Assimilations of GPS radio occultation data with vertical thinning
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Abstract

Many studies have demonstrated the advantages of GPS radio occultation (RO) data with its high accuracy and global distribution. The data has been applied in several operational centers, e.g. ECMWF, NCEP and Météo France etc., by data assimilations. In Weather Research and Forecasting (WRF) three-dimensional variation (3DVAR), the GPS refractivity operator had been implemented and used for several years. In the data assimilation system, it assumes observation errors are uncorrelated. However, vertical correlation does exist in the retrieved GPS refractivity. Once assimilating the high density data of refractivities, it will underestimate the observation error and artificially amplify the data impact.

Data thinning is one possible approach to reduce the vertical correlations of the observations and allow the assumption of uncorrelated in observation error to be valid. In this study, we test two thinning methods in the WRF 3DVAR, one is using super-obsing with a constant interval, and the other one with a varied interval based on the model layer thickness, With the data thinning, both methods result in smaller differences between observation and first guess (O-B) and also between the observation and the analysis (O-A). We also assess the thinning effect on a typhoon prediction.