



Improving Forecasts of Freezing Rain at ECMWF

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Freezing rain events, though relatively rare, can be extremely debilitating and dangerous for society, with recovery times of order months or even years. Analysis of forecasts of past events by the operational ECMWF Integrated Forecast System (IFS) showed a strong tendency to incorrectly represent freezing rain as snow. Investigations highlighted that this was primarily because the re-freezing process in IFS, following hydrometeors as they descend, was parametrised with the same time-scale as the melting process. In reality the time-scale for re-freezing should, in general, be much longer. The model physics were changed accordingly, and the results in terms of forecast quality were positive and very striking. Coupled with these physics changes new IFS output was developed for users which shows precipitation type at the surface (rain, snow, wet snow, sleet, freezing rain, ice pellets).

The changes to the physics will be described in detail, and their impact will be illustrated by comparing forecast output for past events in new and old model versions, in terms of precipitation type and intensity. Illustrations will include short-range deterministic forecasts from 'HRES' (the high resolution ECMWF model), and longer range probabilistic forecasts of freezing rain occurrence from the ensemble. There will also be reference to issues requiring further work/investigation, such as high level convection in potential freezing rain cases, freezing drizzle generated in supercooled shallow clouds, and IFS retention of the 'warm nose' in which melting occurs.