Contribution ID: **36** Type: **not specified**

# Preparing the two-moment microphysical scheme for operational forecasts using radar and satellites

*Friday 21 March 2025 10:45 (15 minutes)*

The Deutscher Wetterdienst has recently introduced a new Rapid Udpate Cycle (RUC) for a seamless transition between Nowcasting (a pure radar product) and Numerical Weather Prediction (NWP). The two-moments scheme (Seifert and Beheng 2006) produces significantly more realistic reflectivities than the currently operational one-moment scheme, thus allowing for a smooth transition between Nowcasting and NWP. The challenge in the last years has been to prepare the two-moments scheme, which has been previously mostly used for research, to be employed for operational weather forecasts.

The two-moment scheme includes evolution equations for the number concentration of the different hydrometeors. This means that the mean size of each hydrometeor in the model is known, which allows for more-physical assumptions in the parameterized processes. The challenge is that many of the involved parameters, such as sticking efficiencies, ice nuclei concentrations or sedimentation velocities, are to a large degree unknown. It is not only that there have been insufficient laboratory experiments related to these processes (quite frequent), but also that the model assumptions are too simple to capture a more-complex reality. This means that many of the microphysical parameters need to be tuned.

Knowing the size of each hydrometeor in the model also provides a key advantage when considering forward operators, especially radar and satellites. For example, few very large graupel particles produce a much larger radar reflectivity than a lot of small ones, even when the summed mass is the same in both cases. This means that the simulated radar and satellite signals are sensitive to the assumptions that are made in the microphysical scheme. Given that we have fully coverage of radar and geostationary satellites in Germany, we are in an ideal situation to examine many of the physical assumptions and parameters in the model.

In this presentation we will show how we have used radar and satellite information to prepare the RUC microphysics for operational forecasts. Our objective has been not only to improve the forecast scores, but also to get "more-physical"clouds, as seen by those remote systems. We have focused on radar reflectivities and on three different radiation channels from the Meteosat-SEVIRI instrument. Those channels provide information about cloud thickness, cloud height and particle size. We will show how the information from the radar and the different channels provides a complementary view, as often variation in microphysical assumptions can be directly detected by only one observation system.

## VAT

## Session

Enhancing Process Understanding: Model parameter estimation

## Preferred Contribution Type

Oral Presentation

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