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Recent developments in the RTTOV model

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RTTOV (Radiative Transfer for TOVS) is a fast radiative transfer model developed within the context of the EUMETSAT NWP SAF (Numerical Weather Prediction Satellite Applications Facility) and designed for use in operational NWP environments. The model allows rapid simulations (∼1 ms for 40 channels on a desktop PC) of radiances for satellite infrared and microwave nadir-scanning radiometers given an atmospheric profile of temperature, variable gas concentrations, cloud and surface properties. Presently, about 40 sensors are supported, including ATMS, CrIS and VIIRS instruments onboard the recently launched NPP satellite.

Clear-sky layer optical depth calculations are based on a regression on a set of atmospheric predictors carried out over a range of input profiles. Computations may optionally include scattering by clouds and aerosols at infrared wavelengths, and by clouds and precipitation at microwave frequencies.

The latest version of RTTOV (v10) has introduced a number of new features including; explicit treatment of Zeeman splitting for AMSU-A and SSMI/S, principal component calculations for IASI and AIRS spectra, enhanced scattering code for cloudy microwave simulations, an improved microwave sea surface emissivity model (FASTEM-5) and new land surface emissivity atlases for use with infrared and microwave sensors. In addition, much of the code has been rewritten to be clearer and more efficient.

RTTOV (v11) is expected to further improve performance over previous versions and will contain the following scientific enhancements, viz.: visible and near-infrared wavelength simulation for improved assimilation of aerosol-affected short-wave radiances; treatment of non-LTE (local thermodynamic equilibrium) effects to reduce biases in stratospheric/upper-tropospheric temperature sounding channels; enhancements to the principal components calculations for high-resolution sounders.

RTTOV 10 is available to any users free of charge on request from the NWP SAF website: http://research.metoffice.gov.uk/research/interproj/nwpsaf/rtm/