NCEP Numerical Wave Guidance and NCEP/FNMOC Combined Probabilistic Forecasts During Tropical Storms Sandy (Atlantic Ocean, Oct/2012) and Narelle (Indian Ocean, Jan/2013)

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In this study, we describe the performance of operational wave model systems at NCEP during two recent extreme weather events, with a focus on the skill of probabilistic forecasts provided by the recently-implemented combined NCEP/FNMOC wave ensemble product. The latter is the first multi-center wave ensemble system with 41 model components (members), developed via a partnership between the US National Weather Service and the US Navy, which will be expanded to include 20 additional members from a Canadian wave ensemble system this year.

Hurricane Sandy (24-29 October 2012) propagated north-ward, near the East coast of the United States, and became the largest Atlantic hurricane on record. Sandy packed 150 km/h sustained winds that generated an unprecedented oceanic area of hundreds of square kilometers covered with Hs exceeding 7-8 m, and Hs larger than 10 m near its maximum-wind region. As a post-tropical storm propagating over the continent, Sandy developed a massive wind fetch covering the Great Lakes, generating the second highest significant wave height measured in Lake Michigan (6.7m), and a high-wave duration record with ten straight hours of measured Hs larger than 5m. TC Narelle (8-15 January 2013) followed a southwesterly track near Western Australia, and intensified peaking at Saffir-Simpson category 4 on 11-12 January. Sustained winds during peaked at 175 km/h, generating waves that were recorded with Hs in excess of 10m.

NCEP operational models were at the heart of the ocean and wave guidance provided during Hurricane Sandy to American forecasters and the general public, which gave decision-makers information that helped mitigate the severity of this historical event. Forecasters in the Australasian region praised the high quality probabilistic forecasts issued during TC Narelle. In addition to the skill of NCEP's numerical guidance during these extreme events, the present study also discusses future developments of NCEP's probabilistic wave modeling systems, incorporating new technology and scientific developments.