RTTOV development status

James Hocking, Roger Saunders, Peter Rayer, Dave Rundle, Pascal Brunel, Jérôme Vidot, Marco Matricardi, Alan Geer, Niels Bormann

ITSC-18, Toulouse, March 2012

What is RTTOV?

Estimate of atmospheric state and surface parameters for observation point X

Viewing angle and sun angles

RT model for required sensor

Time ~1ms for 20 chans

Radiances for required satellite channels *y=H*(X) and optionally Jacobians as TL, AD, or K

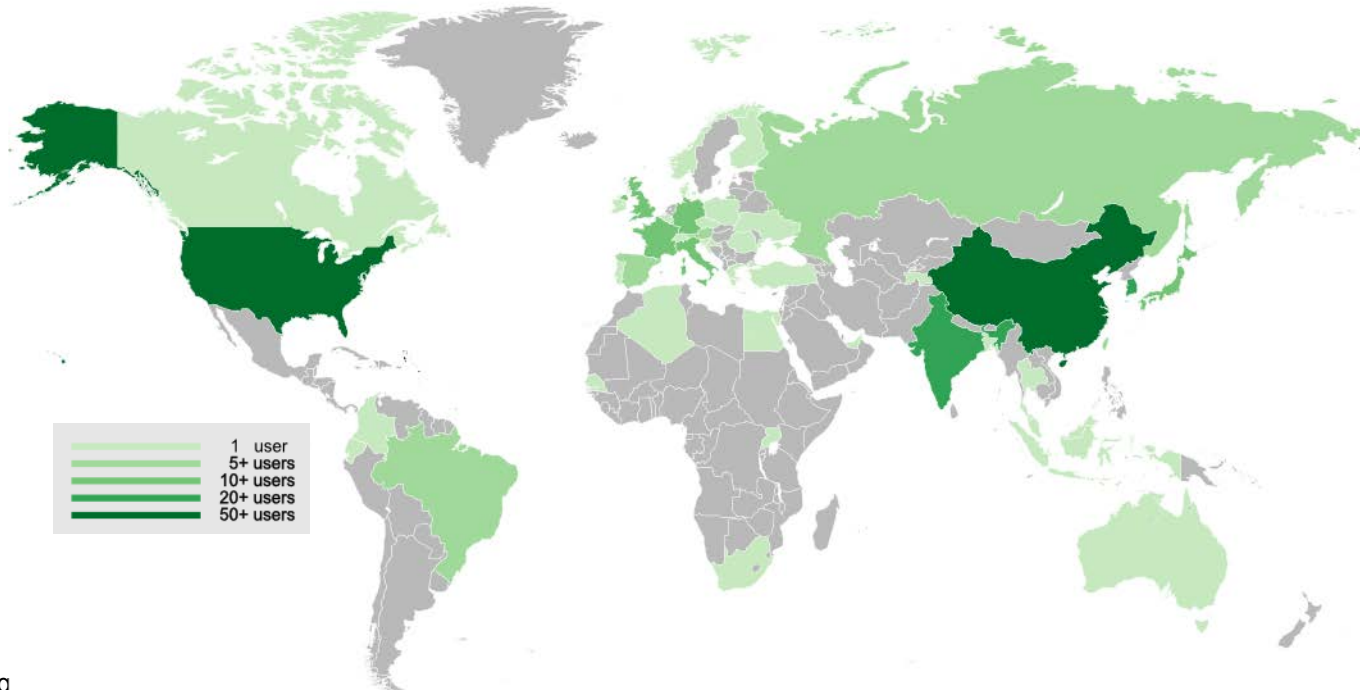$$H' \equiv \frac{\partial y_i}{\partial X_j}$$

RTTOV users

Number of RTTOV v9 users provided code = 483

Number of RTTOV v10 users provided code = 364

Earlier versions no longer distributed or supported.

1   user
5+ users
10+ users
20+ users
50+ users

File   Edit   View   History   Bookmarks   Tools   Help

http://www.nwpsaf.eu/forum/   Wikipedia (en)

Most Visited ⌄   Latest Headlines ⌄   Met Office Warn... ⌄   DisplayOneProduct...

NWP SAF forums • Index page

NWP SAF forums

The NWP SAF is a EUMETSAT-funded activity that exists to co-ordinate research and development efforts among the SAF partners to improve the interface between satellite data and NWP for the benefit of EUMETSAT member states.

The NWP SAF website can be found at http://nwpsaf.org

Search...   Search

Advanced search

🏠 **Board index**   ⌄A^

🖳 User Control Panel (**0** new messages) • View your posts   ❓FAQ 👥Members ⏻ Logout [james.hocking]

It is currently Mon Mar 12, 2012 1:33 pm   Last visit was: Fri Mar 09, 2012 11:04 am
[Moderator Control Panel]

View unanswered posts • View unread posts • View new posts • View active topics   Mark forums read

RTTOV	TOPICS	POSTS	LAST POST
RTTOV 10 Version 10 of RTTOV was first released in January 2011. This is the most recent version of RTTOV.	25	57	by james.hocking ▸ Mon Feb 20, 2012 10:18 am
RTTOV 9 Version 9 of RTTOV was first released in March 2008, but users are advised that this version of RTTOV has now been superceded by RTTOV v10, which should be used in preference to RTTOV v9.	11	16	by roger.saunders ▸ Mon Feb 20, 2012 10:16 am
Older versions Older versions of RTTOV should be discussed here.	1	1	by roger.saunders ▸ Mon Feb 07, 2011 9:02 pm

AAPP	TOPICS	POSTS	LAST POST
AAPP Announcements	10	13	by nigel.atkinson ▸ Fri Mar 02, 2012 10:54 am
AAPP General Discussion	6	12	by nigel.atkinson ▸ Mon Feb 20, 2012 9:11 am

WHO IS ONLINE

In total there are **4** users online :: 1 registered, 0 hidden and 3 guests (based on users active over the past 5 minutes)
Most users ever online was **8** on Fri Mar 02, 2012 11:32 am

Registered users: james.hocking
Legend: Administrators, *Global moderators*

STATISTICS

Total posts **99** • Total topics **57** • Total members **72** • Our newest member **hultberg**

Disclaimer :

http://research.metoffice.gov.uk/research/interproj/nwpsaf/rtm/rtm_rttov10.html

W ▾ | Wikipedia (en)

🗎 Most Visited ▾   🗎 Latest Headlines ▾   🗎 Met Office Warn... ▾

NWP SAF: RTTOV v10 resources

RTTOV v10 coefficients files:

Coefficient files for most sensors are included with the source code distribution. Additional larger coefficient files are available separately below. Note that RTTOV v10 uses a slightly different header format for coefficient files to previous versions of RTTOV, so that old RTTOV coefficient files are not directly compatible with RTTOV v10 (though it is possible to convert old coefficient files using software supplied in the distribution). The coefficient files below and those in the source distribution are the recommended ones for use with RTTOV v10 and have been updated with v10 headers.

Optical depth predictors for high resolution IR sounders based on LBLRTMv12.1:

The following files should be unzipped in `rtcoef_rttov10/rttov7pred51L/`:

- AIRS RTTOV coeffs on 51L mixed gases, water vapour and ozone (bzipped 15 MB) (for faster computations but less accurate) *download from mirror site* Updated 2012-01-17
- IASI RTTOV coeffs on 51L mixed gases, water vapour and ozone (bzipped 53 MB) (for faster computations but less accurate) *download from mirror site* Updated 2012-01-17
- CrIS RTTOV coeffs on 51L mixed gases, water vapour and ozone (bzipped 8 MB) (for faster computations but less accurate) *download from mirror site* Updated 2012-01-17

The following files should be unzipped in `rtcoef_rttov10/rttov7pred101L/`:

- AIRS RTTOV coeffs on 101L mixed gases, water vapour and ozone (bzipped 29 MB) (for faster computations but less accurate) *download from mirror site* Updated 2012-01-17
- IASI RTTOV coeffs on 101L mixed gases, water vapour and ozone (bzipped 104 MB) (for faster computations but less accurate) *download from mirror site* Updated 2012-01-17
- CrIS RTTOV coeffs on 101L mixed gases, water vapour and ozone (bzipped 17 MB) (for faster computations but less accurate) *download from mirror site* Updated 2012-01-17

Optical depth predictors for high resolution IR sounders based on LBLRTMv11.1:

The following files should be unzipped in `rtcoef_rttov10/rttov9pred101L/`:

- AIRS RTTOV coeffs on 101L mixed gases, H_2O, O_3, N_2O, CH_4, CO, CO_2 (bzipped 45 MB) *download from mirror site*
- IASI RTTOV coeffs on 101L mixed gases, H_2O, O_3, N_2O, CH_4, CO, CO_2 (bzipped 165 MB) *download from mirror site*

Optical depth predictors for infrared imagers and sounders based on LBLRTMv12.1 on 51L:

- HIRS NOAA 5-19 and Metop RTTOV coeffs on 51L mixed gases, H_2O, O_3, CO_2 (bzipped tarball 3 MB) *download from mirror site* New 2012-02-09

The following files should be unzipped/untarred in `rtcoef_rttov10/rttov7pred51L/`:

- VIIRS RTTOV coeffs on 51L mixed gases, water vapour and ozone (bzipped 60 kB) *download from mirror site* Updated 2012-01-17
- MSG-3 SEVIRI RTTOV coeffs on 51L mixed gases, water vapour and ozone (bzipped 66 kB) *download from mirror site* New 2012-01-17
- RTTOV coeffs for all other IR sensors on 51L (bzipped tarball 7 MB) *download from mirror site* Updated 2012-01-17

Optical depth predictors for microwave imagers and sounders based on Liebe 89/92 on 51L:

The following files should be unzipped/untarred in `rtcoef_rttov10/rttov7pred51L/`:

- ATMS RTTOV coeffs on 51L mixed gases, water vapour (bzipped 124 kB) *download from mirror site* Updated 2012-01-17
- GCOM-W 1 AMSR2 RTTOV coeffs on 51L mixed gases, water vapour (bzipped 61 kB) *download from mirror site* New 2012-01-17
- RTTOV coeffs for all other MW sensors on 51L (bzipped tarball 3 MB) *download from mirror site*

IASI & AIRS Principal Components coefficient files:

The following files should be unzipped in `rtcoef_rttov10/pc/`:

- AIRS PC coeffs (bzipped 9 MB) *download from mirror site*
- IASI PC coeffs (bzipped 29 MB) *download from mirror site*

Infrared cloud scattering coefficient files:

The following files should be unzipped/untarred in `rtcoef_rttov10/cldaer/`:

- AIRS coeffs (bzipped 28 MB) *download from mirror site*
- IASI coeffs (bzipped 161 MB) *download from mirror site*
- All other sensors (bzipped tarball 12 MB) *download from mirror site*

RTTOV status

v10.1 released January 2011

- Pascal Brunel and Philippe Marguinaud restructured/rewrote much of the v9 code:

    - grouping of similar variables together in structures

    - TL/AD/K use rttov_direct for the direct calculation

    => easier to maintain/reduced chance of bugs; cleaner interfaces; faster run-time.

- Improved build process

- Test suite overhauled to be much more flexible

v10.2 released January 2012

- Small improvements to functionality, bug fixes, some optimisation.

v11 due for release May 2013

- VIS/NIR capability, non-LTE, improvements to PCs, further optimisation.

v10 scientific improvements

- Principal Components calculations of AIRS and IASI spectra

- Explicit treatment of Zeeman splitting for SSMI/S and AMSU-A

- New IR and MW land surface emissivity atlases

- Improved MW sea surface emissivity model (FASTEM)

- Updates to RTTOV_SCATT for cloudy MW simulations

- Multiple cloud types per layer for cloudy IR simulations

- Explicitly include top layer (0.005hPa) in input profile

- Updated coefficient files on new set of 51 levels

FASTEM-4 (Mark Liu)

- The FASTEM-3 model was developed for frequencies in the range 20-60 GHz and is biased at higher and lower frequencies.

- Several critical components such as variable sea surface salinity and a full Stokes vector have not been generally taken into account.

- A new permittivity model has been generated from measurements of fresh and salt water at frequencies between 1.4 GHz and 410 GHz.

- A modified sea surface roughness model from Durden and Vesecky

- Also included in CRTM (OEMM) and has resulted in some major improvements in microwave radiance simulations.

FASTEM-5

- In some cases FASTEM-4 gave inferior results to previous FASTEM versions, particularly at high wind speeds.

- RTTOV v10.2 released with "FASTEM-5" which is based on FASTEM-4 with two differences:

  - constraint added to reflectance-fitting equations ensuring the same V- and H-pol reflectance at nadir.

  - foam coverage model reverted from Tang 1974 (as in FASTEM-4) to Monahan *et al.* 1986 (as in FASTEM-3).

- The science in FASTEM is largely mature, but the foam coverage model is one area where improvements could be made.

Other v10.2 improvements

- Option to specify ice effective diameter explicitly in input cloud profile (new *profile % icede(:)* array) for cloudy IR simulations.

- Optimisation: improved performance on IBM (clear-sky direct code ~10% faster, direct+TL+AD+K ~10-15% faster).

- Several bug fixes including incorrect predictor calculations being performed when optional trace gas profiles were omitted. Impact depends on profile and channel, but potentially very significant (several K).

- Updated coefficient files based LBLRTM v12.1 and AER v3.1

- New coefficient files for Suomi NPP instruments, MSG-3 SEVIRI and GCOM-W AMSR2.

- Full list of changes on RTTOV website.

Latest coefficients

Infrared:

- LBLRTM v12.1, AER v3.1, MT_CKD_2.5.2

- ECMWF 83 profile set

- RTTOV-7 predictors on 51 levels (and also 101 levels for AIRS/IASI/CrIS)

- RTTOV-9 predictor files for hi-res sounders to be updated using latest LBLRTM for RTTOV v11

Microwave:

- Liebe-MPM 89/92, no-Zeeman code with O2, N2, WV and optionally climatological O3

- ECMWF 83 profile set

- RTTOV-7 predictors on 51 levels

- Zeeman coefficients for SSMI/S and AMSU-A also available

New coefficients - ATMS

- The current ATMS coefficient file on the website is due to be updated: channel 10 and 17 pass bands are currently incorrect.

- Proposal is to use instrument specification passbands which ECMWF O-Bs demonstrate are optimal

- More feedback on this welcome

- Revised coeffs will be released after ITSC-18

New coefficients – ERACLIM

- Aim to provide coefficients for a range of older instruments:

  - PMR

  - SCAMS

  - SMMR

  - SSM/T

- See poster by Paul Poli/Steve English.

- We are seeking information on pass bands/response functions for these instruments: any info gratefully received!
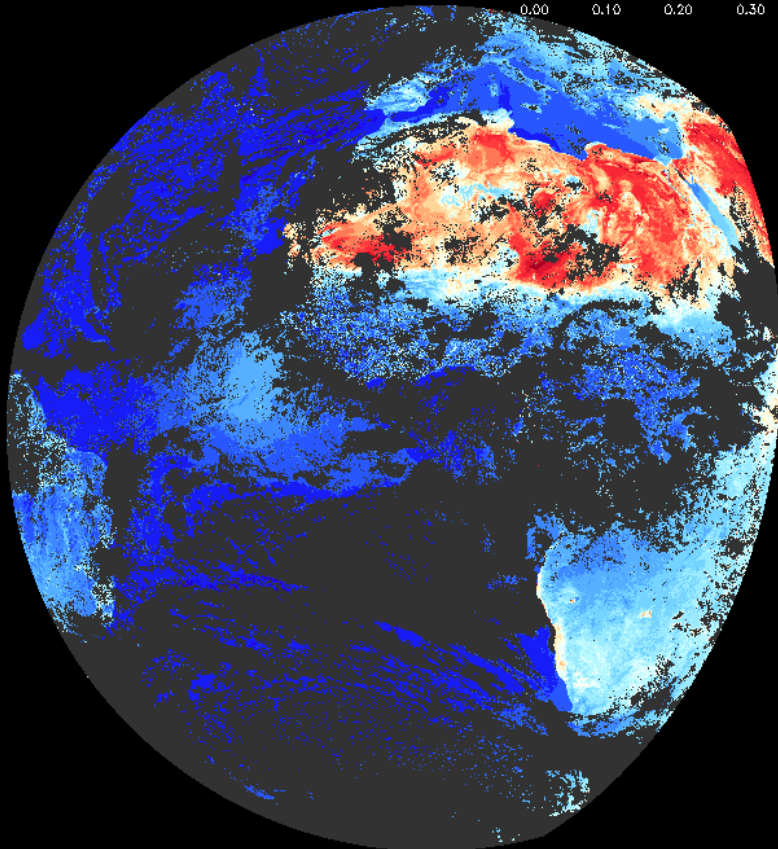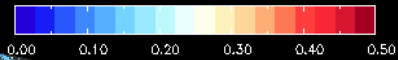
Plans for RTTOV v11

- Capability to simulate visible and near-IR channels:
    - Clear-sky code already functional using "v9 predictors"
    - Jerome Vidot and Eva Borbas are developing a bi-directional land surface reflectance atlas (see Jerome's poster)
    - Capability to simulate aerosol scattering under development
- Inclusion of non-local thermodynamic equilibrium effects for shortwave infrared sounding channels.
- Simulation of PCs for advanced IR sounders will be extended to all surface types, and clear and cloudy profiles.
- Possible improvements to FASTEM (e.g. foam coverage model).
- Further code optimisation focussing on IBM and Intel architectures.
- Support for new instruments (e.g. MTG-IRS) and improved coefficients for older instruments (e.g. SSU).
- Due for release in May 2013.

Any questions?

Met Office

RTTOV-11 early results -- SEVIRI 1500UTC 25th August 2011

Observed and simulated 0.6μm reflectances (clear-sky pixels only)