



Analysis of the evolution of lapse rates in the early evolution of a European cold-season derecho

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On 21 Oct 2014, a derecho moved from southern England to Croatia, affecting northern France, Belgium, Luxembourg, northern Switzerland, southern Germany, southern Czech Republic, northern and eastern Austria, south-western Slovakia, Slovenia, western Hungary, and northern Croatia along its 1600 km long path. The impressive event started as typical high-shear, low-CAPE derecho and moved into a region with high CAPE values later on. This work concentrates on the early evolution of the convective system across England, France, and Belgium.

Radar, satellite, and observational data indicate that in the early phase of the event a clearly defined low-level front was not present. It evolved after approximately three hours as one of initially three rain bands that were affected by a mid-tropospheric PV intrusion. Using the local lapse rate tendency equation calculated for a COSMO model simulation of this event, it is shown that subsequent stretching lead to the development of steep low-level lapse rates and a slowly rising equilibrium level. Vertical cross sections of the different terms of the lapse rate tendency equation indicate also that this stretching occurs below the PV intrusion.

This case shows that it is possible to forecast convective storms even in situations when steep lapse rates are initially missing. The lapse rate tendency can give information when and where deep moist convection can be expected.