Satellite Observations of the Sea Surface Salinity Response to Tropical Cyclones

Reul, N., Chapron, B., Grodsky, S.A., Guimbard, S., Kudryavtsev, V., Foltz, G. R., & Balaguru, K.

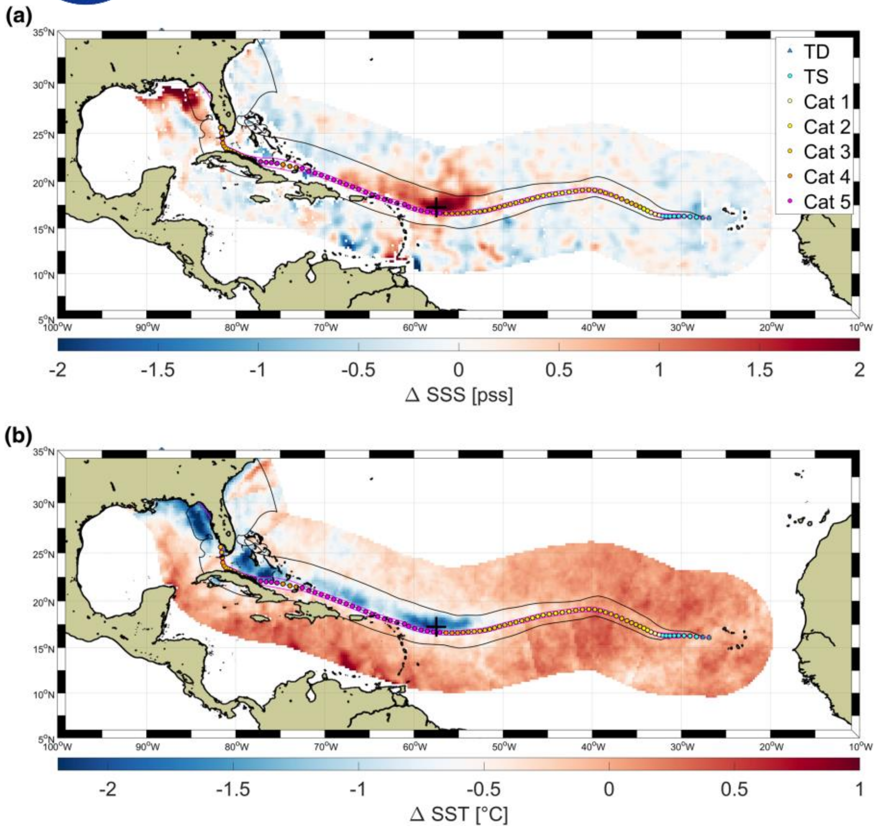
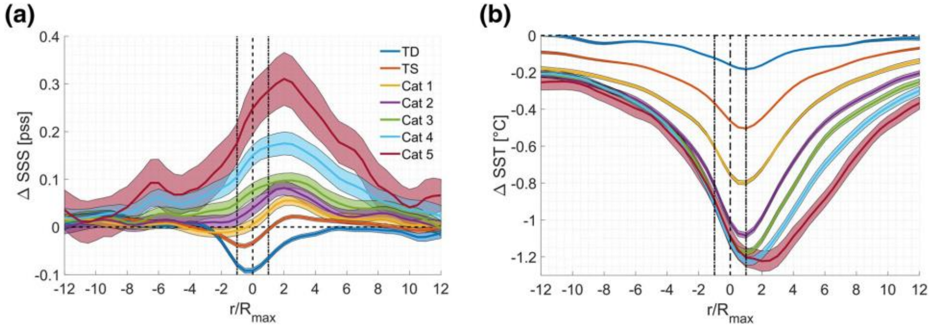


Figure 1. Haline (a) and thermal (b) surface wakes left by Hurricane Irma (2017). The thin black and magenta curves are indicating the 34 kt and maximum wind radii, respectively. The color circles indicate the storm center location and intensity (see legend in (a)).



For strong storms, both SSS and SST wakes develop to the right of storm's track (Fig. 1). The present global satellite-based analysis also emphasizes the influences of salt-stratified barrier layers. As anticipated and unambiguously revealed, SSS and SST responses to TCs do not behave similarly in such conditions. In particular, we found reduced SST cooling and increased SSS salinification after the passage of TCs over thick BLs (Fig. 2). To first-order, satellite SSS can thus inform about the expected resulting strength of hurricane-induced mixing and upwelling, and should be incorporated into metrics of TC-induced SST cooling. It is also found that barrier layers lead to saltier and warmer storm wakes compared to wakes produced over barrier layer free areas.

Figure 2. Radial (*x*-axes) distributions of the median SSS (a) and SST (b) response to TCs as a function of SSWS intensity (color code provided in the legend in (a)). For each intensity, the median (thick black curves) is evaluated in *r*/*R*max bins of width 1/2. The color patches indicate the extent of the 95% confidence intervals. The storm center and the radial borders of the inner eye-wall (|*r*/*R*max| = 1) are indicated by black vertical dash lines. SSS, sea surface salinity; SST, sea surface temperature; TC, tropical cyclone; SSWS, Saffir-Simpson Wind Scale.

- Sea surface salinity drops after passing of tropical depressions and storms, with minima to the left of the storm track
- Above hurricane force, post-storm salinification dominates to the right, with higher magnitude for intense slowly-moving storms
- Pre-storm upper ocean vertical salinity gradients control haline and thermal wakes. River plumes exhibit the strongest salinity wakes

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