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The 2017 hurricane season in the Atlantic Ocean showed major storms making landfall in the Antilles and in continental U.S. Accurately forecasting major hurricanes, in particular their intensity, is a critical societal need to support decision making related to marine safety, and to the protection of lives and property. We used satellite and in situ observations, as well as a coupled ocean-hurricane model, to investigate the impact of the observed ocean conditions on the intensification of Hurricane Maria in 2017. Underwater gliders deployed in the Caribbean Sea and in the Tropical North Atlantic revealed the presence of a thick barrier layer, i.e. a strong stratification at the top of the ocean due to freshwater. By reducing the ocean cooling under the storm, barrier layers are known to favor storm intensification. The ocean-hurricane model, based on HYCOM and HWRF models, was used to estimate the impact of the observed ocean conditions, and of individual observing platforms (through data-assimilation), on the storm intensity forecast. This coupled model showed that the assimilation of ocean observations contributed to improved ocean representation, and consequently to improved hurricane forecast. More specifically, satellite altimetry allows identifying ocean features such as currents and mesoscale eddies, Argo floats allow for correcting model temperature and salinity large scale biases, and glider data provide continuous temperature and salinity profiles in areas of intense mesoscale activity. In particular, gliders deployed in the Caribbean Sea were the main contributor, among ocean observations, to the improvement of the wind intensity forecast in the 24 hours preceding Maria’s landfall in Puerto Rico.
Presentation file
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