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New ECMWF products: Probability of Precipitation Type and Most Probable Precipitation Type

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One of the greatest difficulties facing forecasters during the cool season is the correct determination of precipitation type, especially with temperatures close to freezing point. Some forms of winter precipitation can pose a threat to human health and safety and/or disrupt economy, like freezing rain with its ice-loading effects on power wires and its threat to travel safety. There are numerous sources of uncertainty in precipitation type forecasts which is why mixed phases are not well predicted. These uncertainties are difficult to reduce but can potentially be quantified by the use of ensembles.

At ECMWF the precipitation type (ptype) output variable is provided by the Integrated Forecast System (IFS) ensemble forecasts (ENS); it describes the type of precipitation (rain, freezing rain, snow, wet snow, sleet or ice pellets) at the surface at each forecast time step. As part of ECMWF's contribution to the ANYWHERE (EnhANcing emergencY management and response to extreme WeatHER and climate Events) project two new products have been developed based on 15-day ENS forecasts of precipitation type. These are the most probable precipitation type, shown in map format, and the instantaneous probabilities of different types, shown for a given site. The first of these shows which type is most probable whenever the probability of some precipitation is >50%. The second product depicts the temporal evolution of probabilities for a specific location in bar chart format, classified also according to three categories of instantaneous precipitation rate. An important consideration for both products has been what to use as a minimum precipitation rate to classify dry from precipitating. The approach taken has been to set this value according to type, in order to try to enforce a zero frequency bias for all types (within the 4-month verification training period we used).

The verification of both products was developed using 3-hourly observations of present weather from manual SYNOPs in Europe for 4-months of data in the 2016-2017 winter period. This verification shows that the IFS is highly skilful in forecasting rain and snow, but only moderately skilful for freezing rain and sleet, while the ability to predict the occurrence of ice pellets is negligible. The verification also highlighted some changes with lead time in the frequency of occurrence of freezing rain. The main advantage of using the ENS is the possibility of varying probability thresholds to give more complete information for decision-makers.