4–8 November 2019, Kraków, Poland
ECSS2019-215

A prototype real-time sting jet precursor tool for forecasters

Oscar Martinez-Alvarado (1), Suzanne L. Gray (2), Dan Suri (3), and Duncan Ackerly (3)

(1) National Centre for Atmospheric Sciences, United Kingdom, (2) Department of Meteorology, University of Reading, United Kingdom, (3) Met Office, Exeter, United Kingdom

European windstorms are a major cause of hazardous weather, mainly due to intense or sustained wind, rainfall or snowfall. For example, windstorm Daria in 1990 was the most devastating and costly of recent storms with an insured loss of $8.2bn (indexed to 2012 values). Strong surface winds within these storms typically arise from the three low-level wind jets, associated with the so-called warm conveyor belt that ascends ahead of the cold front, the cold conveyor belt that wraps rearwards around the cyclone to the north, and (in some extreme cyclones) a transient, smaller-scale feature termed a sting jet that can lead to strong winds and gusts, especially in the dry air ahead of the convex "cloud head" seen in satellite images of extreme cyclones. Previous research has shown that sting jets are likely to be common, with about 30% of North Atlantic storms containing a precursor to sting jets, and likely to become more common in a warming climate. Possible sting jets are currently identified by forecasters using satellite imagery to spot distinctive cloud features in the cyclone, which is only possible once the cyclone is at the stage when sting jets are occurring.

In this contribution we present first results from a prototype system to predict within an operational forecasting system which cyclones will develop sting jets several days in advance. An established diagnostic is used which is based on the detection of Downdraught Slantwise Convective Available Potential Energy (DSCAPE) as a precursor to sting jets, analogous to the diagnosis of large values of CAPE as a precursor for thunderstorm development. In addition to the presence of sufficient instability, the diagnosis also considers the location and the environment within which the instability is present to decide whether or not a given windstorm is likely to produce sting jets. The prototype system, including easily-interpreted graphical output, will be implemented at the United Kingdom's Met Office to inform its forecasters of the presence of a precursor to sting jets within forecast windstorms. The tool will be applied to operational global domain ensemble forecasts, focusing on the two to five days lead time. We will present details on the implementation, including a new way to compute DSCAPE from single vertical soundings, as well as early results from the trial period to take place in autumn 2019.