ALG Comparative analysis of atmospheric RTMs using the Atmospheric Look-up table Generator (ALG) toolbox

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magellium

Introduction:

- **Problem:** Complexity of atmospheric **radiative transfer models** (RTMs), i.e. configuration, execution and interpreting results ➔ difficulties in practical applications and model intercomparison
- **State-of-the-art:** Existing tools do not allow common setup for multiple RTMs and straightforward generation of look-up tables (LUTs)
- **Goal: I)** Present the **Atmospheric Look-up table Generator** (ALG v2.0) ➔ software tool to generate LUTs based on a suite of atmospheric RTMs. **II)** Demonstrate the utility of ALG by comparison of global sensitivity analysis of three atmospheric RTMs (MODTRAN6, libRadtran and 6SV)

Design:

Requirements:

- Expandable with new RTMs
- Versatile and common interface
- Easy setup and LUT generation

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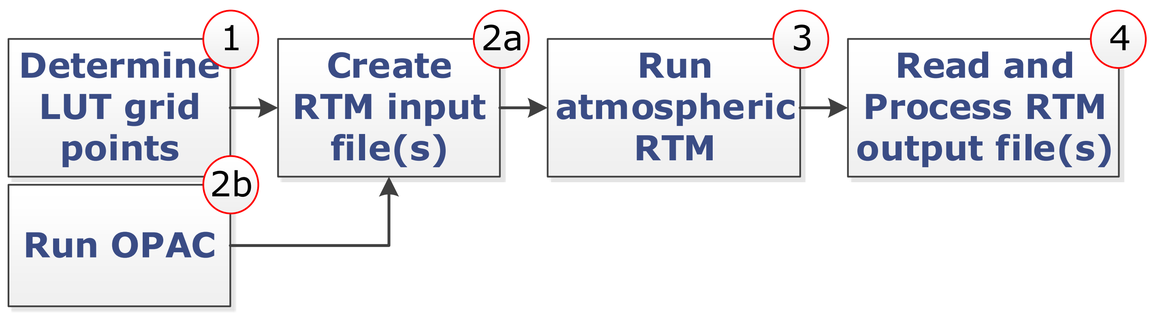
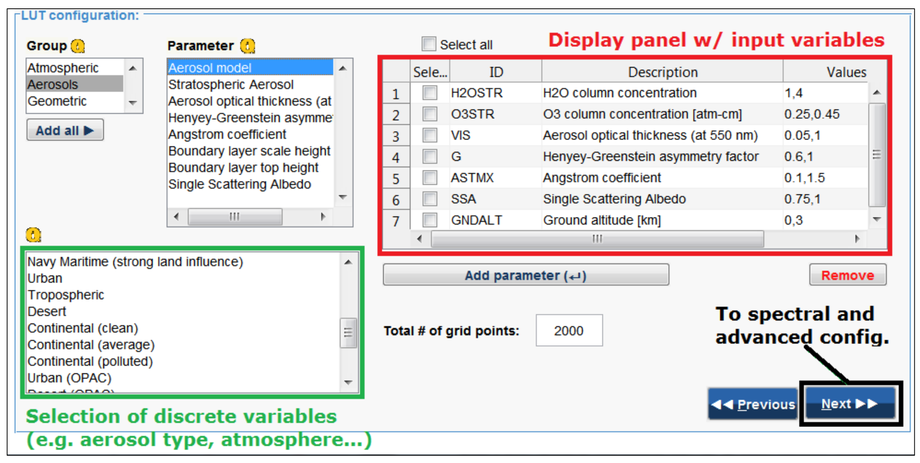
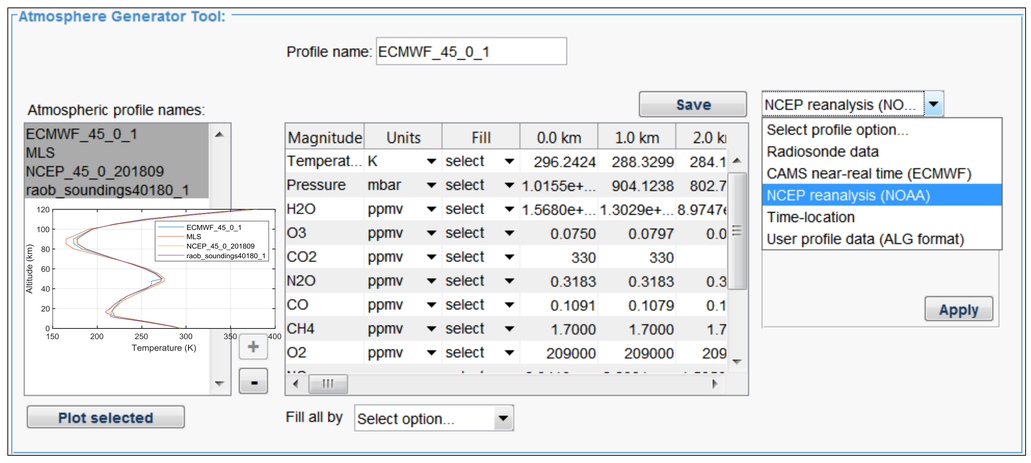
Workflow:

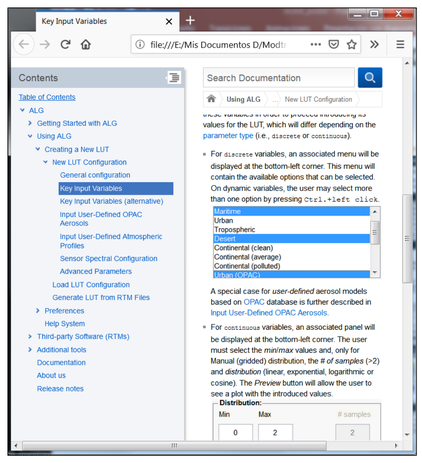


Features and tools:

- Multithreading
- Interface with OPAC aerosol database
- User-friendly user interface
- Versatile model configuration (variables, spectral range, grid points distribution…)
- Additional functions: LUT interpolation, spectral convolution…
- Help system and tutorials
- Tools: Aerosol Toolkit, Atmosphere Profile Generator, Plotting tool

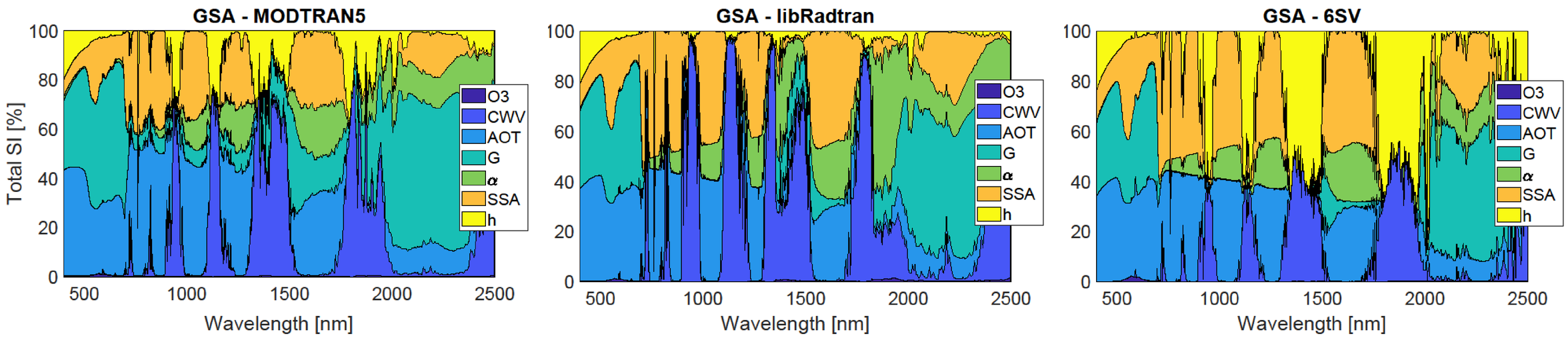






Application example: global sensitivity analysis (GSA) comparison of RTMs

Relative impact of key input variables on the top-of-atmosphere (TOA) radiance



Future work:

- Integration of ARTDECO, SOS-abs, RTTOV…
- Including (i.e. reading) Stokes vector (e.g. 6SV, Mystic…)
- TOA radiance mode (w/ user-defined surface conditions)
- Compatibility with Linux and MacOS

Reference:

Vicent et al., *Geoscientific Model Development*, 188 (in review), 2019 **https://doi.org/10.5194/gmd-2019-188**