Data assimilation of dense precipitation radar observations: a simulation study

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Precipitation radar observations have been playing an important role in meteorology through providing valuable information, such as precipitation nowcast. Recently, a new radar system known as the phased array radar, which can scan the three-dimensional structure of precipitation much faster than the conventional parabolic type radar, has been developed. The advancement can also be seen in the spaceborne precipitation radar. The GPM core satellite, the successor of the TRMM satellite, has the newly-developed dual-frequency precipitation radar (DPR). Precipitation radars keep advancing and tend to provide denser and more frequent observations. With these in mind, it would be essential to develop methods to effectively use the radar reflectivity data for numerical weather prediction through data assimilation. Previous studies showed some success in data assimilation of radar reflectivity for convective-scale and tropical cyclone analyses. Nevertheless, it is still difficult to build a general approach to data assimilation of radar reflectivity due to various factors such as the non-diagonal observation error covariance matrix, complex observation operator, and strong nonlinearity and model errors in the moist physical processes. In this study, we aim to develop an effective data assimilation method which can fully exploit the radar reflectivity data. We perform an observing system simulation experiment, in which we assume that reflectivity data are available at all model grid points. As the first step, we focus on the case of Typhoon Soudelor (2015), which was the strongest typhoon in the West Pacific in 2015. In the presentation, we will report the impact of dense radar observations on the analyses and forecasts of Typhoon Soudelor.

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