



The role of conditional symmetric instability in Sting Jet storms

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The aim of this project is to determine the mechanisms that lead to sting jets in extreme windstorms and develop diagnostics for predicting their formation and development. Extratropical cyclones often produce strong surface winds, mostly associated with low-level jets along the warm and cold fronts. Some severe extratropical cyclones have been found to produce an additional area of localised strong, and potentially very damaging, surface winds during a certain part of their development. These strong winds are associated with air that originates within the cloud head, exiting at the tip of the cloud head and descending rapidly from there to the surface. This rapidly descending air associated with the strong surface winds is known as a sting jet.

One significant feature of sting jet storms is mesoscale slantwise circulations in the cloud head, which have been speculated to be due to the release of conditional symmetric instability (CSI). Analyses of two very different proposed sting jet storms will be presented. In both cases, a sting jet feature has been identified and examined using two diagnostics for CSI: SCAPE (slantwise convective available potential energy) and moist potential vorticity (MPV). SCAPE and negative MPV exist near the tip of the cloud heads and SCAPE decreases during the time of the descent of the sting jets, indicating that CSI may be being released.