Contribution ID: **73** Type: **Oral presentation**

Recent advances in the Community Radiative Transfer Model (CRTM) in support of all-sky radiance assimilation

Wednesday, 5 February 2020 09:00 (25 minutes)

The Joint Center for Satellite Data Assimilation (JCSDA) Community Radiative Transfer Model (CRTM) is a fast, 1-D radiative transfer model used in numerical weather prediction, calibration / validation, etc. across multiple federal agencies and universities. The key benefit of the CRTM is that it is a satellite simulator, in that it provides a highly accurate representation of satellite radiances by making appropriate use of the specific sensor response functions convolved with a line-by-line radiative transfer model (LBLRTM). CRTM covers the spectral ranges consistent with all present operational and most research satellites, from visible to microwave. The capability to simulate ultraviolet radiances are being added over the next two years.
Another unique aspect of the CRTM is that it also provides the tangent-linear, adjoint, and Jacobian outputs needed for satellite data assimilation applications. The ability to compute a Jacobian for various geophysical input parameters significantly expands the capabilities beyond traditional forward RT models, such as those used in remote sensing retrieval algorithms and other "Bayesian" or "1D-VAR" applications.

The present talk will focus on recent advances in the ability of the CRTM to simulate satellite radiances in the presence of cloudy and precipitating scenes, with a particular emphasis on ice-phase microphysics. We'll explore the radiance sensitivity to cloud microphysical parameters through a series of experiments that will form the basis of the next generation of operational satellite data assimilation and numerical weather prediction. This represents a significant and necessary expansion of the CRTM capabilities to perform in an all-weather, all-surface, all-sensor environment.

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Session Classification: Session 3: Observation operators

Track Classification: 4th workshop on assimilating satellite cloud and precipitation observations for NWP