

Mission Summary
990803H Aircraft 42RF
Early-Season: Tropical Cyclone Air-Sea Interaction
Gulf Loop Current/Eddy Flight

Scientific Crew (42RF)

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Mission Briefing:

This flight was the AXBT version of the early-season, air-sea interaction experiment designed to map the boundaries of the Gulf Loop Current and associated warm anticyclonic eddies as well as obtain an initial estimate of the heat content anomalies associated with these features. The experiment is designed to determine the effect of heat content in anomalous warm eddies in the Gulf of Mexico on hurricane intensity change. A secondary objective was to test the aircraft receiver system with three expendable probe types: AXBT (measures temperature vs. depth), AXCP (measures temperature and current vector vs. depth) and AXCTD (measures temperature and conductivity (salinity) vs. depth from which density is calculated).

With the help of blended TOPEX and ERS2 satellite altimeter maps from the University of Colorado (CCAR), and feature boundaries based on drift buoy and rig ADCP measurements used to initialize the CU-POM Gulf of Mexico ocean model, a flight pattern was designed to map the main Loop Current region and two anticyclonic warm eddies in the process of breaking off from the Loop Current. A feature to the northeast of the Loop Current had separated the week before, and named Eddy Haskell. A second feature to the northwest of the Loop Current proved to be stronger and deeper than Eddy Haskell, but not yet completely separated. The complex structure deduced from the satellite altimeter data was confirmed in its essential pattern by the AXBT survey, but somewhat different in detail.

Mission Synopsis

The flight departed MacDill AFB at 1315 UTC and landed there at 2245 UTC, a duration of 9.5 hours. The flight pattern consisted of a single line through the NE eddy feature (Eddy Haskell), a 'butterfly' pattern (3-legged) centered on the NW eddy feature and a modified 'Fig 4' centered on the main Loop Current feature. The first two legs through Eddy Haskell and NW to SE through the main Loop Current feature was flown at 10K ft (3 km/700 mb), while the rest of the flight was flown at 5 kft (1.5 km/850 mb).

A total of 46 AXBTs were deployed, 19 CAD-launched externally and 25 internally via the free-fall chute. Clean signals were observed to 350 m on 43 of 46 AXBTs, a failure rate of less than 7%. Two AXCPs and two AXCTDs were also launched to test the receiver systems. One AXCTD failed due to erroneous receiver assignment. The others were partially successful with strong initial signals, but rapid weakening of signals occurred after 400m depth due to poor signal strength, and no data was obtained below 500 m.

A double-lobbed eddy pattern was diagnosed by the AXBTs similar to the TOPEX/ERS2 blended analysis. The analysis of 20°C and 15°C isotherm depth showed a weak warm eddy (Haskell) to the northeast of the Loop Current and a stronger eddy northwest of the Loop Current. At 150 m, there was approximately a 10°C temperature difference between the standard Gulf water (Gulf Common

Water) and the Loop Current/warm eddy water. The maximum depth of the 20°C isotherm was 310m in the Loop Current, 260m in the northwestern eddy and 200m in Eddy Haskell.

Problems:

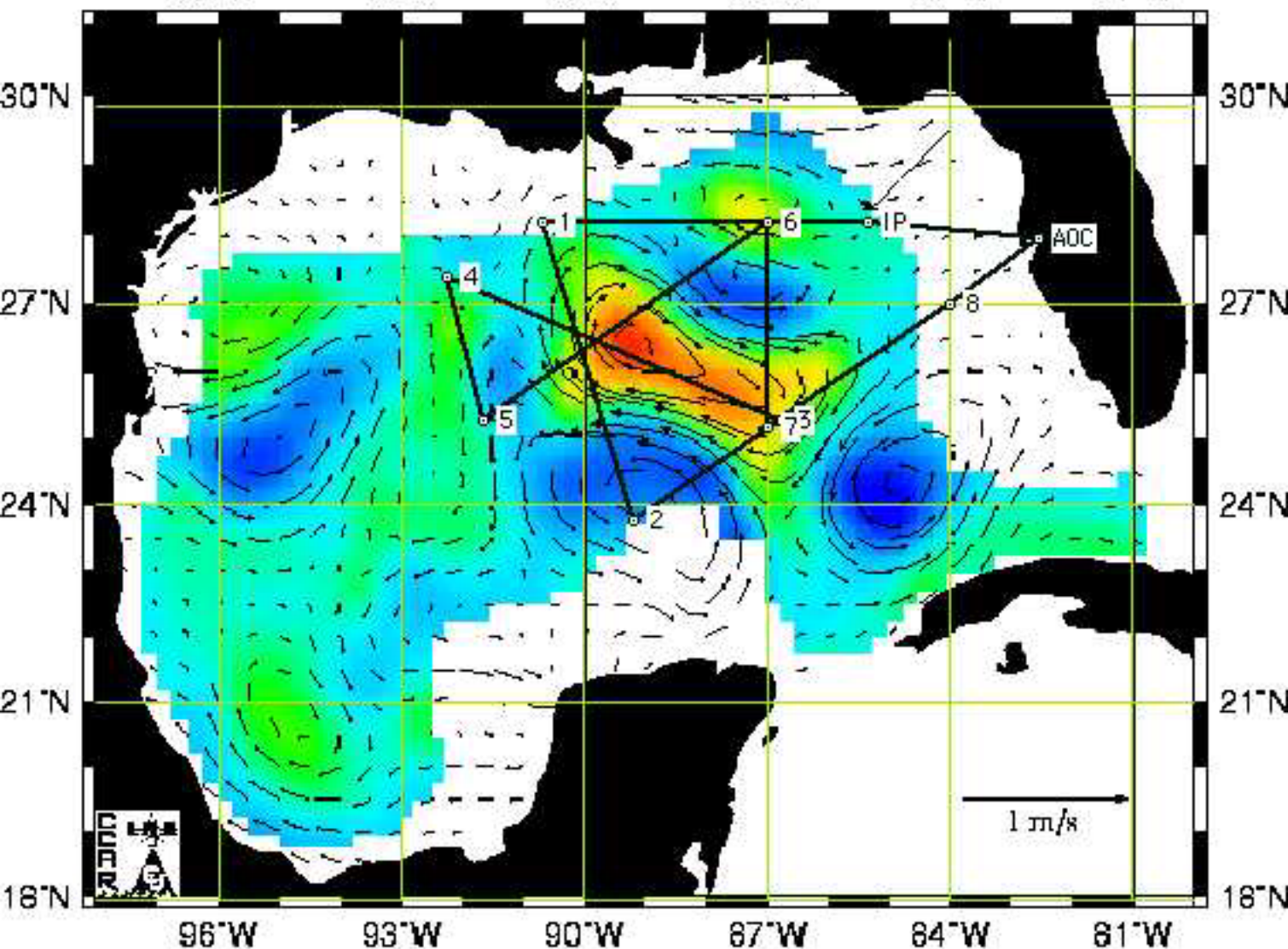
This flight followed AXBT/AXCP/AXCTD system continuity checks on the ground and a test drop of two AXBTs during the aircraft system calibration flight on 31 July (flight 990731H). Digital audio recording of the data failed on 990731H. A defective antenna cable (one of two) was found and the flight (990803H) was conducted with only one working antenna.

One cause of the weak AXCP and AXCTD signals was found to be due to a 7 dB signal strength loss in the antenna cable and to the lack of a necessary pre-amp to boost signal strength, a problem which was fixed along with the bad antenna cable the next day. This preamp was in line for the AXBT signals, hence the excellent data return.

P. Black

TOPEX/ERS-2 Analysis Aug 1 1999

96°W 93°W 90°W 87°W 84°W 81°W



Sea surface height anomaly (cm)

