

Effective Comparison between Easterly and Westerly Vertical Wind Shear on Tropical Cyclone Intensity Change over Western North Pacific

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The effects of vertical wind shear (VWS) with various directions on tropical cyclone (TC) intensity change are compared in this statistical study, based on TC cases during 1982 to 2015 over western North Pacific. Results show that westerly VWS has a much higher correlation (-0.36) with TC intensity change than easterly VWS (-0.07) over WNP. Particularly, the correlation coefficient could reach -0.43 when VWS is south-westerly. SST can influence the effect of W-VWS and E-VWS on TC intensity change, due to its large negative correlation (-0.48) with zonal VWS. The E-VWS increases as SST increasing. The competition of their opposite effects leads to the relatively weak correlation between E-VWS and TC intensity change. By contrast, when SST increasing, the W-VWS decreases. The favorable SST effect amplifies the correlation between W-VWS and TC intensity change. Both very low and high SST seems to reduce W-VWS effect and dominate the TC intensity change. The highest correlation of W-VWS and TC intensity change is found when SST is around 301K in statistics.

The high negative correlation highlights the importance of VWS in determining the TC intensity change. But the performance of VWS with different directions has an effective discrepancy on TC intensity change, partially due to the close relationship between SST and zonal VWS. In many statistical prediction models of TC intensity, VWS and SST are two key independent predictors. According to our study, two suggestions are proposed here: 1) considering the direction of VWS in prediction model; 2) considering the close relationship between SST and zonal VWS. The cases under E-VWS and W-VWS should be treated separately when determining the significances of impact factors in prediction model. Furthermore, our results suggest the climatological change of E-VWS and W-VWS will change the predictability of TC intensity forecast by environmental factors.