Effect of storm traces in data on the correlation analysis between tropical cyclone activity and environmental factors

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Researches on the relationship between environmental factors and tropical cyclone (TC) activity have significant implications to TC intensity and seasonal predictions. Traditionally, the environmental factors are calculated using the reanalysis data that contain historical TC information. One can predict that the storm traces in the data such as rotating strong winds, low pressure, high moisture, and warm core along the storm's track, may artificially enhance the correlation between the environmental factors and TC activity indices (TC frequency, ACE, intensity). This study investigates impact of the storm traces on the correlation analysis between the vertical wind shear (VWS) and TC activity averaged for the TC peak seasons (JJASO) in the eastern Pacific using 3 reanalysis dataset, NCEP/NCAR (2.5°×2.5°), MERRA (1.25°×1.25°), and MERRA (0.5°×2/3°). We compare two correlations between ACE (or TC frequency) and VWS after/before removing the existing TC traces within 800km radius from the storm center along the TC track in data. The results reveal that the overall effects of the storm traces in data on the TC activity analysis were very small. This may be because the reanalysis data do not have enough spatial resolution to resolve the storm's core and are even averaged over the peak seasons, which lead to smooth out the TC traces in data. For the high-resolution MERRA data, however, we found that the correlation between TC frequency and VWS slightly increased after the removal of TC, which is an unexpected result. From additional numerical simulations using a high-resolution WRF model (30km×30km) for typhoon RUSA in 2012, we found that on the average the VWS increased along the storm track, which mean that the environmental conditions with the TC traces become unfavorable for the TC genesis. This explains why the removal of TC traces in data plays a positive role in the relationship between TC frequency and VWS.

Key words: Tropical cyclone, Strom traces, Reanalysis data, Vertical wind shear

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