

EGU21-7803, updated on 03 Aug 2021

<https://doi.org/10.5194/egusphere-egu21-7803>

EGU General Assembly 2021

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Increasing tropical cyclone intensity and potential intensity in the subtropical Atlantic around Bermuda from an ocean heat content perspective 1955- 2019

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Here we investigate tropical cyclone (TC) activity and intensity within a 100km radius of Bermuda between 1955 and 2019. Our results show a more easterly genesis over time and significant increasing trends in tropical cyclone intensity (maximum wind speed (V_{max})) with a decadal V_{max} median value increase of 30kts from 33 to 63kts, together with significant increasing August, September, October (ASO) sea surface temperature (SST) of 1.1°C (0.17 °C per decade) and ocean temperature between 0.5–0.7°C (0.08–0.1°C per decade) in the depth range 0–300m. The strongest correlation is found between TC intensity and ocean temperature averaged through the top 50m ocean layer (T_{50m}) $r=0.37$ ($p<0.01$).

We show how tropical cyclone potential intensity estimates are closer to actual intensity by using T_{50m} opposed to SST using the Bermuda Atlantic Timeseries Hydrostation S dataset. We modify the widely used sea surface temperature potential intensity index by using T_{50m} to provide a closer estimate of the observed minimum sea level pressure (MSLP), and associated V_{max} than by using SST, creating a T_{50m} potential intensity (T_{50m_PI}) index. The average MSLP difference is reduced by 12mb and proportional to the SST/ T_{50m} temperature difference. We also suggest the index could be used over a wider area of the subtropical/tropical Atlantic where there is a shallow mixed layer depth. Finally, we outline the TC wind-pressure relationship observed for the subtropical Atlantic around Bermuda, explaining 77% of the variance, which may prove useful for future prediction.

(Environmental Research Letters, 2020, in revision)