Coastal Puerto Rico SST Response to Hurricanes Irma and Maria, September 2017

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Introduction
In September 2017 Puerto Rico suffered the passage of two major hurricanes, Irma and Maria. Both were Category 5 hurricanes at some point, however at landfall (Maria) and point of closest approach (Irma) they were Category 4 intensity. The purpose of this study is to examine the response/recovery of regional sea surface temperature (SST) associated with the two hurricanes.

The eye of Hurricane Irma tracked 50 nmi to the North of Puerto Rico on September 6-7, 2017. Winds were sustained at 48 kts with a gust to 64 kts at San Juan.

Hurricane Maria made landfall at Yabucoa, Puerto Rico on September 20, 2017 at 1015 UTC. At landfall, in the south west, Hurricane Maria made landfall at Yabucoa, Puerto Rico on September 6, 2017. Winds were 95kt with a gust to 105kt and an eye diameter of 28 n mi. At 1800 UTC, in the north west, Hurricane Maria made landfall at Yabucoa, Puerto Rico on September 20, 2017 at 1015 UTC. At landfall, in the south, Hurricane Maria had wind speeds of 135 kt. and an eye diameter of 28 n mi. At 1800 UTC, in the north west, Maria emerged to the Atlantic Ocean with winds of 95kts.

Materials and Methods
SST data for each hurricane were obtained from the National Data Buoy Center (NDBC) website. After looking through the data we chose 6 stations that had the best data available for SST. Five National Ocean Service (NOS) water level stations (MISP4, MGP4, SINP4, ESPP4, and CLBP4) around the island and one Caribbean Regional Association for Coastal Ocean Observing (CARICOOS) ocean buoy (41115) provided near continuous SST for the hurricane period.

Results
The SST had an average decrease of 2.2°C after Hurricane Irma, and 2.3 °C after Hurricane Maria.

Recovery time to recover one-half of the decreased SST for Hurricane Irma took between 1-3 days. For Hurricane Maria, it took between 2-7 days.

Hurricane Irma had a heat loss from 228 – 685 Wm⁻², and for Hurricane Maria had from 388 - 1370 Wm⁻².

Conclusion
Factors like Hurricane Maria passing over Puerto Rico made the SST recovery slower than for Hurricane Irma. The area around the chosen stations were more directly affected by Maria than by Irma. Overall, the response of SST for both hurricanes was similar.

However, the recovery pattern for both hurricanes was different. A conclusion on the recovery pattern is complicated because of seasonal cooling and data loss.

The heat loss values indicate that some upwelling in the deeper water occurred. The northern stations had more heat loss than the southern station during the passage of Hurricane Irma. For Hurricane Maria, the station MISP4 had the largest heat loss.

Hurrincanes Irma and Maria had similar behaviors as Hurricane Harvey. It also happened that same year but in the Gulf of Mexico.

Therefore, upwelling, seasonal cooling, trajectory, size, and intensity of both hurricanes affected the response and recovery of SST.

References
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