Development of Observation Operator for Dual Polarimetric Radar

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Polarimetric radars can provide various kinds of parameters on hydrometers (e.g., ZDP, KDP, and ZDR), which represent distribution-density, shapes and types of hydrometers. Thus, we can obtain detailed information on hydrometers in clouds. Furthermore, we expect that representations of clouds in numerical weather prediction models could be improved after assimilating polarimetric radar data.

In this study, we are developing a forward operator for dual polarimetric radar data as part of an observation operator. The operator consists of the variable converter (Bakhshaii et al., 2014), a space interpolator and super observations. However, the current form of the operator is not combined with the converter, but only includes the interpolator and super observations. The combination will be shown in our poster presentation.

In the super-observation method, we define the middle of a segment of the radar beam within a model grid as the interpolation point instead of the center of the model grid. Then the data on the segment are averaged. This treatment reduces uncertainty in locations of the assimilation. In the space interpolator, we take into account the earth curvature and beam broadening. We assume that the broadening follows Gaussian function with distance, and implement the Gaussian weights to be calculated both horizontally and vertically. In comparison between our method and the traditional linear interpolation, we find that the reflectivity with the linear interpolation shows stronger intensity than that with our method.