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Organized convection ahead of a potential vorticity anomaly

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We present a case study of a convective band that intensified ahead of an upper level trough on September 16 2011, distinguishing the role of the upper-level potential vorticity anomaly from that of low-level forcing. The event occurred during an Intensive Observing Period of two field campaigns, providing the study with detailed measurements from the UK's FAAM research aircraft together with intensive ground-based observations. The WRF model, initialized with ECMWF analyses, was able to simulate the observed structure of the band very well, allowing its development to be analyzed in detail. The band intensified as the result of the merger of two convergence lines which originated in a frontal structure over the Atlantic the previous day, with its morphology influenced by two upper-level features: the remnants of a tropopause fold which capped convection over the south of the band, and a reduction in upper tropospheric static stability over the north of the band which enabled the convection to reach the tropopause. The cause of the band was therefore the low-level forcing (lift) which was manifest as a sharp line of veering wind below 2 km. Accurate forecasting of events such as this require such small-scale boundary-layer features to be accurately captured in the model analyses.