ACCESS NUMBER: 39051

**STUDY TITLE:** Coastal Air-Sea Coupling at Critical Latitudes: Supplement

**REPORT TITLE:** Quality Control and Analysis of Acoustic Doppler Current Profiler Data Collected on Offshore Platforms of the Gulf of Mexico

CONTRACT NUMBER: 1435-01-05-CT-39051 (M05PC00001)

SPONSORING OCS REGION: Gulf of Mexico

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**KEY WORDS:** Gulf of Mexico, currents, quality control, acoustic current velocity profiler, ADCP, NTL 2005-G05, zooplankton, backscatter, continental slope, deepwater, monitoring, platforms, vertical structure, oceanography, hydrography

**BACKGROUND:** In 2005 MMS announced Notice to Lessees and Operators (NTL) No. 2005-G05 “Deepwater Ocean Current Monitoring on Floating Facilities” that provides for the submittal of oceanographic data and current monitoring information to MMS via a single publicly available Internet Site. The MMS therefore established that all floating mobile offshore drilling units, and production facilities (with certain exceptions) operating or installed in water depths greater than 400 m must continuously monitor and gather ocean current data in a real-time basis from near the ocean surface (~30 m) to ~1000 m using acoustic Doppler current profiles (ADCP) current monitoring or compatible equipment. The ADCP data collected under the NTL will be very useful in achieving the objectives of the air-sea coupling at critical latitudes study. The ADCP data possess the necessary temporal sampling to resolve diurnal variations and have broad spatial coverage to investigate signal propagation and phasing. The vertical resolution of the instruments will also provide data to investigate how the diurnal signals vary with depth.

**OBJECTIVES:** The objectives of this study are to provide to MMS two items regarding industry ADCP data collected and submitted to MMS under NTL No. 2005-G02: 1) an

evaluation of the Level 1 QA/QC procedures and 2) provide recommendations for next level quality control of the collected data.

**DESCRIPTION:** This project provides an independent review of the industry ADCP collected under the NTL No. 2005-G05. This would be executed by an analysis of the incoming (raw) data and a review of the QA'd Level 1 data at up to three selected reporting sites. The raw and Level 1 data would be compared and statistics of percentage of raw data eliminated from the database would be calculated. Physical oceanographic variables (temperature, horizontal current velocity, pressure and salinity, when available) eliminated from the database due to Level 1 failure will be qualitatively examined to verify that elimination from the database is justified. Statistics (mean, variance, maximum and minimum values) of passed and eliminated variables will be compared. Second element is proposed to provide recommendations for more in-depth processing and archival of the ADCP data. Typically, Level 2 processing entails advanced statistical methods such as variance spectra, empirical orthogonal function (EOF) analysis, and auto- and cross-correlation analysis. Upon completion of the Level 1 Evaluation proposed above, we will provide to MMS recommendations and guidance for additional QA/QC processing of the Level 1 dataset. This includes but not limited to recommendations for additional Level 1 tests (if any), guidance for Level 2 test criteria, formatting and archival. This project was proposed to be a limited study of up to three reporting sites. We picked two groups of platforms (Group A and Group B) that have a mix of fixed and mobile assets and a range of operators. We thought direct comparison of the measured currents between nearby platforms would help to shed some light on the quality of the data; unfortunately, it did not. Group A consisted of the three platforms 42366, 42368 and 42872 and Group B consisted of the three platforms 42373, 42880 and 42888.

**SIGNIFICANT CONCLUSIONS:** A series of 24 findings resulting in specific recommendations concerning quality control were identified. The most significant are listed below.

- The NDBC Web site explanation should be far more detailed as to how quality control flags are determined.
- Specifying ADCP setup parameters should be a requirement of operators. Exact setup parameters should be entered and a new flag added that indicates if the actual setup parameters are to specification.
- In some cases, the physical constraints on mounting an ADCP to a platform will require an unusual set up. This information should be required in the meta data.
- Users of low-frequency (38-kHz) ADCP data should be aware that there may be small biases in the horizontal speed due to the presence of widely distributed, relatively fast swimming organisms.
- The option of manual input of platform position should be eliminated and GPS input required for all platforms.
- The usefulness of machine-based automated quality control procedures is limited to problems that have been encountered previously. When possible, a

technician experienced in data quality and ocean processing should review the data to identify new problems and errors.

**STUDY RESULTS:** It is our opinion that this report provides one of, if not the first opportunities, to examine ADCP quality control issues across a wide range of operators, platforms and physical setup. The vast majority of quality control to date has been done by individual operators. Three principal recommendations based on the findings of the study are offered. 1) We recommend a workshop involving RDI, MMS, NDBC, and the operators to discuss the results of this report and to discuss how quality control can reasonably be achieved across different instrument, different platforms, and different operators. 2) The ideal quality control environment would be achieved by saving the ping-by-ping data. In this way the setup parameters would be irrelevant and all the QC could be performed as post processing and strictly controlled. 3) The potential effect of grazing organisms on the validity of the velocity data could be large. A plan to study how prevalent and how influential this may be is recommended if velocity accuracies of better than 20 cm/sec are desired.

**STUDY PRODUCT(S):** Bender, L.C. and S.F. DiMarco. 2009. Quality control and analysis of acoustic Doppler current profiler data collected on offshore platforms of the Gulf of Mexico. U.S. Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2009-010. 72 pp.

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