

ITSC-23 RTTOV/CRTM Technical Subgroup

RTTOV future plans

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RTTOV release time table

RTTOV v13.0: **released November 2020** *(see presentation on Thursday 24 June)*

RTTOV v13.1: **October 2021**

RTTOV v13.2: **September 2022**

RTTOV v14.0: **March 2024**

The plans presented here are not comprehensive.

Contents

- UV simulations
 - MFASIS fast visible cloud parameterisation
 - MTG-IRS
 - Far-IR (FORUM)
 - RTTOV v14 plans
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Support for UV sensors

Basic support planned for v13.1

- Capability to be improved in future releases

Expect the **v13 predictors** will work OK for gas absorption

- If necessary **update predictors** and support **additional variable gases** for v13.2

Rayleigh scattering:

- Existing simple **single-scattering** will work in v13.1
- *Fast **multiple-scattering** parameterisation candidate for v13.2?*

Surface reflectance:

- **Sea** surface BRDF model should be OK in v13.1
- **Land** surfaces candidate for v13.2 or v14

Support for UV sensors

Cloud optical properties:

- Existing properties should be OK in v13.1
- Possible improvements/flexibility planned for v14

Aerosol optical properties:

- None supplied for v13.1 (users can generate Mie properties using supplied tool)
- Aim to provide some aerosol optical properties for v13.2 or v14

Scattering solvers:

- RTTOV-DOM solver optionally including Rayleigh multiple scattering in v13.1
 - MFASIS neural network parameterisation in v13.2
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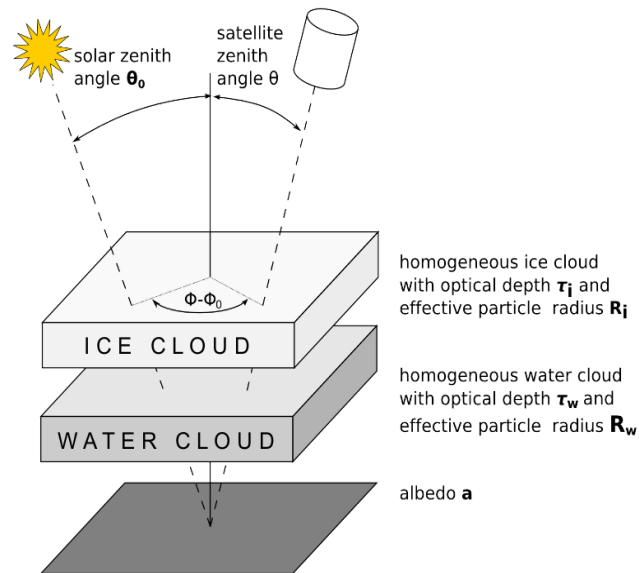
MFASIS fast visible cloud parameterisation

Current status:

- LUT-based approach, supports channels **below 1 micron**.
- Water vapour handled by **interpolating** between 3 LUTs.
- **Mixed phase** clouds associated with larger errors: addressed via an **empirical correction**.
- Code **optimised** for RTTOV v13.0.

RTTOV v13.1:

- Support for **1.6 micron** channels.
- Possible improvements for **mixed phase** clouds.



MFASIS fast visible scattering parameterisation

RTTOV v13.2:

- **Neural network** version for **clouds**.
- **Additional** input **parameters**: water vapour, total AOD, mixed phase cloud.
- Order of magnitude **faster** than LUT-based version, similar accuracy.

RTTOV v14.x:

- Implementation of **ICON-ART aerosol properties** in RTTOV.
- Apply MFASIS to **aerosol** simulations.
- *Provide **tool** for **users** to **train** MFASIS on **custom optical properties**.*

MTG-IRS support

- RTTOV optical depth coefficients **Hamming** apodisation – **recommended**
 - RTTOV optical depth coefficients for **light apodisation** – larger errors due to significant negative lobes in spectral responses.
 - *Support for **light apodisation** via **HTFRTC** (not currently available)*
 - Are **RTTOV** users planning to use **lightly apodised radiances**?
 - If so, please **let us know!**
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Far-IR support (in particular for FORUM)

- RTTOV **coefficients** already available for **FORUM**.
 - Modification to **fast IR cloud scattering solver** (“Chou-scaling”) for **v13.2**
 - **Temperature-dependence** in **IR cloud optical properties** (**v13.2** or **v14**)
 - Surface **emissivity**: work is planned to **extend** the **CAMEL** atlas (**v14**)
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RTTOV v14 plans

Major update to RTTOV.

Two largest changes:

- Unification of RTTOV and RTTOV-SCATT
- Fully polarised model

We will continue to maintain and update existing capabilities.

This presentation is not a comprehensive list of updates.

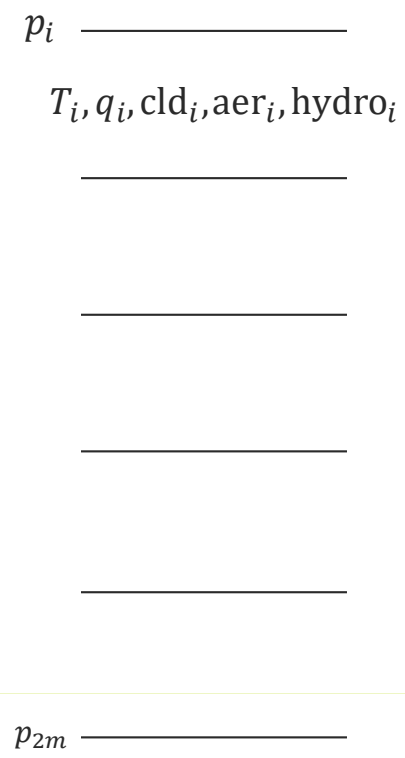
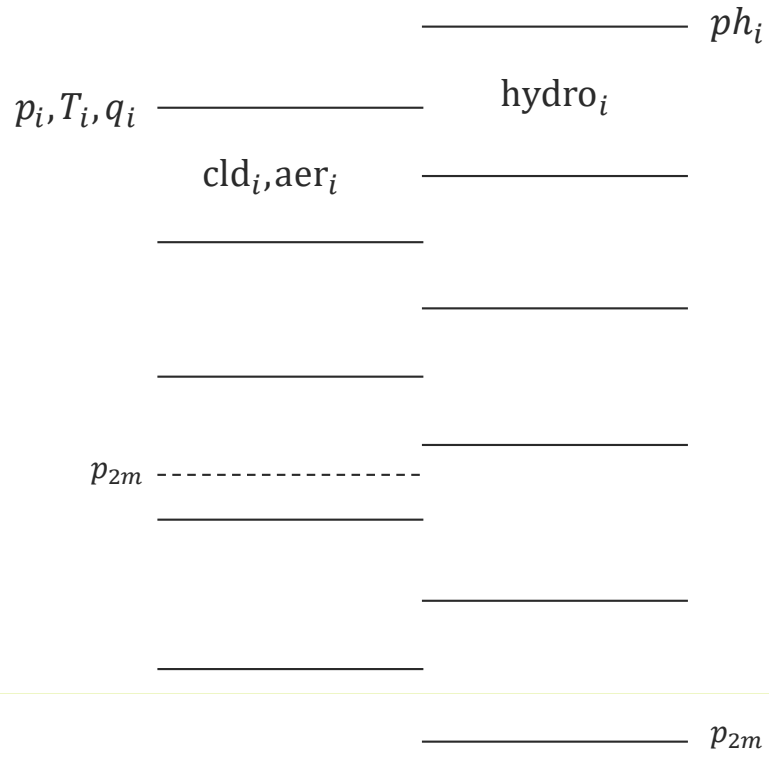
RTTOV v14.0 – unify RTTOV/RTTOV-SCATT

- Treat **levels/layers** in RTTOV as in RTTOV-SCATT.
- RTTOV will **mandate** the **surface** lies on the **bottom pressure level**.
- If there is a **user requirement** we will create **external subroutines** to “convert” **user profiles** with **arbitrary surface pressure** to the required form for RTTOV.

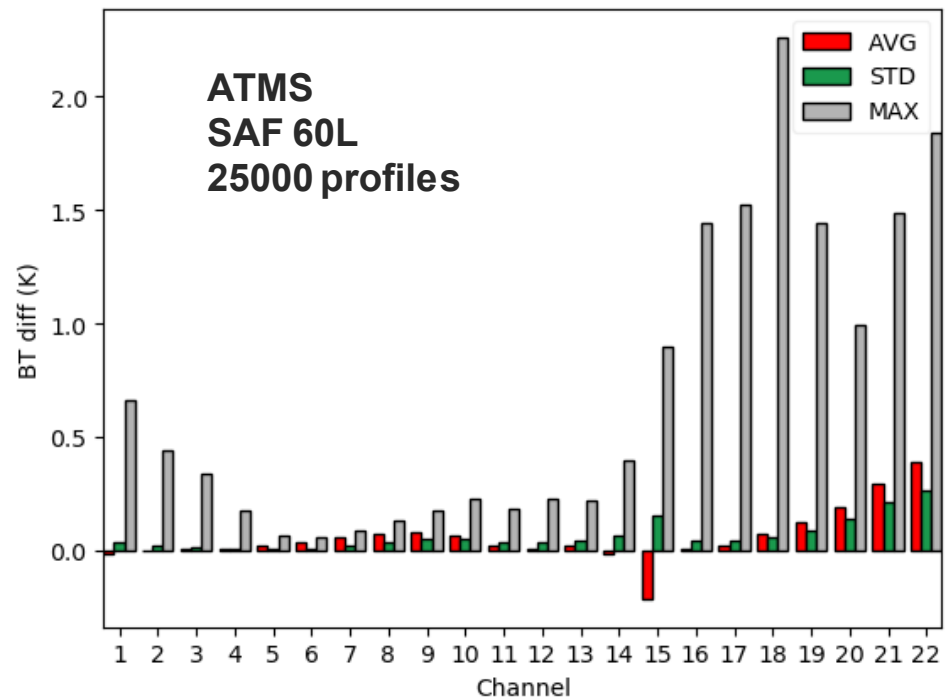
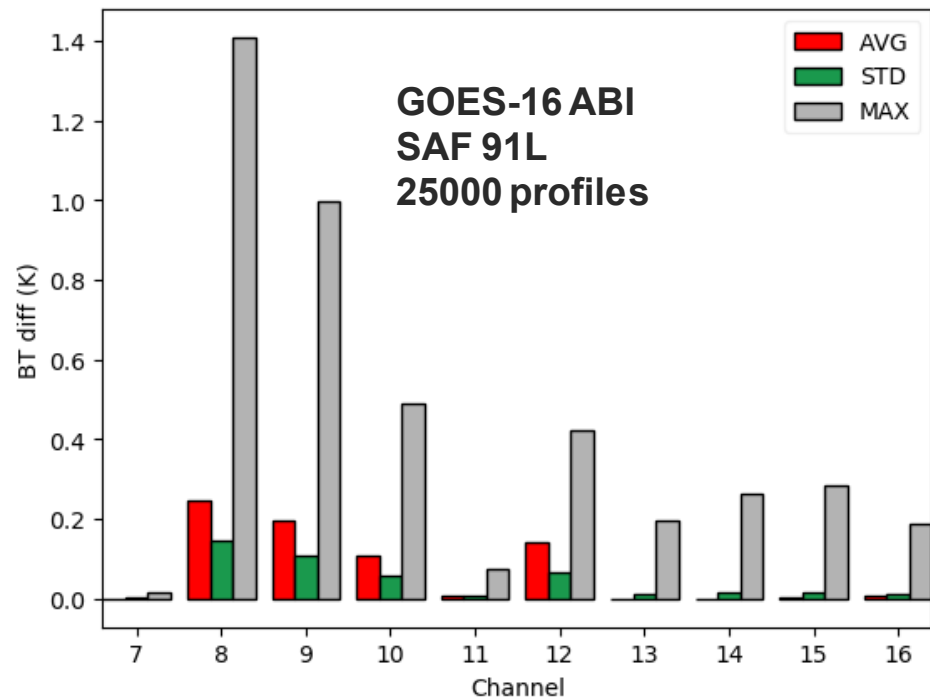
- This approach will have **benefits** in terms of **simplifying** code which improves **robustness** and increases possibilities for **optimisation**.
- RTTOV v14 will ***not be able*** to **replicate** v13 radiances.

RTTOV v13 / RTTOV-SCATT

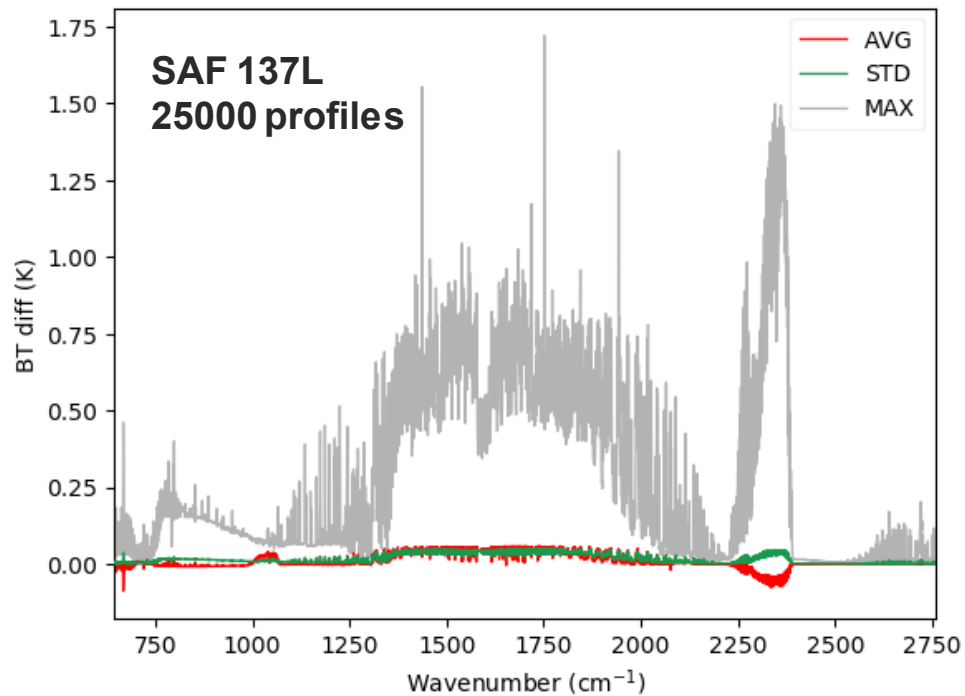
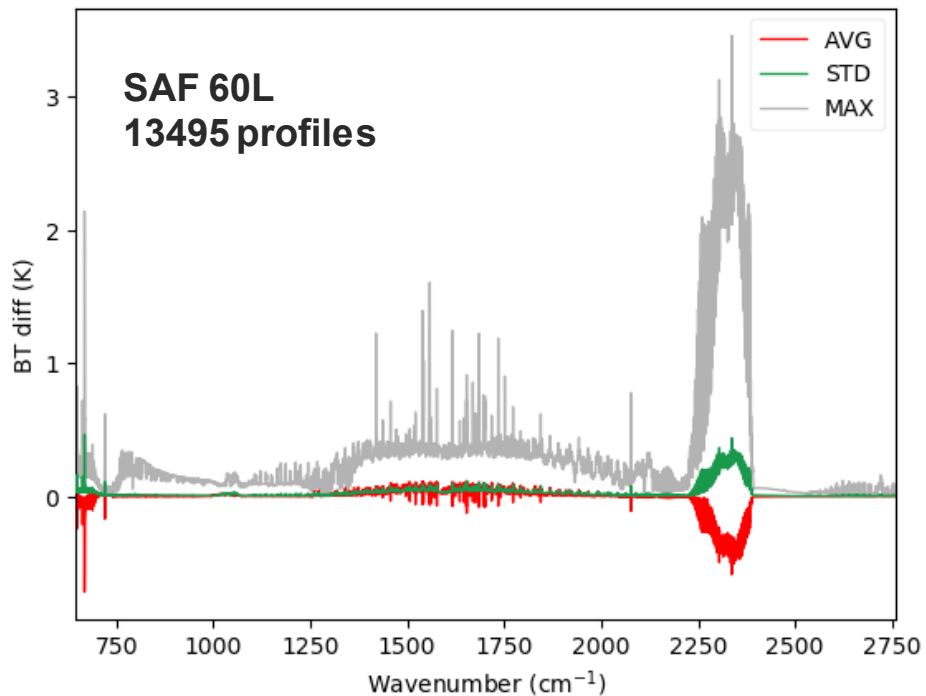
RTTOV v14



Impact of levels/layers changes for clear-sky ABI and ATMS simulations (coefficients on 54L). NWP SAF diverse profile datasets, satellite zenith 50°.



Impact of levels/layers changes for clear-sky IASI simulations (coefficients on 101L). NWP SAF diverse profile datasets, satellite zenith 50°.



RTTOV v14.0 – unify RTTOV/RTTOV-SCATT

- The aim is to **minimise** (as much as practical) **spectral distinctions**.
- Update **VIS/IR optical properties** to work more like **v13 hydrometeors**.
- **Unify data structures** and **file format** for **optical properties** across the spectrum.
- Implement **RTTOV-SCATT solver** within RTTOV.
- Share **solvers** and **parameterisations** across the **spectrum** (where applicable).
- *(Unified?) Tools for **user-generated optical properties** across the spectrum (possibly further ahead).*

RTTOV v14 – other plans

- Wrapper updates:
 - Possibly rewrite wrapper to be simpler.
 - Increased support: [TL/AD](#), [PC](#) models, support for additional RTTOV [user-level routines](#)
 - Aiming to improve [performance](#) on [vector](#) architectures while maintaining performance on [scalar](#) machines.
 - Improvements in [variable](#) and [subroutine naming](#) (including in the user interface).
 - Opportunity for [code cleaning/tidying](#).
 - [Remove](#) solar single-scattering solver.
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