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The southern England tornadoes of 30 December 2006: Case study of a tornadic storm in a low CAPE, high shear environment

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Abstract

On 30 December 2006 an outbreak of tornadoes affected parts of southern and eastern England. The tornadoes occurred as a small, developing depression tracked northeastwards over southern England. Convection developed in the vicinity of the surface cold front as a dry intrusion overspread low level warm sector air from the west. As the tornadic storm moved northeast it progressively moved ahead of the surface cold front and into the warm sector.

Although the storm developed within an area of dynamic rainfall, it became increasingly isolated owing to a decrease in coverage and intensity of the surrounding rainfall. After development over central southern England the storm moved northeastwards from Berkshire to Norfolk before moving into the North Sea. Radar reflectivity sequences, a

damage survey, and the storm relative locations of tornado damage, suggest that the storm contained a mesocyclone in the early part of its lifetime, which spawned the first two or three tornadoes. The storm echo evolved rapidly as it moved northeast. A bow shaped echo developed between 1530 and 1630 UTC to the south of the tornadic portion of the storm. A larger cyclonic vortex subsequently developed immediately to the north of the bowing echo, which was associated with a large hook shaped echo in radar reflectivity fields. Further tornadic damage occurred close to the tip of this hook.

The storm environment was characterised by very large $0\text{--}1\text{ km}$ storm relative helicity (over $400\text{ m}^2\text{ s}^{-2}$) and meagre CAPE. Previous studies have shown that the majority of tornado outbreaks in the UK occur in the cool season in similar high shear, low CAPE environments. This case study shows that mesocyclonic tornadic convection may occur in such environments. Further research into cool season tornadic storms is required to determine the dominant type of cool season tornadic convection in the UK and in particular the relative frequency of mesocyclonic and non mesocyclonic tornadoes.



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Keywords

Tornado; England; Winter; Cold front; Mesocyclone

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