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An Ocean Cooling Potential Intensity Index for Tropical Cyclones

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Timely and accurate forecasts of tropical cyclones (TCs, i.e. hurricanes and typhoons) are of great importance for risk mitigation. Though in the past two decades there has been steady improvement in track prediction, improvement on intensity prediction is still highly challenging. Cooling of the upper ocean by TC-induced mixing is an important process that impacts TC intensity. Based on detail *in situ* air-deployed ocean and atmospheric measurement pairs collected during the Impact of Typhoons on the Pacific (ITOP) field campaign, we modify the widely used Sea Surface Temperature Potential Intensity (SST_PI) index by including information from the subsurface ocean temperature profile to form a new Ocean Cooling Potential Intensity (OC_PI) index. Applied to a 14-year (1998-2011) western North Pacific TC archive, OC_PI reduces SST_PI-based overestimation of archived maximum intensity by more than 50% and increases the correlation of maximum intensity estimation from r^2=0.08 to 0.31. For slow-moving TCs that cause the greatest cooling, r^2 increases to 0.56 and the root-mean square error in maximum intensity is 11 ms^{-1}. As OC_PI can more realistically characterize the ocean contribution to TC intensity, it thus serves as an effective new index to improve estimation and prediction of TC maximum intensity.