

STUDY TITLE: Observation of the Atmospheric Boundary Layer in the Western and Central Gulf of Mexico

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CONTRACT NUMBER(S): 1434-01-97-CT-30854

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREA(S): Western and Central Gulf of Mexico

FISCAL YEAR(S) OF PROJECT FUNDING: 1998,1999,2000,2001,2002

COMPLETION DATE OF REPORT: April 2002

COST(S): FY 1998: \$619,198; FY 1999: \$161,075; FY 2000: \$150,623; FY 2001: \$156,105; FY 2002: \$165,244

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KEY WORDS: Western Gulf; Central Gulf; atmospheric boundary layer; marine boundary layer; radar profiler; radio acoustic sounding system; meteorological measurements; upper air meteorological data; surface meteorological data; platform measurement sites; GOES satellite data transmission.

BACKGROUND: For the Gulf of Mexico, data sets poorly represent how temperature, winds, and mixing height vary vertically over the atmospheric boundary layer and free troposphere. Empirical constants and relationships are used to approximate vertical variations in temperature, winds, and other boundary layer properties. However, direct observations more accurately describe vertical variations. The MMS has an interest in collecting field observations of the vertical structure of the marine boundary layer because such observations would reduce uncertainties in environmental assessments.

OBJECTIVE: To obtain field observations describing the vertical structure of the marine boundary layer over the Western and Central Gulf of Mexico for ongoing and future applications.

DESCRIPTION: Field observations of upper air wind and temperature, surface wind, surface temperature, surface relative humidity, surface pressure, and sea surface

temperature were collected at two offshore platform sites for a continuous 40-month period.

Site selection criteria included a shallow water location to collect data that will help measure how the marine boundary layer is affected by the land/sea breeze mechanism, and a deep water location to collect data that will help measure how the marine boundary layer is affected by interaction between advecting air masses and colder waters in the Gulf of Mexico.

Using these criteria, Vermillion 22D was selected as the shallow water data collection site and South Marsh Island 161A was selected as the deep water data collection site.

SIGNIFICANT CONCLUSIONS: The data base collected provides the type of direct atmospheric measurements needed to help better define the vertical structure of the marine boundary layer in order to reduce uncertainties in environmental assessments.

STUDY RESULTS: Meteorological measurement equipment was installed, operated, maintained and audited at the two sites during the data collection period, and was removed following completion. This included a 915 MHz pulsed-Doppler radar profiler at each site to collect upper air wind and virtual temperature data, and a suite of standard in-situ sensors to collect surface (platform level) wind, temperature, relative humidity, pressure, and sea surface temperature data.

Data were retrieved from both sites each hour by transmission to a collection and processing facility through the NOAA GOES satellite communications system. All retrieved data were quality checked upon receipt and were made available to NOAA in near real-time. Validation and reporting of collected data was accomplished each month, and a complete data base of all measurements recorded during the continuous 40-month observation period was compiled at the end of the data collection program.

The overall data capture rate achieved for the 40-month measurement period was 89.3%, which was slightly below the project goal of 90% due to practical time-delay limitations in accessing the meteorological and communications equipment at the remote sites when corrective maintenance was needed, such as to reset the equipment after power interrupts. The achieved data capture rate did not vary significantly by data type or site.

The data collection project was conducted according to its planned schedule except for an initial delay awaiting site RF transmission licenses, was completed within its planned budget, and was conducted with no personnel or equipment accidents.

STUDY PRODUCTS: 2002. Observation of the Atmospheric Boundary Layer in the Western and Central Gulf of Mexico. A final performance report by Vaisala Meteorological Systems Inc. and Sonoma Technology, Inc. for the U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico Region, OCS, New Orleans, LA. Contract No. 1434-01-97-CT-30854. 125 pp.



Location of Selected Monitoring Sites