



OTC 18903

## Development of Revised Gulf of Mexico Metocean Hurricane Conditions for Reference by API Recommended Practices

E.P. Berek, ExxonMobil; Cortis K. Cooper, Chevron; David B. Driver, BP; John C. Heideman and Douglas A. Mitchell, ExxonMobil; James D. Stear, Chevron; and Michael J. Vogel, Shell Intl. EP

Copyright 2007, Offshore Technology Conference

This paper was prepared for presentation at the 2007 Offshore Technology Conference held in Houston, Texas, U.S.A., 30 April–3 May 2007.

This paper was selected for presentation by an OTC Program Committee following review of information contained in an abstract submitted by the author(s). Contents of the paper, as presented, have not been reviewed by the Offshore Technology Conference and are subject to correction by the author(s). The material, as presented, does not necessarily reflect any position of the Offshore Technology Conference, its officers, or members. Papers presented at OTC are subject to publication review by Sponsor Society Committees of the Offshore Technology Conference. Electronic reproduction, distribution, or storage of any part of this paper for commercial purposes without the written consent of the Offshore Technology Conference is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgment of where and by whom the paper was presented. Write Librarian, OTC, P.O. Box 833836, Richardson, TX 75083-3836, U.S.A., fax 01-972-952-9435.

### Abstract

The hurricane metocean conditions presently contained in the 21<sup>st</sup> edition of API RP2A are in the process of being revised, to account for both the effects of recent major hurricanes as well as changes in understanding regarding the occurrence of severe hurricanes that has taken place since the RP2A conditions were last updated in 1993. This paper contains information on the process used to develop new hurricane metocean conditions, including the hurricane hindcast information used as the basis for the conditions and the statistical methodology used to analyze the data. A summary of the present draft version of the new conditions is also included.

The new conditions, when accepted by API, will eventually be published as part of a separate stand-alone API recommended practice on metocean conditions which can then in turn be referenced by other API recommended practices covering offshore structures and operations, such as those addressing shallow-water fixed platforms, jackups, deepwater platforms, and floating MODUs.

New draft hurricane metocean conditions are provided for four regions spanning the northern Gulf of Mexico from southern Florida to southern Texas, for all water depths 7.5 m and deeper. The new conditions between 86.5° and 90° W are significantly higher than the conditions currently contained in RP2A, due to the recent severe storms, most notably Opal (1995), Ivan (2004), and Katrina (2005); however, the new conditions in the other three regions are similar to those currently in RP2A. The new conditions are based on the hurricane record from 1950 to the 2005. Unlike common practice in previous hurricane metocean studies, storms before 1950 were excluded from the statistical analysis because the quantity and quality of data available for those storms is considered too uncertain.

The division into four regions recognizes the geographical variability of hurricane conditions across the Gulf of Mexico and is an improvement over the uniform conditions described in RP2A. However, a site-specific metocean study is the only way to ensure that regional variability is properly accounted for and is the preferable approach for design and operational criteria for major development projects.

**KeyWords:** GOMOS, MODU, hurricane, hindcast, metocean, Gulf of Mexico, API.

### Introduction

The arrival of major hurricanes Ivan, Katrina, and Rita, three of the most severe storms on record in the Gulf of Mexico, within two hurricane seasons (2004 and 2005), caused massive interruptions in the production of oil and gas in the Gulf of Mexico due to damage to facilities. Given the impact of these storms, and changes that have occurred in the understanding of hurricane conditions in the Gulf of Mexico since 1993 (the year the conditions in API RP2A were last updated), it was decided by the API Hurricane Evaluation and Assessment Team (HEAT) that the hurricane metocean conditions presently contained in the 21<sup>st</sup> edition of API RP2A (1) should be re-evaluated and, if necessary, revised. An API Task Group, composed of the authors of this paper, was formed to develop new hurricane conditions. It was also decided that the new hurricane conditions would not be included in API RP2A but would be included in a stand-alone API recommended practice document on metocean conditions, which could then in turn be referenced by other API recommended practices.

The proprietary hindcast data available for use in developing conditions has been revised since the last update in 1993. Because the hindcast data is not publicly available for every grid point in the Gulf, it was necessary to take advantage of hindcast data already made public in the industry-sponsored MODU Mooring Strength and Reliability JIP (MODU JIP), managed by ABS Consulting (2).

Hurricane conditions have been derived for four regions of the Gulf of Mexico, shown in Figure 1, as opposed to the prior API practice of recommending one set of conditions to apply over essentially all the active drilling and producing area of the Gulf. The decision to use four regions is based on work by a number of researchers, including several of the authors, over a number of years. Key publications include Cooper (3) and Chouinard, et al. (4) which indicate that the substantial differ-