

Supplementary Information for

**Enlarging rainfall area of tropical cyclones by atmospheric aerosols**

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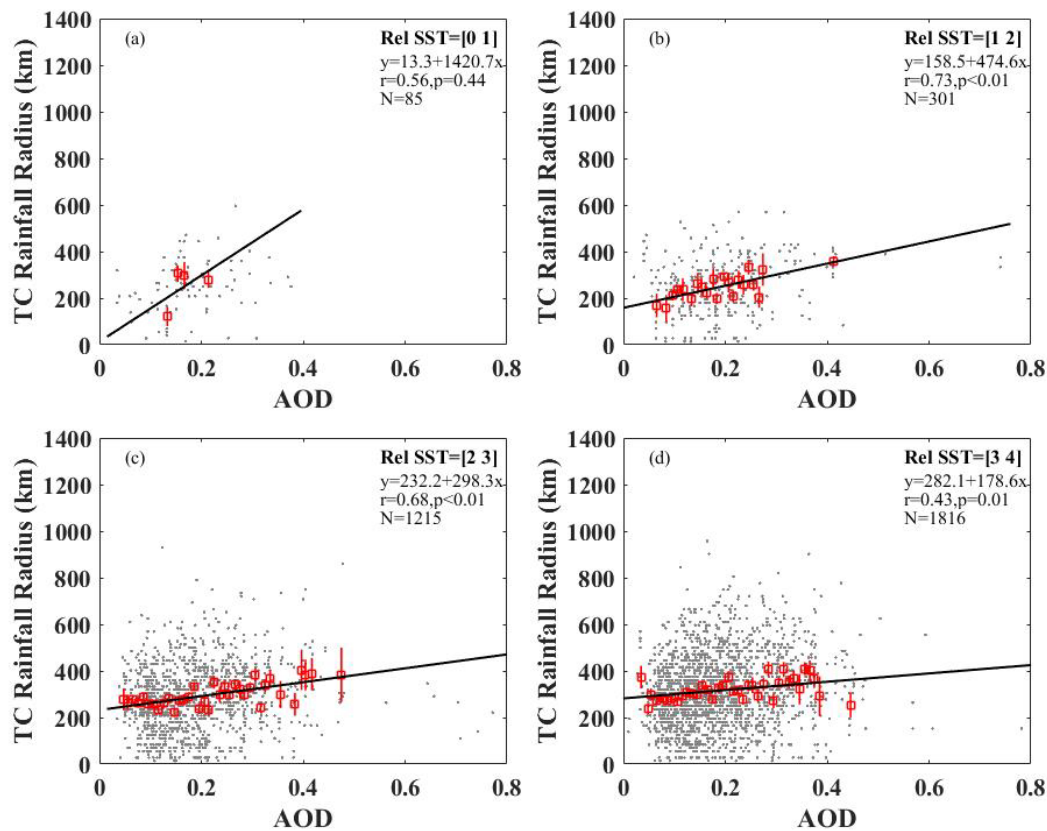


Figure S1. The relationship between the western North Pacific region TC rainfall radius and MODIS AOD for binned relative SST with bin width of 1 °C from 0 to 4 °C. Panel (a) is for relative SST between 0 and 1 °C, which has only 85 samples and the relationship between TC rainfall area and MODIS AOD cannot pass the 95% significance t-test. Panel (b) is for relative SST between 1 and 2 °C, which has 301 samples and the positive relationship between TC rainfall area and MODIS AOD passes the 95% significance t-test. Panel (c) is for relative SST between 2 and 3 °C, which has 1215 samples and the positive relationship between TC rainfall area and MODIS AOD passes the 95% significance t-test. Panel (d) is for relative SST between 3 and 4 °C, which has 1816 samples and the positive relationship between TC rainfall area and MODIS AOD passes the 95% significance t-test. The red squares with lines are averaged TC rain rate with Standard errors at each bin of AOD with a bin width of 0.01 and sample volume larger than 5. The solid black line is the linear fitting regression relationship between TC rain rate and AOD.

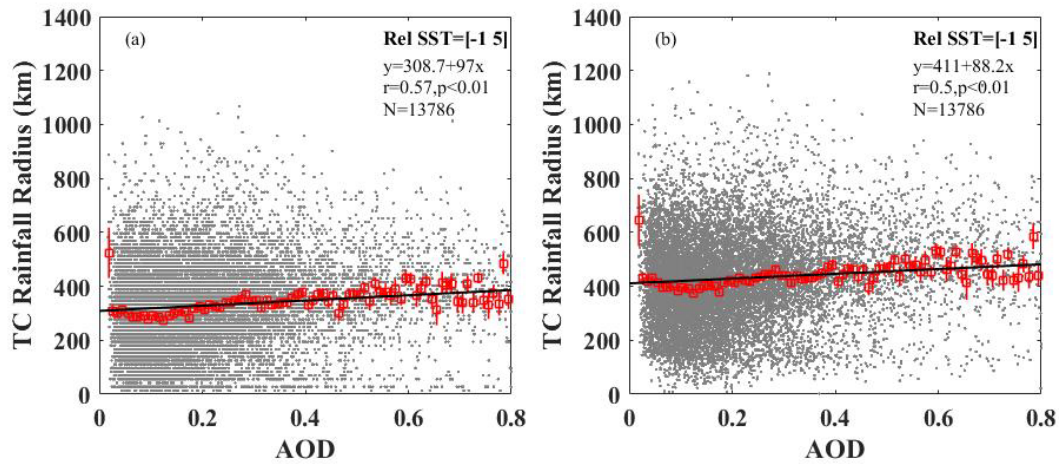


Figure S2. Scatter plot between TC rainfall radius and MERRA2 AOD for (a) with and (b) without the impacts of relative SST between -1 and 5 °C for western North Pacific region. The gray color points are observation data; the red squares with lines are averaged TC rainfall radius with Standard errors at each bin of AOD with a bin width of 0.01 and sample volume larger than 5. The solid black lines are the linear fitting regression relationships between TC rainfall radius (km) and AOD. The correlation coefficients shown in the figure are for the bin averaged values indicated in red colors.

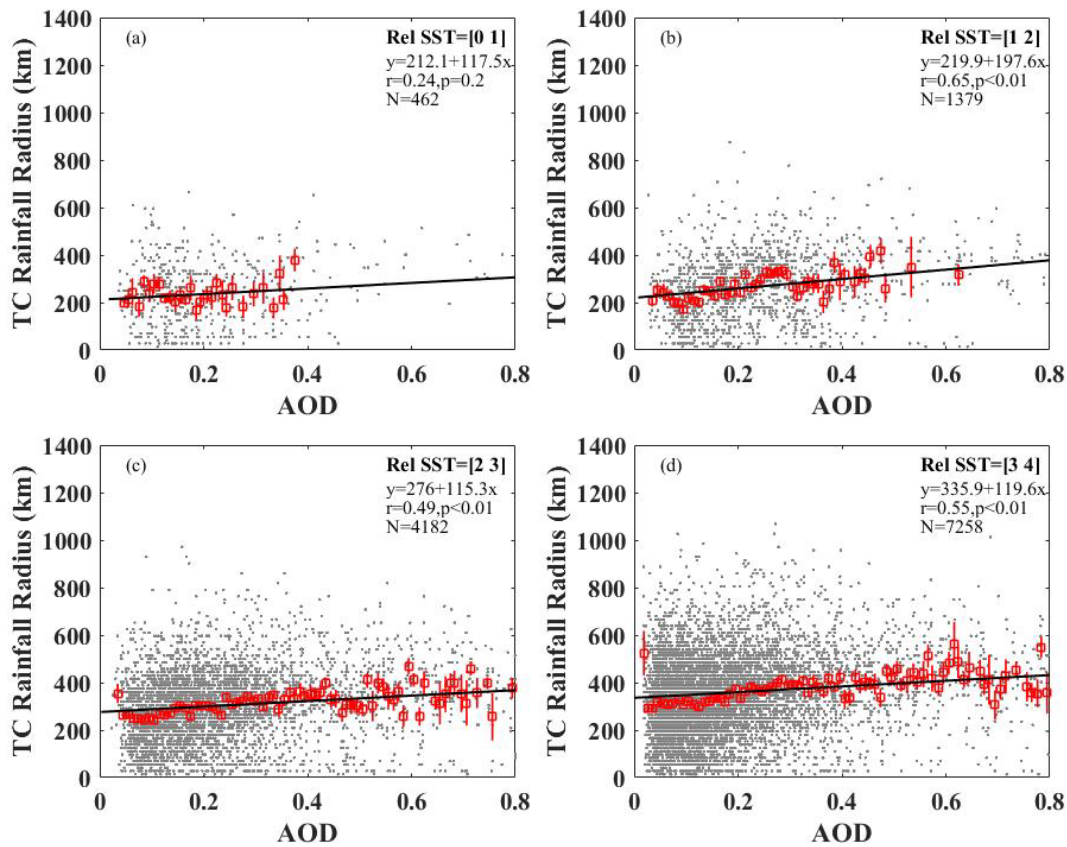


Figure S3. The relationship between the western North Pacific region TC rainfall radius and MERRA2 AOD for binned relative SST with bin width of 1 °C from 0 to 4 °C. Panel (a) (b) (c) (d) shows the same relationship as Figure S2 between TC rainfall area and MERRA2 AOD. Panel (a) is for relative SST between 0 and 1 °C, which has 462 samples and the relationship between TC rainfall area and MERRA2 AOD passes the 95% significance t-test. Panel (b) is for relative SST between 1 and 2 °C, which has 1379 samples and the positive relationship between TC rainfall area and MERRA2 AOD passes the 95% significance t-test. Panel (c) is for relative SST between 2 and 3 °C, which has 4182 samples and the positive relationship between TC rainfall area and MODIS AOD passes the 95% significance t-test. Panel (d) is for relative SST between 3 and 4 °C, which has 7258 samples and the positive relationship between TC rainfall area and MERRA2 AOD passes the 95% significance t-test.

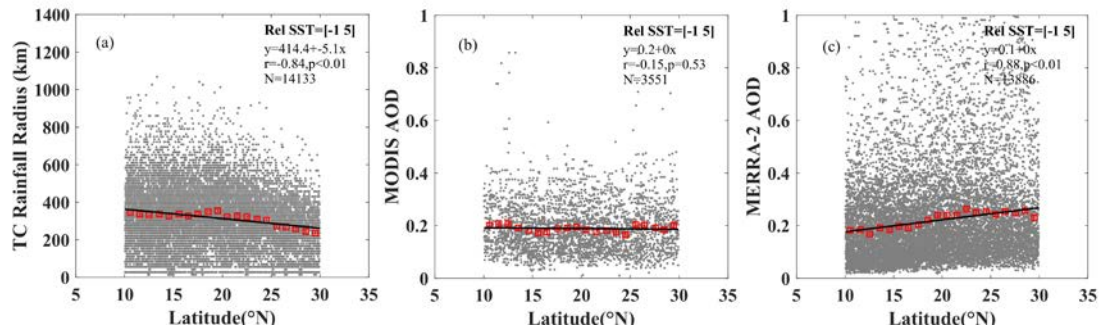


Figure S4. Variation of (a) TC rainfall radius, (b) MODIS AOD, and (c) MERRA-2 AOD with latitudes over WNP. The gray color points are observation data; the red squares with vertical lines are averaged values with RMS errors at each bin of latitudes with a bin width of 1 degree. The solid black lines are the linear fitting regression relationships based on the binned data.