Preparation of CRTM for NPP/JPSS and GOES-R

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\section*{Introduction}

Sensors on future national operational environmental satellite systems-Joint Polar Satellite System (JPSS) and the fixed-stationary Operational Environmental Satellite R-Series (GOES-R) will provide satellite data to improve weather forecasts in Numerical Weather Prediction (NWP) models through direct assimilation of satellite radiances. For this purpose, a fast and accurate Radiative Transfer (RT) model is required. Community Radiative Transfer Model (CRTM) is developed at the Joint Center for Satellite Data Assimilation (JCSDA), providing calculated radiances (or Brightness Temperature (BT)) and the responses of the radiances to the perturbations of state variables (radiance Jacobians, Tangent-Linear (TL), and Adjoint (AD) models). The current CRTM version (v2.0.2) has the capability to simulate visible, infrared, and microwave channel radiances (or BTs) for satellite sensors under various atmosphere and surface conditions.

CRTM readiness for NPP/JPSS and GOES-R is very important for NWP centers to use GOES-R and JPSS data as soon as the new systems launch. Efforts have been made to produce the CRTM transmittance coefficients (both ODAS and ODPS), which are used to calculate the clear sky atmospheric optical depth in CRTM, for the Cross-track Infrared Sounder (CrIS), the Advanced Technology Microwave Sounder (ATMS), and Visible/Infrared Imager/Radiometer Suite (VIIRS) on NPP, and the Advanced Baseline Imager (ABI) on GOES-R. The training statistics are presented for each of these sensors. Channel weighting function and Jacobian calculated from CRTM are also discussed.

\section*{Results}

\subsection*{Generation of Transmittance Coefficients}

\begin{itemize}
  \item CRTM simulated brightness temperature spectra for hyperspectral infrared sensors IASI, AIRS, and CrIS
  \item VIIRS IR channel transmittance ODAS, and ODPS training results compared to LBL for dependent profile set (mean difference and standard deviation).
  \item VIIRS Imager channels 34, and 35 weighting functions and Jacobians
  \item VIIRS moderate spatial resolution sensor channels MUS-MUS weighting functions and Jacobians
  \item ATMS channel transmittance ODAS, and ODPS training results compared to LBL
  \item ATMS channel weighting function peak height
\end{itemize}

\subsection*{Concluding Remarks}

Two sets of coefficients are generated in the formats of ODAS and ODPS for infrared and microwave sensors on future satellites NPP/JPSS and GOES-R. CRTM is ready to simulate the channel brightness temperatures as well as the channel Jacobians for sensors CrIS, ATMS, and VIIRS on NPP/JPSS, and ABI on GOES-R. Future work will focus on preparation of the radiance assimilation for these sensors in NCEP Global Data Assimilation System (GDAS) to accelerate the uses of satellite data as soon as the new systems launch.