2.26 POLARIMETRIC SIGNATURES IN SEVERE STORMS: OBSERVATIONS BY THE FRENCH RADAR NETWORK VS. FORECASTS FROM THE AROME CONVECTIVE-SCALE NWP SYSTEM

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In the last years, substantial efforts have been devoted world-wide to upgrade operational weather radar networks with dual-polarization capabilities. Besides measuring the intensity and the displacement of precipitation, dual-polarization radars provide additional information about the characteristics of hydrometeors within the observed volume. In particular, it has been shown that specific signatures could be observed in distinctive parts of severe thunderstorms (e.g., K_{DP} columns and Z_{DR} arcs and columns).

Concurrently, a new generation of Numerical Weather Prediction (NWP) models with kilometre-scale horizontal resolutions and advanced representations of microphysics is making it possible to represent atmospheric processes at the convective scale with improved realism.

The joint use of dual-polarization radars and high-resolution NWP models opens a new area of investigation with potential breakthroughs in terms of knowledge of the microphysics and dynamics of thunderstorms, as well as improvements in the nowcasting and short-term prediction of these hazardous weather systems. Indeed, the simulation of realistic radar observations might shed light on the unobserved processes that drive the evolution of thunderstorms. Besides, such simulations could be useful to create diagnostics of severe convection for nowcasting applications or to assimilate dual-polarization radar observations in NWP systems.

Here, the concurrent availability of operational dual-polarization data and of state-of-the-art numerical modelling tools is leveraged with the aim of improving the knowledge and short-term prediction of thunderstorms. More specifically, dual-polarization radar observations from the French weather service are analysed for severe convection cases. The dual-polarization signatures of thunderstorms are characterized for each stage of their life cycles and related to their severity. For the same cases, short-range forecasts from the French operational convective-scale NWP system AROME are compared with the dual-polarization observations. Such comparisons allow to determine to which extent AROME and its microphysical scheme are able to reproduce dual-polarization signatures observed in thunderstorms.