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Oral
Tropical cyclone (TC) rapid intensification (RI) is difficult to predict and poses a formidable threat to coastal populations. A warm upper ocean is well known to favor RI, but the role of ocean salinity is less clear. This study shows a strong inverse relationship between salinity and TC RI in the eastern Caribbean and western tropical Atlantic due to near-surface freshening from the Amazon–Orinoco River system. In this region, rapidly intensifying TCs induce a much stronger surface enthalpy flux compared to more weakly intensifying storms, in part due to a reduction in SST cooling caused by salinity stratification. This reduction has a noticeable positive impact on TCs undergoing RI, but the impact of salinity on more weakly intensifying storms is insignificant. These statistical results are confirmed through experiments with an ocean mixed layer model, which show that the salinity-induced reduction in SST cold wakes increases significantly as the storm’s intensification rate increases. Currently, operational statistical–dynamical RI models do not use salinity as a predictor. Through experiments with a statistical RI prediction scheme, it is found that the inclusion of surface salinity significantly improves the RI detection skill, offering promise for improved operational RI prediction. Satellite surface salinity may be valuable for this purpose, given its global coverage and availability in near–real time.
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