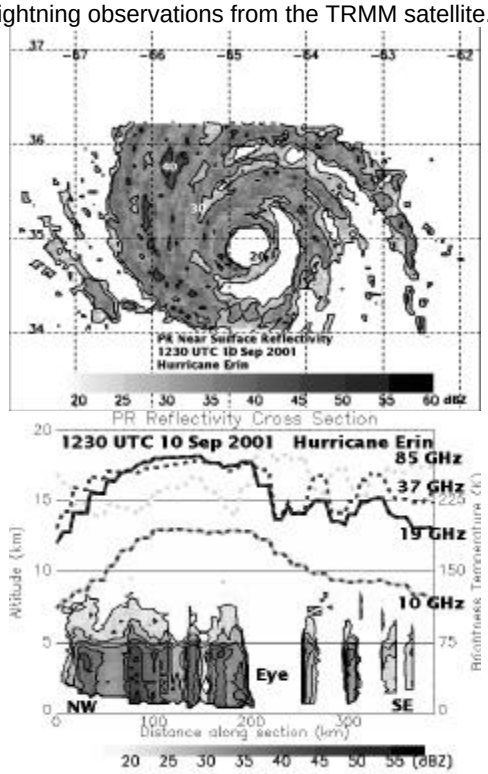

Fig. 1. (a) Near surface reflectivity from TRMM PR in Hurricane Erin, 1230 UTC 10 Sep 2001. Contours at 20, 30, 40 dBZ. (b) Vertical cross section of reflectivity and coincident horizontally polarized brightness temperatures from TMI. Cross section extends from northwest to southeast. Contours at 20, 25, 30, 35, 40, 45 dBZ.

2. RESULTS

Hurricane Erin had a well developed eye, eyewall, and rainbands when the ER-2 overflew it on 10 Sep. 2001. Fig. 1 shows the precipitation field several hours before the flight. Erin had just passed its peak intensity and the convection was not particularly strong. As a result, the AMPR signatures are dominated by emission without a great deal of scattering (Fig. 2).

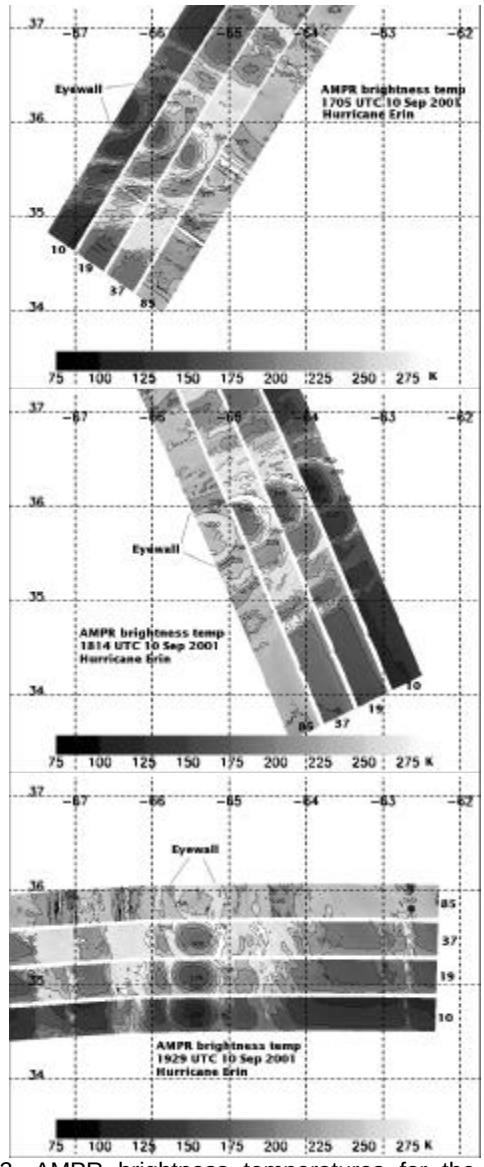

Fig. 2. AMPR brightness temperatures for the three passes across the center of Erin. The 85 GHz channel is plotted at its proper geolocation, with the other channels offset to the left of the aircraft track. 1705, 1814, 1929 UTC.

Convection encountered in Hurricane Humberto was much stronger than that in Erin. The second aircraft mission (Fig. 3) was followed by a TRMM observation (Fig. 4) with six lightning flashes, deep radar echoes, and strong ice scattering signatures. The third aircraft mission into Humberto featured the greatest AMPR ice scattering at 85 GHz of any of these flights, suggesting the strongest convection.

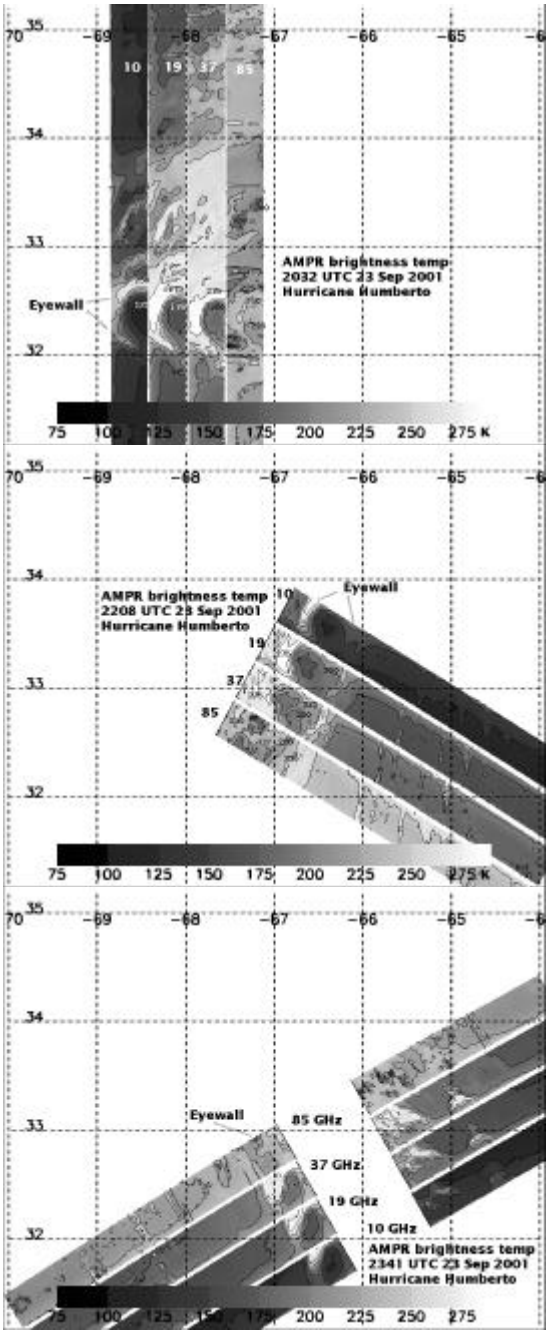

Fig. 3. As in Fig. 2, but for the 23 Sep Humberto mission. 2032, 2208, 2341 UTC.

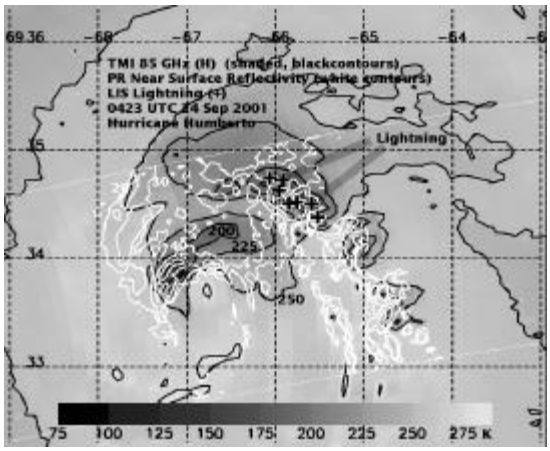

Fig. 4. TRMM observations at 2341 UTC 23 Sep 2001. 85 GHz horizontally polarized TB (shaded and black contours at 25 K intervals); near surface reflectivity (white contours at 20, 30, 40, 50 dBZ); lightning flashes (+ signs).

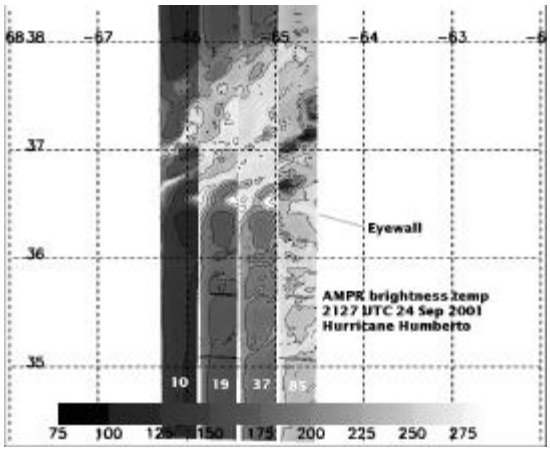

Fig. 5. As in Fig. 2, but for the 24 Sep Humberto mission. 2127 UTC.

An overwhelming number of observations were made in Humberto, but unfortunately AMPR was less stable (more data dropouts) on 23 Sep than on the 10 Sep Erin flight. On 24 Sep, the ER-2 only completed one pass across the center of Humberto (Fig. 5).

The AMPR brightness temperatures presented here have undergone initial quality control. More observations from additional instruments (particularly radars and electric field mills) will be presented at the conference after additional quality control and processing.