Synoptic-scale conditions and convection-permitting hindcast experiments of a cold-season derecho on 3 January 2014 in Western Europe

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A major linear mesoscale convective system caused severe weather over northern France, Belgium, the Netherlands and northwestern Germany on 3 January 2014. The storm was classified as a cold-season derecho with widespread wind gusts exceeding 25 m s\(^{-1}\). While such derechos occasionally develop along cold fronts of extra-tropical cyclones, this system formed in a postfrontal air mass along a baroclinic surface pressure trough favoured by strong largescale air ascent induced by an intense mid-level jet. The lower-tropospheric conditions were characterized by weak latent instability and strong vertical wind shear. Given the poor operational forecast of the storm, we analyse the role of initial and lateral boundary conditions to the storm’s development by performing convection-permitting simulations with different datasets. The storm is best represented in simulations with high temporally and spatially resolved ERA5 initial and lateral boundary conditions, which provide the most realistic development of the essential surface pressure trough. Moreover, simulations at convection-resolving scale enable a better representation of the observed derecho intensity. This case study indicates that high resolution ensemble simulations might be important to overcome the current shortcomings of forecasting cold-season convective storms, particularly for cases not associated with a cold front.