NATIONAL WEATHER SERVICE
PRODUCT/SERVICE DESCRIPTION DOCUMENT (PDD)

Rayleigh Distribution in the NWS Coastal Waters Forecast (CWF)
September, 2013

Part I – Mission Connection

a. Product Description:

Each coastal Weather Forecast Office (WFO) within the National Weather Service (NWS) issues a daily Coastal Waters Forecast (CWF) product that is routinely sent four times per day. This product includes critical information regarding the expected marine conditions within the area of responsibility of each coastal office out five days. It is primarily used as a tool for planning purposes to support and promote safe transportation across the coastal waters. For more information regarding the CWF product, refer to NWSI 10-310. This enhancement was tested at WFO Miami in 2012. After a one year comment period the vast majority of the comments from the surveys were positive. As a result the testing will be expanded to include other WFOs from Southern Region.

Offices currently testing the enhanced CWF:
WFO MFL
WFO TAE

Additional offices may be added at a later date.

b. Purpose:

The purpose of this proposal is to enhance the CWF at Southern Region WFOs with the inclusion of additional wave height fields by implementing the theoretical Rayleigh Distribution.

In general, it is assumed that individual wave heights can be described using this distribution, which accounts for these wave heights:

- (H_f) Most Frequent
- (H_{ave}) Average
- (H_s) Significant (currently forecast in the CWF)
- ($H_{1/10}$) Highest one-tenth

A more detailed description of this distribution will be discussed in Part II of this document.

c. Audience:

The target audience for this product enhancement is operators of small craft (vessels less than 40 feet in length), which accounts for a high volume of marine traffic within the area of responsibility.

Additional audiences will include operators of large craft, such as the general and commercial marine community, military and government agencies.

d. Presentation Format:

These additional wave fields will be disseminated within the CWF text product and made available through NOAA Weather Radio-All Hazards (NWR) broadcast and through the Web using the marine forecast "point and click".

e. Feedback Method:

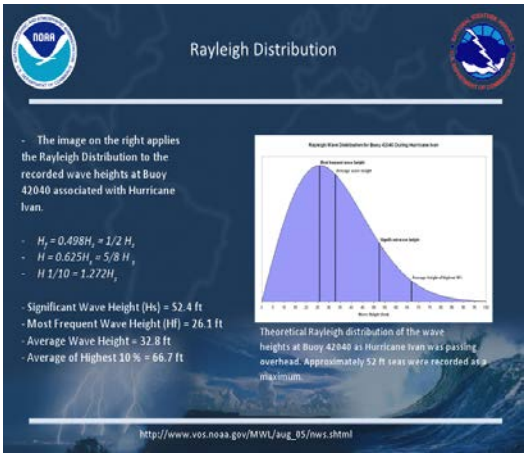
Comments regarding this enhancement to the CWF can be provided through an interactive link on the product webpage. Comments will be solicited for a period of nine months, (from September 18, 2013 through June 18, 2014). During this experimental period, a proactive effort will be made to educate users and partners of the product availability and use. At the end of the comment period, if comments are favorable, the enhanced CWF will be evaluated for use in other regions. A decision will be made whether to transition to operational at regional or national level or to discontinue the product.

Part II – Technical Description

a. Format and Science Basis:

Wave heights in the ocean are modeled according to the Rayleigh distribution. As described above, this distribution accounts for an average value, with most elements or individual wave heights clustered toward lower values, and only a few exceptionally large values.

Several different wave statistics can be inferred from this distribution. For example, the most frequent wave height (H_f), which is approximately half the value of the significant wave height, and the average wave height (H_{ave}), which is estimated to be about 5/8 the value of the significant wave height.



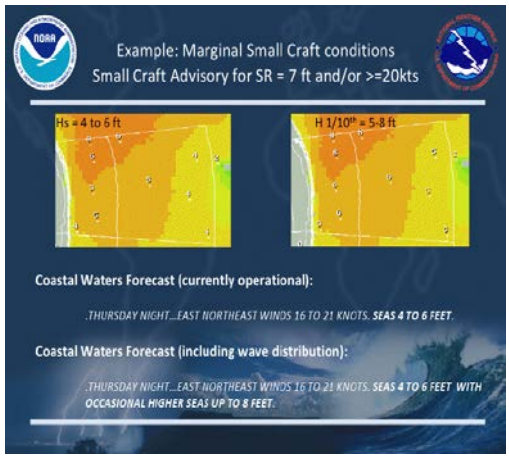


Figure 1: Graphical description of the Rayleigh Distribution curve (left), and a gridded example within GFE and the CWF text product (right).

As shown in Figure 1, the average height of the highest 10% of waves observed at sea is approximately 1.272 times the significant wave height. The inclusion of the $H_{1/10}$ wave height into the CWF product will provide a more descriptive and accurate assessment of the wave field expected for any particular time across a given marine zone.

Logistically, this addition could enhance decisions made within the marine community. More importantly, knowledge of this information could reduce the number of marine incidents and accidents out at sea, thus saving lives.

b. Product Availability:

These additions will be made available as part of the routine forecast provided online at the following Southern Region WFOs:

WFO MFL http://www.srh.noaa.gov/mfl/
WFO TAE http://www.srh.noaa.gov/tae/

and broadcast over NOAA Weather Radio-All Hazards. Additional Southern Region WFOs be added at a later date.

c. Additional Information:

A GFE Procedure will automatically create the different statistical gridded wave height elements described above from the official NDFD Wave Height forecast. The CWF text formatter also will be updated to include these new elements. No special software will be necessary to generate these additions.