The inclusion of cloudy radiances in the NCEP GSI analysis system

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The impact of AMSU-A, AMSU-B and MHS radiance on numerical weather predictions has been found to be significant. The major limitation on the use of these data has been the presence of clouds. In the Joint Center for Satellite Data Assimilation (JCSDA) we have begun to develop the capability to use the information from cloudy microwave radiance in the NCEP Gridpoint Statistical Interpolation (GSI) analysis system. Radiance data assimilation in cloudy regions requires rapid and accurate radiative transfer and radiance gradient models. The Community Radiative Transfer Model (CRTM) was developed at the JCSDA for use in the radiance assimilation problem and has incorporated appropriate physics for a vertically stratified scattering and emitting atmosphere. This CRTM is employed in this study to calculate radiances and Jacobians at various microwave wavelengths for radiance assimilation under all weather conditions. In the first part of this study, the sensitivity of CRTM calculated radiances to the cloud variables are presented and the accuracy of CRTM calculated Jacobians for cloud profiles are evaluated. In the second part, methodologies for the cloudy radiance related bias corrections in the GSI are addressed. Preliminary results showing the impacts of cloudy radiance assimilation on analysis fields and forecast results will be presented.