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Conference on European Tornadoes and Severe Storms

Severely damaging hailstorms in Great Britain: a climatological review

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This paper examines the historical, seasonal, and geographical distribution of severely damaging British hailstorms (TORRO intensity H3+), based on the current database of over 800 such storms. Most analyses presented refer to the 50 year period 1950 to 1999. However, features of the severest (H6+) storms have been examined over a much longer historical period.

Severe hailstorm frequency has remained fairly constant since the 1870s, indicating consistency in the reporting of the more extreme events. 10-year running means for the period 1950 to 1999 indicate relative peaks in the 1950s, and again in the mid-1980s to the early 1990s, with a lower frequency in the 1970s. There has been a tendency for the severest events to cluster together (e.g 1958-59, 1967-68, 1983-85).

Early summer has the highest proportion of damaging hailstorms relative to overall thunderstorm frequency. In fact more than half of the damaging hailstorms between 1950 and 1999 occurred in June (30%) or July (22%). 77% occurred between May and August. Analyses of the smaller database of the severest storms (H5/H6+) indicate a peak incidence slightly later - during July, with August ranking closely behind June. Moreover, September's small share of all hailstorms has included, on separate occasions, both the longest track event, and one of the few H7 storms.

Nearly all the severest (H6+) hailstorms known for Britain since 1800 had a swath length of over 25 kilometres, and tracked from directions between south-south-east and south-west. Even taking H3 as the threshold, 56% of storms in the period 1950 to 1999 had a swath length of 20km or more. During this period, 67% of severe hailstorms approached from a south or south-westerly direction. Surface winds preceding the severest categories of storms were usually noted as blowing from between south-south-east and north-east, highlighting the role of wind shear in such extreme events.

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In general, the geographical distribution of severe hailstorms closely correlates with the areas of higher summer temperatures in the Midlands and Eastern England, although high population densities here may have assisted in the reporting of events. There is some evidence of topography enhancing frequencies in south-west England, and also around the southern Pennines; however, relief appears to have had little impact across Scotland and northernmost counties of England, where the incidence of high summer temperatures is much reduced (and usually associated with subsiding air within an anticyclone). Counties most frequently affected by hail damage have been from Lancashire and Merseyside, across the Midlands, to the Thames Valley, the London area, and southern East Anglia. The tracks of the severest (H6+) storms over the past 200 years, indicate a strong bias towards the East Midlands, East Anglia, and counties adjacent to London, with a smaller cluster of tracks around the Bristol Channel. Since the 17th century, one British hailstorm is believed to have attained an intensity of H8, while six others have almost certainly reached H7.