



Environmental precursors of sting jet storms

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A sting jet is an accelerating, descending air stream that originates in the cloud head of some intense extratropical winter cyclones. Storms with a sting jet event pose high risk loss potential, due to strong, localised surface winds associated with the sting jet phenomenon. At present, global numerical weather prediction models are unable to represent sting jets. To explore ways of predicting these potentially damaging events using global model forecasts two environmental precursors, the upper-level divergence (associated with the upper-level jet) and latent heat release, are investigated.

The strengths of these precursors are compared for sting jet storms and non-sting jet storms. The sample storms are taken from the 100 most intense North Atlantic storms over the last two decades in ERA-Interim reanalysis data. They have been assessed for the presence of a sting jet in previously published research and here the 31 sting jet storms with a strong likelihood of a sting jet event and 48 non-sting jet storms form the two storm sets.

The development of a sting jet is far more likely to occur in storms that cross the upper-level jet and experience the associated upper-level divergence. Latent heat release was inferred using low-level (850 hPa) wet bulb potential temperature. Sting jet storms on average were found to be associated with a warmer core (2.3 K) and warmer conveyor belt (4.7 K) than the non-sting jet storms. Based on the above results, both the upper-level divergence and the latent heat release can be used as sting jet storm precursors, providing long-range guidance to weather forecasters.