



## Statistical analysis of the spatial and temporal distribution of tornadoes in Germany

Thilo Kühne (1,2), Andreas Kollmohr (2), Martin Hubrig (2), Thomas Sävert (2), Oliver Schlenczek (2), Werner Simon (2), and Heiko Wichmann (2)

(1) ESSL e.V. (DLR), Wessling, Germany (thilo.kuehne@googlemail.com), (2) Tornado-Arbeitsgruppe Deutschland (TAD e.V.), Mainz, Germany (oliver.schlenczek@gmx.de)

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The Tornado-Arbeitsgruppe Deutschland (TAD; engl.: Tornado Work Group Germany) was founded in 2015 and works in the field of studying and documenting tornado events in Germany and also carries out site surveys documenting tornado damage. The group consists of members working in the fields of meteorology, forensic meteorology, forestry, mathematics, physics and also consists of experts for building standards. Furthermore, students and enthusiasts in the field of severe weather, mostly connected with Skywarn Deutschland, are supporting the group voluntarily.

At first glance, the collected data of tornadoes in Germany from the last fifteen years (2002–2016) seem to be temporally shifted by additional two months w.r.t. the occurrence of tornadoes in the United States. Similar to the observations in the U.S., we found tornado events also in the winter time, most often associated with unstable regions of intense winter storms. A popular case of winter-time tornadoes was the cyclone "Kyrill" in January 2007. In the last two years, the highest observed frequency of tornadoes in Germany was in May and June. Due to recent data, the northern half of Germany shows a higher impact of tornado occurrence, as the southern part of the country.

Individual years with a substantial difference in intensity and / or number of tornadoes are analyzed to investigate the reason for the observed trends. The multi-annual transition between years with a large total number of tornadoes but very few F2+ tornadoes (e.g. 2006) and years with a lower total number but a high contribution of F2+ tornadoes (e.g. 2015) to the total is still an enigma and subject to current research. An advantage of the analysis of strong (F2+) tornadoes is that their total number seems to be less biased by population density, compared to the total number of tornadoes. The last violent tornadoes (F4 or stronger) over German territory after 1950 occurred in 1968 (Pforzheim, Baden-Württemberg) and in 1979 (Schönborn-Eichwald areas, Brandenburg). The spatial density of weak tornadoes (tornadoes of intensities from F0/T0 to F1/T3 after Feuerstein et al. (2011)) is very likely biased as their documentation by video or photographs is often the only evidence and more likely to occur in a densely populated area. Also, the observation effect and its suggestion of an increase of the number of tornadoes is part of our analysis.