



Identification of sting jet extratropical cyclones in ERA-Interim

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Sting jets are transient, highly localized low-level jets that descend from the tip of the cloud head towards the top of the boundary layer in some rapidly deepening Shapiro-Keyser type extratropical cyclones. Sting jets have recently been recognised as clearly different from other air streams, such as the warm and cold conveyor belts, that are also part of the structure of these cyclones. Understanding the dynamics and statistics of sting jets is important due to the potential loss of life and damage to property and infrastructure that can occur as a consequence of the strong winds that sting jets can generate if their momentum is transferred to the surface. However, with very few documented cases, their frequency of occurrence and intensity range are still open questions.

One way of tackling this problem is to study available reanalysis datasets. However, these datasets are not expected to explicitly show the occurrence of sting jets due to their coarse resolution. Instead of a direct search for sting jets, a search for sting jet precursors such as regions of high conditional symmetric instability (CSI) at mid-tropospheric levels is proposed in this study. For this purpose, a method based on an appropriate set of diagnostics has been devised to identify regions of CSI potentially associated with sting jets in gridded atmospheric datasets at resolutions including the coarse resolution of currently available reanalyses.

The method is tested on some of the well-documented case studies of sting jets. Once its reliability is proven, it is applied to the 50 most intense cyclones in the North Atlantic during the first 10 years (from 1989 to 1998) of the ECMWF reanalysis ERA-Interim. Around 10% of these cases are found to potentially have sting jets. These results represent a further step towards the construction of the first climatology of sting jets.