ESA-JAXA Pre-Launch EarthCARE Science and Validation Workshop

13 – 17 November 2023 | ESA-ESRIN, Frascati (Rome), Italy

L1 simulator tool for EarthCARE's Multi-Spectral Imager (MSI)

Nils Madenach[1], Sebastian Bley[2], Nicole Docter[1], René Preusker[1], Anja Hünerbein[2]

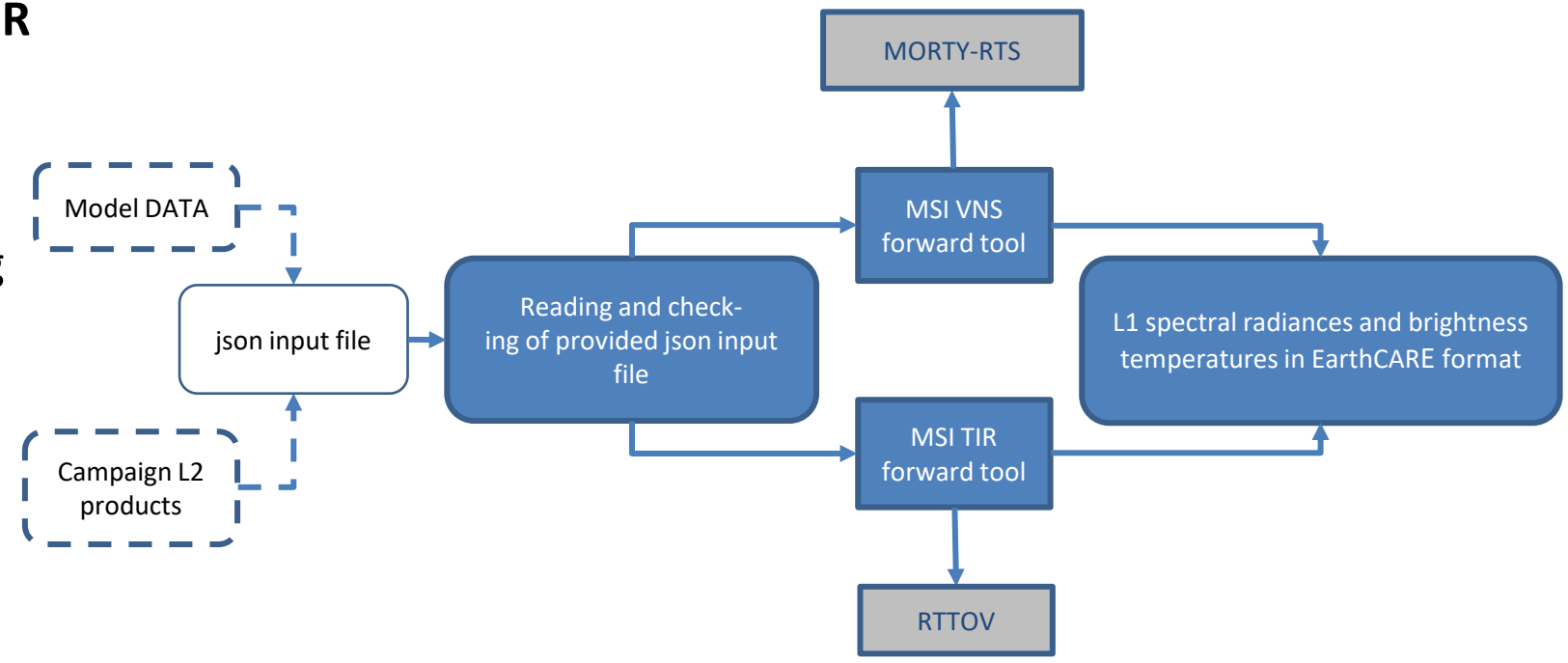
[1]Freie Universität Berlin, [2]TROPOS

MSI forward tool: Overview

- **Python** tool for realistic **simulations** of **EarthCARE MSI radiances and BTs**
- Input data can be from **models** or/and **measurements (e.g. campaigns)**
- Consisting of **two modules**:
  - **MSI VNS** (FUB): VIS (0.67µm), NIR (0.865), SWIR1 (1.65), SWIR2 (2.21)
  - **MSI TIR** (TROPOS): TIR1 (8.8), TIR2 (10.8), TIR3 (12.0)
- **Flexible** with respect to **input data** (e.g. scattering functions, number of layers etc.)
- **Tailored** for **MSI spectral channels** (accounting for smile in VNS)

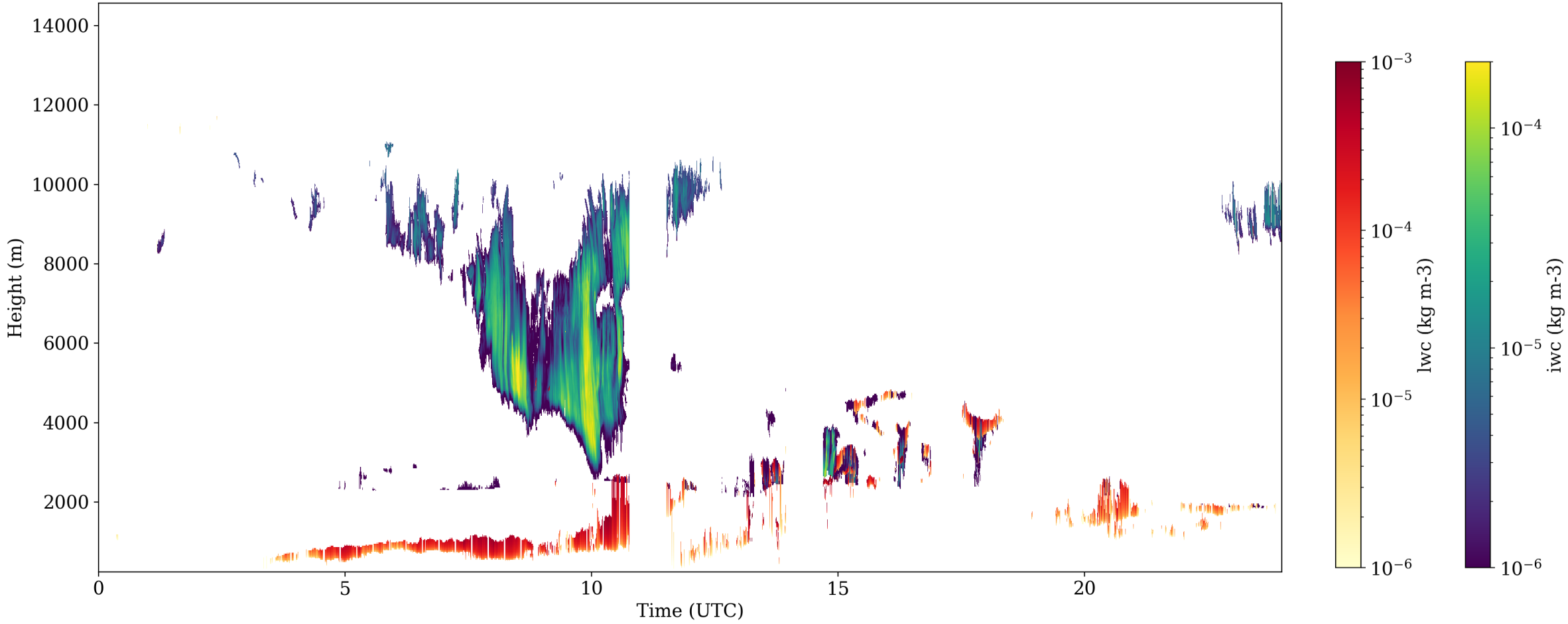
MSI forward tool: Structure

- **JSON input file** containing all relevant **information** for **VNS** and **TIR**
- **One JSON file** per column/pixel
- Reading and validation of input file
- **Radiative transfer** simulations using
  - VNS: **MORTY-RTS***
  - TIR: **RTTOV**
- Write **spectral radiances** and **BT** in **EarthCARE MSI RGR format**



***MORTY-RTS**: **M**atrix **O**perator **R**adiative **T**ransfer in p**Y**thon – **R**adiative **T**ransfer **S**olver

MSI forward tool: Example – Lindenberg 9 July 2022



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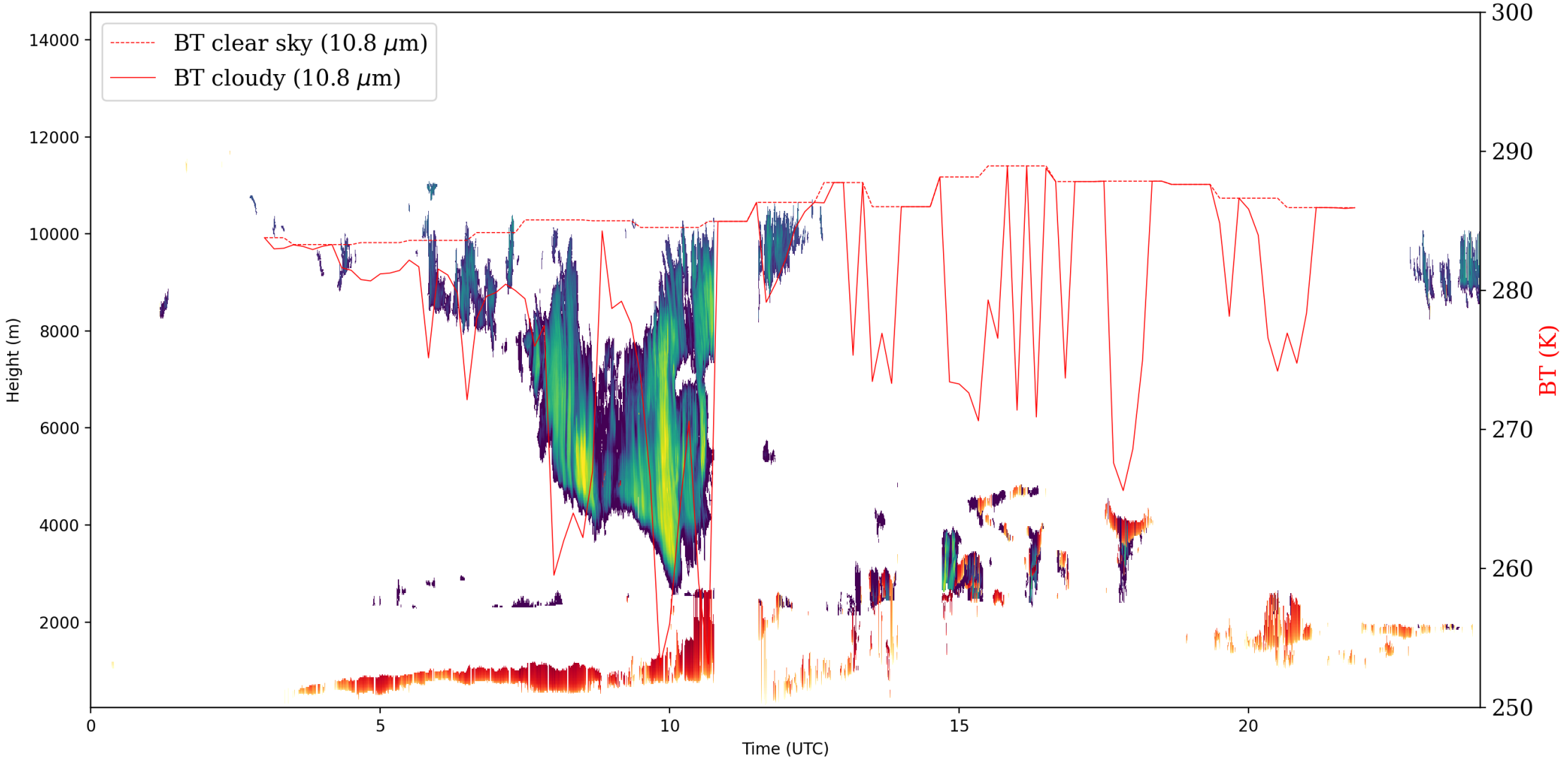
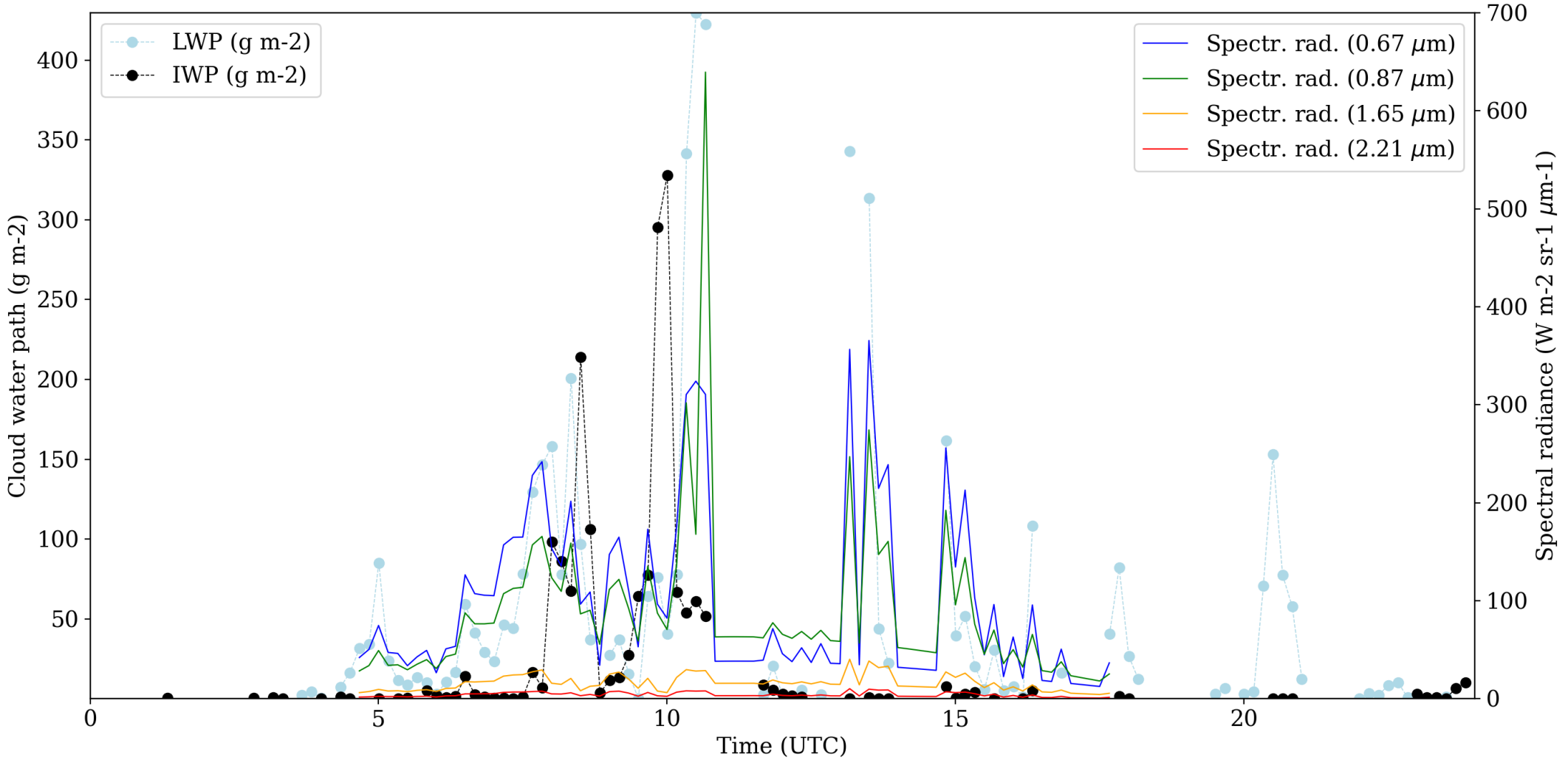
MSI forward tool: Example – Lindenberg 9 July 2022

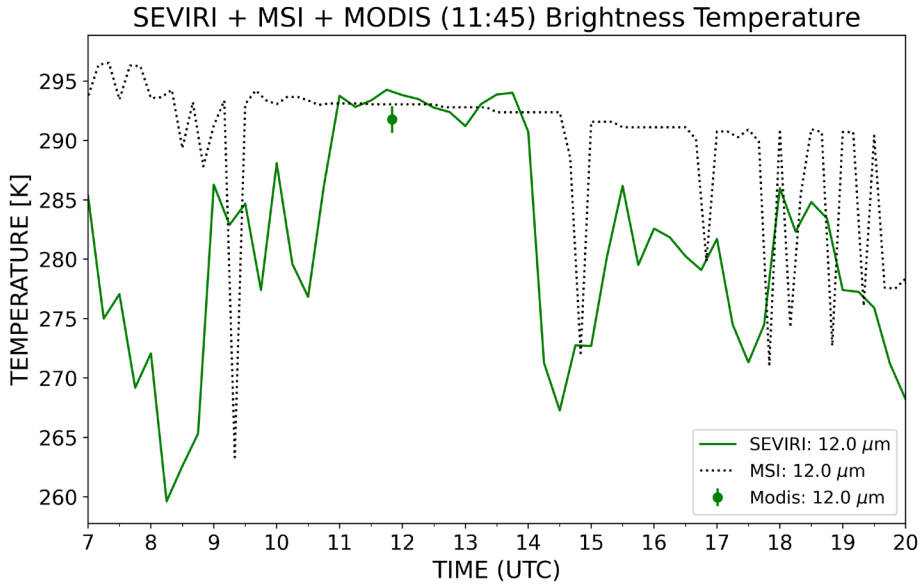


MSI forward tool: Example – Lindenberg 9 July 2022



MSI forward tool: Summary

- MSI tool **freely available** for download
- Integrated in the ESA data validation center (**EVDC**) (talk and demo by Jarek Dobrzanski on EVDC Cal/Val tools)
- Successfully tested using input from **Cloudnet and PollyXT lidars**
- First **validations** against observations from **MSG SEVIRI and MODIS** look promising

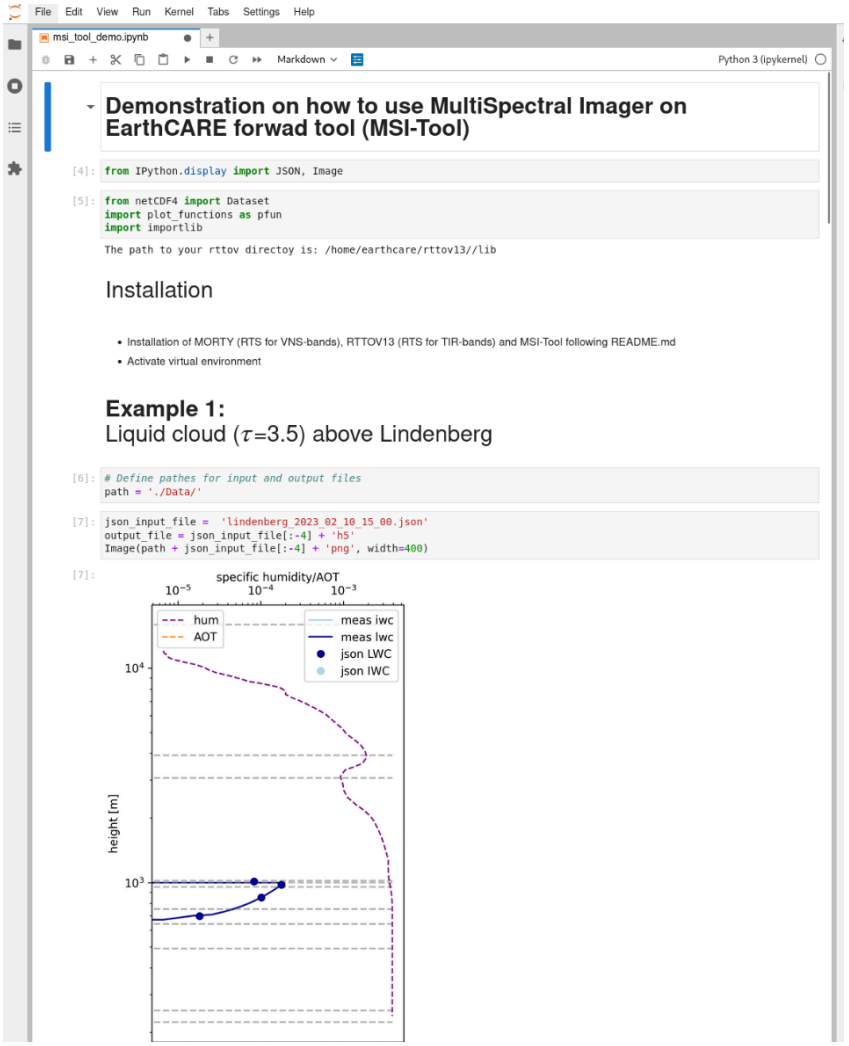


G. Walter, TROPOS

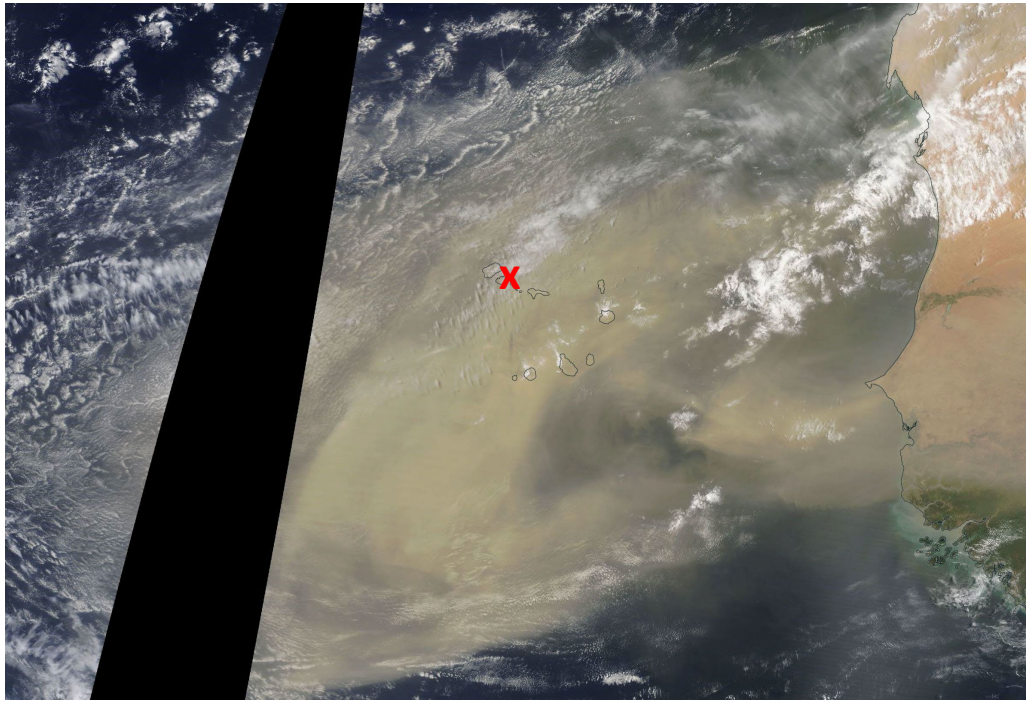
MSI forward tool: Demonstration

- When?
  - Today 17:30 during Demos/Poster Session
- Where?
  - Cook Room
- Download:
  - https://gitlab.com/wew_fub/msi-tool

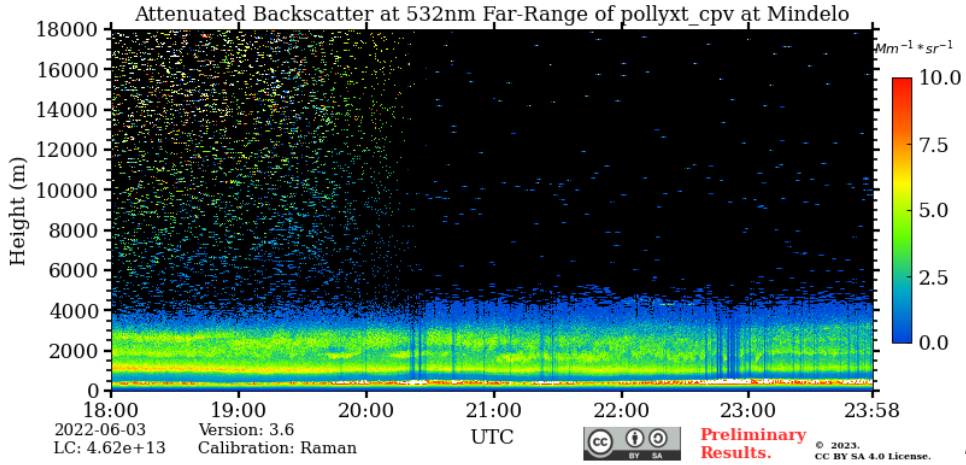
Thanks!



Intense dust outbreak on 3 June 2022

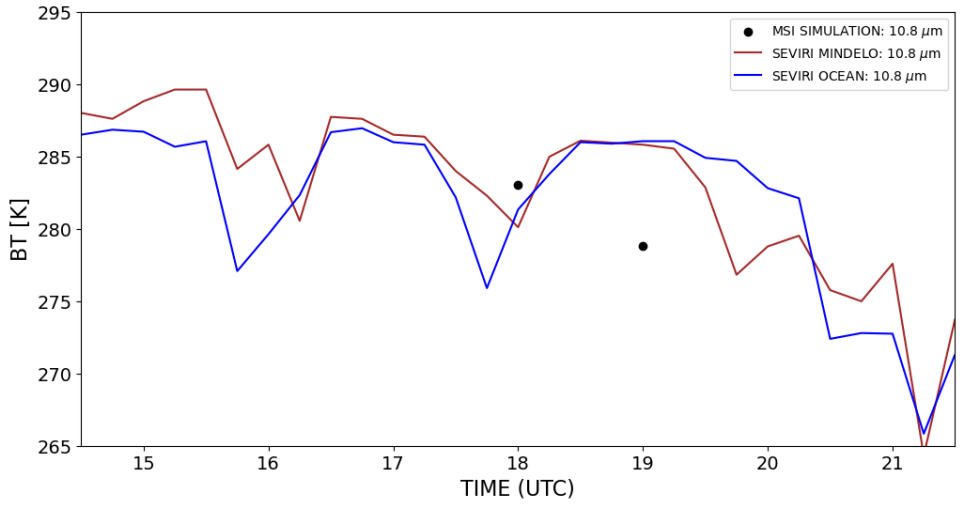


Modis Aqua 3 June 2022, 14:45 UTC
Source: https://www.earthdata.nasa.gov/worldview



https://polly.tropos.de/

- Simulation of strong dust events can help to improve the discrimitation between clouds and aerosol in MSI scenes
- Synergy between MSI and ATLID provides a better picture



Simulated MSI 10.8 micron channel and collocated MSG SEVIRI pixel, courtesy by G. Walter