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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Statistics of severe tornadoes and severe tornado outbreaks" *by* B. D. Malamud and D. L. Turcotte

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I like the work that's been done here, in general, and would be open to future collaboration on this or related topics.

1. p. 5: Verbout et al. (2006) don't really discuss the path length issue. Their focus was on the damage estimates.

2. The trends in Figs. 5 and 6 need to interpreted with caution. It would be good to have estimates of the error bars on the slope from the regression at the very least. In addition, the length of record used here is a matter of concern. Some measures, such as the count of F1+ tornadoes per year (a reasonable robust measure) indicated that the early 1970s were particularly active for tornadoes. If you take the data back

to 1971, the overall linear trend goes to zero or negative for the quantities shown. The quality of the reporting database and all of the issues the authors allude to on that would make any "real error bars" larger than would be estimated from purely statistical reasoning.

3. There's no reason to bring up global warming at all. Our expectations for how tornadoes will change aren't particularly strong. In general, the predicted small decrease in wind shear over the US would almost certainly be difficult to detect given the large interannual variability.

4. How are "days" defined, e.g. midnight-midnight local, UTC? For many purposes, using the so-called "convective day" (12 UTC-12 UTC) is useful. That's what I typically use in analyses.

5. The total path length for a day can almost certainly be extended earlier in the record. Even if individual tornado lengths have shown a change as seen in Fig. 1, that does not mean that the summed lengths of all tornadoes on a day will suffer from the same problem. It is likely that one major reason for the reduction of length of the longest tornadoes is because of better surveying leading to what would have been reported as a single tornado historically as multiple tornadoes now. The total path length of those paths would not be changed much.

6. By my calculation, the longest path length convective day of the 1981-2010 period was a little less than 1300 km (13 March 1990). That's the 5th longest path length day in the 1950-2010, plus the preliminary April 2011 dataset. 3 April 1974 had 3995 km of tornadoes, followed by 27 April 2011, 11 April 1965, and 26 April 2011. Taking the daily path length back earlier in time won't change the results of the analysis shown here, but it would allow for an estimate of how often we should expect to see something like 3 April 1974.

7. The relationship between path length and number of tornadoes is not surprising. Tornado occurrence depends, in large part, on the presence of strong vertical wind

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shear. Strong wind shear environments typically produce fast storm motions, which lead to longer path lengths. Thus, the two are physically linked. The late 1980s, characterized by low wind shear values over the US, have short annual total path lengths and few tornadoes, and the early 1970s and late 1990s, characterized by high wind shear values, have long annual total path lengths and many tornadoes.

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