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# Towards harmonising radiation and cloud microphysics calculations in the HARMONIE-AROME NWP model

Emily Gleeson (1), Karl-Ivar Ivarsson (2), Daniel Martin (3), Laura Rontu (4), and Kristian Pagh Nielsen (5)

(1) Met Éireann, Research, Environment and Applications, Dublin 9, Ireland (emily.gleeson@met.ie), (2) SMHI SE-601 76 Norrköping, Sweden, (3) AEMET/ State Meteorological Agency Leonardo Prieto, 8 (Ciudad Universitaria) Madrid 28071 Spain, (4) Finnish Meteorological Institute, Helsinki, Finland, (5) Department of Research and Development, Danish Meteorological Institute, Copenhagen, Denmark

The HARMONIE-AROME Numerical Weather Prediction (NWP) model, a configuration of the ALADIN-HIRLAM system, is used operationally by several European countries. The Morcrette radiation scheme from cycle 25r1 of ECMWF's Integrated Forecasting System is used by default in the model. In addition two simpler broad-band schemes, ACRANEB2 and HLRADIA, are available for use. The microphysics scheme is a one-moment bulk scheme which uses a three-class ice parametrization referred to as ICE3.

The work presented here focuses on the calculations of cloud particle effective radii in the model, which can be considered as a weighted mean of the size distribution of the particle type (liquid droplets, ice particles, snow, graupel, rain).

The broadband HLRADIA scheme was used in the sensitivity studies carried out using a single column version of the 3D HARMONIE-AROME model, known as MUSC. In HLRADIA the effective radius of ice particles is computed using the Sun and Rikus scheme which depends on model level temperatures and ice water concentrations. The cloud liquid droplet effective radius is computed using the Martin et al. scheme which depend on liquid water concentration and land/sea aerosols. By default, the ice water content includes a weighted average of the mixing ratios of ice, snow and graupel. An alternative approach is to use the size distributions of the microphysics species from the ICE3 scheme to derive the effective radii of cloud liquid droplets, cloud ice, snow, graupel and rain.

A range of sensitivity tests were carried out using the calculations of the radiation and microphysics schemes and will be presented in this study.