

**NOAA/National Weather Service  
National Hurricane Center / Tropical Analysis and Forecast Branch  
Wind Speed Probabilities-Based Tropical Cyclone Danger Area Graphic  
Product Description Document (PDD)**

**June 7, 2016**

**Part I. Mission Connection**

**A. Product Description**

The Tropical Analysis and Forecast Branch (TAFB) is providing, on **an operational basis**, a Wind Speed Probabilities-Based Tropical Cyclone Danger Area graphic based on the 34-kt wind speed probabilities through 72-hours from the latest tropical cyclone advisory for an active tropical cyclone. The graphic outlines avoidance areas using the 5% and 50% 34-kt wind speed probability contours from the latest tropical cyclone advisory issuances for both the Atlantic and East Pacific basins (**Figures 1 and 2**).

The avoidance area encompassed by the 5% 34-kt wind speed probability swath outlines areas where tropical storm force winds are possible and is denoted within a dashed line, while the 50% 34-kt wind speed probability swath outlines areas where tropical storm force winds are likely and is denoted within a solid line.

In the event there are no active tropical cyclones in either basin, the graphic will be blank with the following wording: **“THERE IS NO TROPICAL CYCLONE ACTIVITY IN THE ATLANTIC”** for the Atlantic charts and, **“THERE IS NO TROPICAL CYCLONE ACTIVITY IN THE EAST PACIFIC”** for the East Pacific charts.

The current operational Tropical Cyclone Danger Area graphic uses the Mariners 1-2-3 rule to outline avoidance areas through 72 hours for active tropical cyclones. Feedback from users indicated that the use of the 1-2-3 methodology has led to “over-warned” large avoidance areas.

**B. Purpose**

The 1-2-3 methodology assumes an average forecast track error of 100-NM at Day 1, 200-NM at Day 2 and 300-NM at Day 3 rule (**Figure 3**). These values are well above the most recent 10-year averaged forecast track errors of 50 nmi at Day 1, 85 nmi at Day 2 and 120 nmi at Day 3. Additionally, feedback from users indicated that the use of the 1-2-3 methodology has led to “over-warned” large avoidance areas. The Wind Speed Probabilities-Based Tropical Cyclone Danger Area graphic is designed to meet this gap in service.

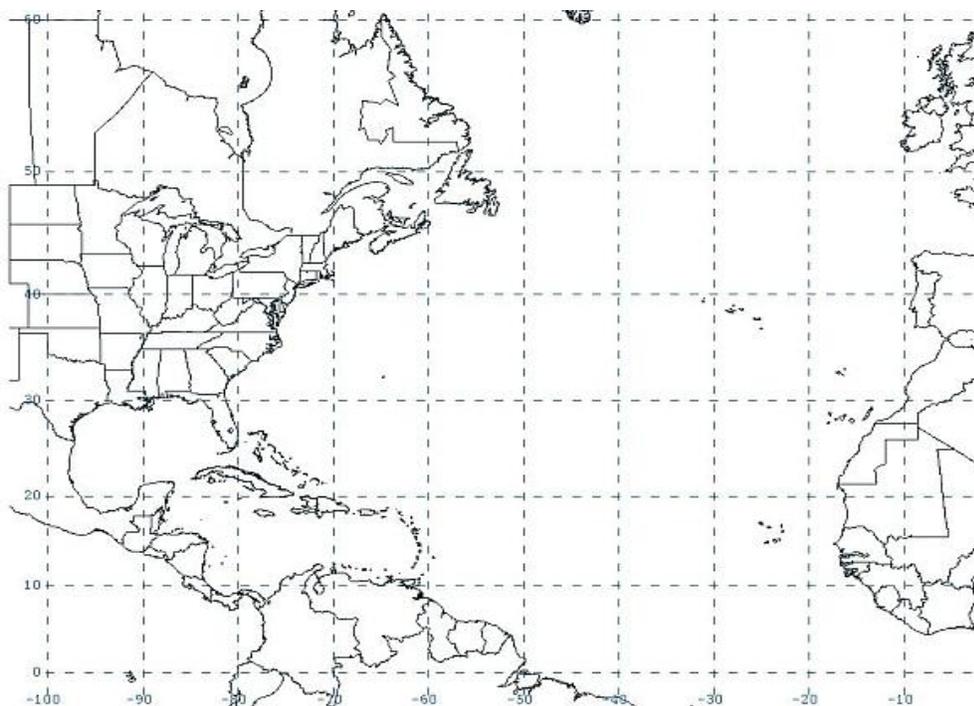
See **Figure 4** below for a comparison of the swath of the danger area of 34-kt winds based on the Mariners 1-2-3 rule and the 5% 34-kt wind speed probability swath for Tropical Storm Alberto in May 2012.

### C. Audience

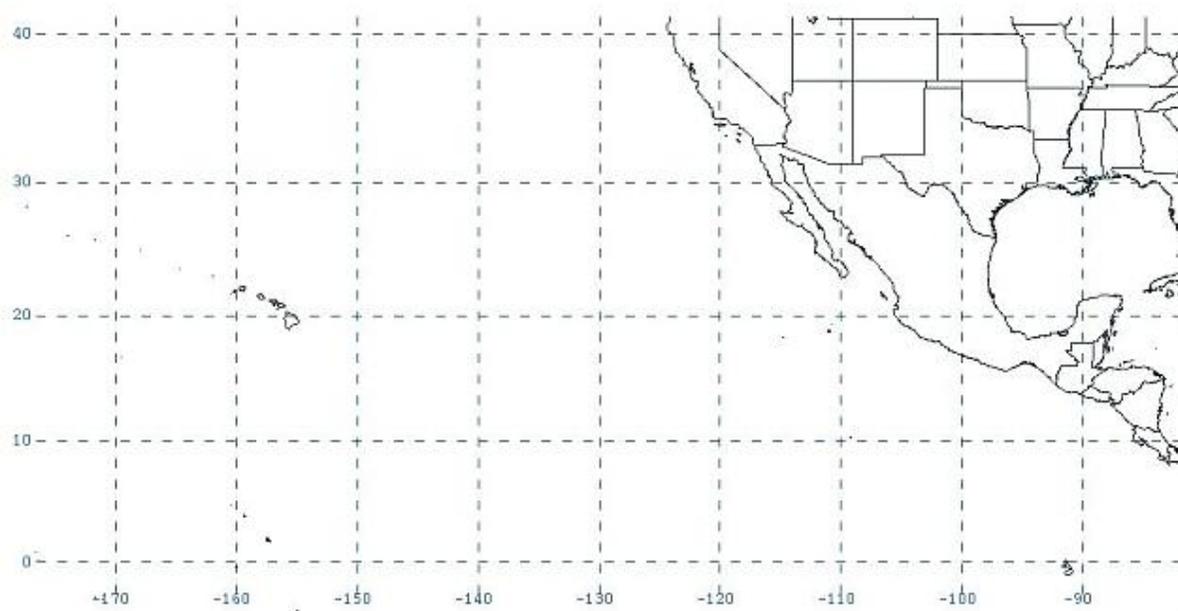
The target audience for this product primarily includes mariners traversing the forecast waters of the Caribbean Sea, Gulf of Mexico, the Atlantic and the Eastern and Central North Pacific oceans. However, other potential users of the product include emergency managers and other decision support agencies, as well as first responders to events both on land and at sea such as search and rescue and oil spill relief efforts.

### D. Presentation Format

The wind speed probabilities-based tropical cyclone danger area graphic is automatically generated daily by 0400, 1000, 1600 and 2200 UTC. When there are active tropical cyclones in either the Atlantic or East Pacific basins, the forecast track and 12-hour positions of the cyclone through 48 hours and a 72-hour position are plotted with the 5% and (if applicable) the 50% 34-kt wind speed probability contours through 72 hours. A tropical storm or hurricane symbol will be plotted at the forecast times denoting the intensity of the cyclone. Areas of possible tropical cyclogenesis will be annotated by forecasters on the graphic if an area has a medium or greater chance of development.



**Figure 1.** Bounds of the tropical cyclone graphic for the Atlantic basin.



**Figure 2.** Bounds of the tropical cyclone graphic for the East Pacific basin.

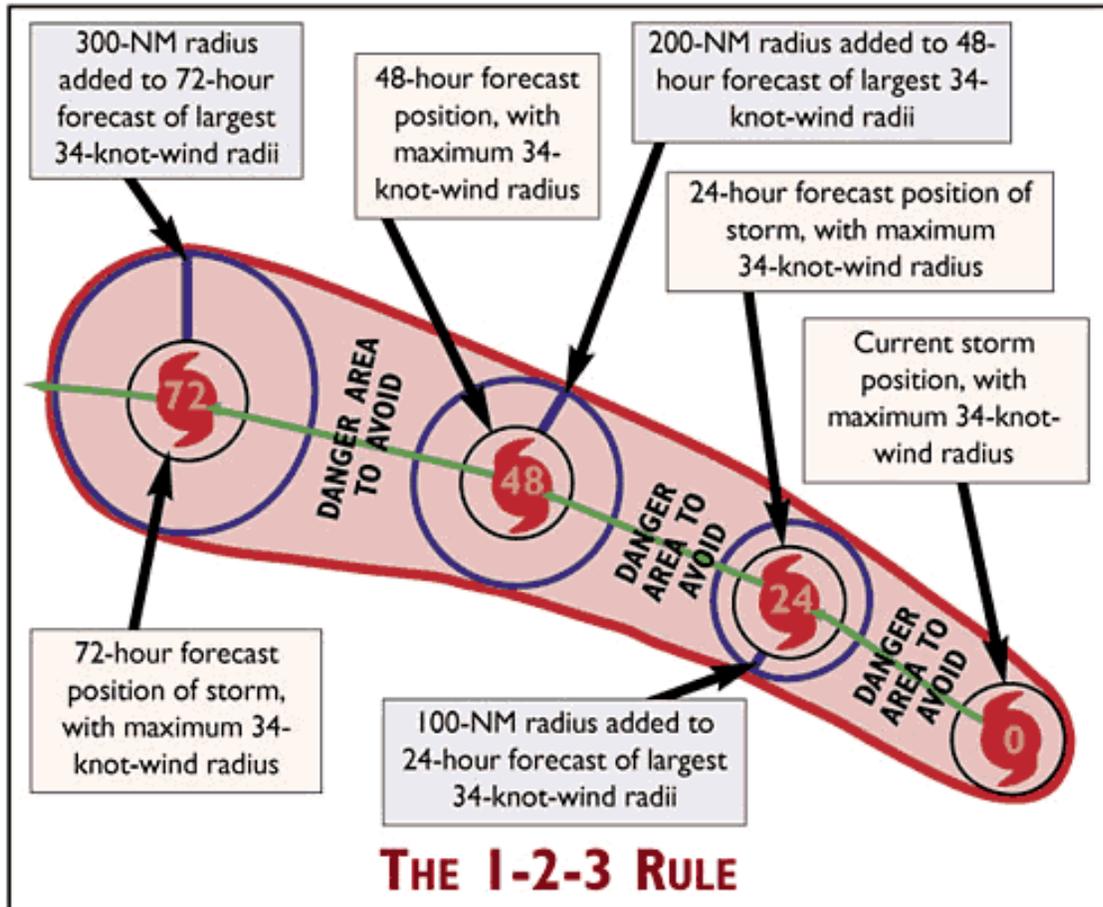


Figure 3. Illustration of the Mariner's 1-2-3 rule.

## Part II. Technical Description

### A. Science Basis and Methodology

The calculation of the wind speed probabilities is accomplished by creating a large set of alternative but plausible tracks and intensities (i.e., realizations) roughly centered on the current official forecast. These alternate forecasts are determined by sampling historical track and intensity errors in official National Hurricane Center (NHC) forecasts over the past five years. The intensity of each realization takes land decay into account if the track of that realization encounters land. The size of the tropical cyclone for each realization is determined by a climatology and persistence (CLIPER) wind radii model. The wind radii CLIPER model takes into account the size of the cyclone at that start of the forecast period as well as typical changes in size that occur as a cyclone experiences changes in strength, forward motion, latitude, and other factors. An adjustment is made, for purposes of calculating the probabilities, so that the wind radii represent the average, rather than the maximum, extent of winds in each quadrant. This process results in probabilities of actually experiencing certain wind speeds, not probabilities of falling within the traditional forecast wind radii that indicate the maximum extent of winds from the center. Swaths of particular wind speeds are then computed for each realization. Probabilities are computed on a 0.5x0.5 degree latitude-longitude grid by counting the fraction of the realizations in which each point falls within a given wind swath (34, 50, or 64

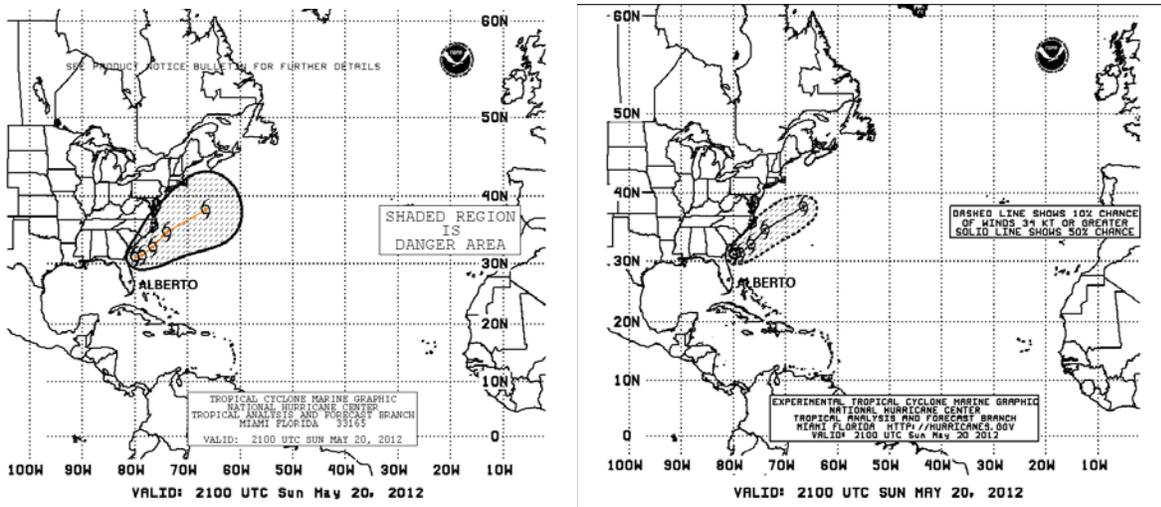
kt). This output is then processed and expressed in text or graphical format via the products being produced by NHC. On the wind speed probabilities-based tropical cyclone danger area graphic, the contours of the 10% and 50% 34-kt wind speed probabilities are shown as dashed and solid lines, respectively.

## B. Availability

The wind speed probabilities-based tropical cyclone danger area graphics are available four times daily at 0400 1000, 1600 and 2200 UTC on the NHC web site at the following URL <http://www.nhc.noaa.gov> beginning July 15, 2016.

## C. Additional Information

Below are examples comparing the swath of the danger area of 34-kt winds based on the Mariners 1-2-3 rule in the operational version of the tropical cyclone danger area graphic and the 10% 34-kt wind speed probability swath in the version of the wind speed probabilities-based tropical cyclone danger area graphic.



**Figure 4.** Comparison of the swath of the danger area of 34-kt winds based on the Mariners 1-2-3 rule in the operational version of the tropical cyclone danger area graphic (left) and the 5% 34-kt wind speed probability swath in the version (right) for Tropical Storm Alberto for the 2100 UTC 20 May 2012 advisory.