Tornadoes do not have a Weekly Anthropogenic Cycle and Supercells have Minimal Susceptibility to Aerosol Influence

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Introduction

Patterns in Dew Point and Aerosol Weekly Cycles

According to RB2011, dew points ≥15°C are necessary in order to have surface dew points... (2011, JGR, RB2011). They claim that high concentrations of aerosol modulate the frequency of tornadoes yielding an anthropogenic weekly cycle in tornado occurrence. Contrary to their findings, we found that:

1) There is not a robust weekly cycle or mid-week maximum in tornado occurrence, and monthly mean dew point values were routinely <15°C and consistent with the diminution of the convective invigoration effect in cool base clouds.

2) RB2011’s physical explanation for how increased aerosol concentrations influence environments is illogical. In fact, 90% of supercells in April and May have surface dew points ≥15°C.

3) RB2011’s method of averaging aerosol and tornado data from 100°W eastward conflates an aerosol weekly cycle in one geographic location with tornado occurrence in another.

Bounded Weak Echo Regions and the Role of Aerosols in Updrafts

RB2011 states that the effect of aerosols on supercells is to suppress coalescence, rain is delayed, and a larger fraction of the cloud water ascends above the 0°C level. We question whether RB2011’s chain of aerosol influences is applicable to supercells based on the following reasons:

1) There is not a robust weekly cycle of aerosol concentrations, and moist updrafts within supercells are not commonly present on the weekends.

2) Tornado counts by day of week over a multi-year period are prone to becoming non-uniform due to a few individual, highly prolific tornado events.

3) Counts of tornadoes by day of week, with and without magnitude thresholds, for different 14 year periods. Data from SPC tornado report data base.

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Anthropogenic Weekly Cycles of Tornado Occurrence

Counts of tornadoes by day of week over a multi-year period are not independent of one another. The days of the week for which the maximum and minimum in tornado counts occur are sensitive to tornado intensity and the period of data examined. The use of tornado counts can be problematic because a few days have many tornadoes whereas some days have no tornadoes at all. Examination of the number of days on which any tornado occurred shows a lower amplitude cycle regardless of the time period examined.