

Towards a Generic Radiative Transfer Model for the Earth's Surface-Atmosphere System: ESAS-Light

ESTEC Contract No AO/1-5433/07/NL/HE

WP1400:

Consolidation of requirements for future evolution of libRadtran toolbox

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1 Introduction

On the basis of the literature surveys about radiative transfer tools (Emde et al., 2008a, WP1100 report) and about forward model requirements (Emde et al., 2008b, WP1200 report), the preliminary requirements given in Annex 1 of SoW (2007) have been revised. The requirements of the demonstration version of libRadtran have been consolidated (Emde et al., 2008c, WP1300 report). Most of the requirements given in the SoW (2007) will already be met by the *libRadtran* demonstration version. Some requirements needed to simulate and analyse measurements of current and future ESA missions can not be met within this ESA study. This document lists the requirements that are foreseen to be implemented in the future (after 2009).

2 Future requirements

- Req 1** *libRadtran* shall include a lidar simulator that includes multiple scattering in clouds. This simulator will be based on the Monte Carlo method.
- Req 2** *libRadtran* shall enable the simulation of the interaction of light with water bodies in the VIS-NIR spectral domain.
- Req 3** *libRadtran* shall enable the simulation of the interaction of light with snow and ice.
- Req 4** *libRadtran* shall enable the calculation of Jacobians to be used for inverse modelling.
- Req 5** *libRadtran* shall provide tools for handling various satellite response functions.
- Req 6** *libRadtran* shall enable the simulation of radiative transfer in the Martian atmosphere. It shall provide at least one standard Martian atmosphere (profiles of temperature, pressure and atmospheric gases) to be used as model input.
- Req 7** *libRadtran* shall enable the simulation of radiative transfer in the Venusian atmosphere. As for Mars it shall provide at least one standard Venusian atmosphere as model input.
- Req 8** *libRadtran* shall enable the simulation of radiative transfer in arbitrary planetary atmospheres
- Req 9** *libRadtran* shall have a tutorial for developer users, accessible from the HMI, describing the architecture of the toolbox, how to plug in new functions and how to make modifications to the code.
- Req 10** *libRadtran* shall have a user friendly graphical user interface (GUI) that allows to create input files from a graphical menu. This GUI shall also provide visualization capabilities.
- Req 11** *libRadtran* shall enable the calculation of microwave radiative transfer.

References

- Emde, C., Büll, R., Buras, R., Faure, F., Hamann, U., Kylling, A., Mayer, B., and Meerkötter, R.: WP1100: Literature survey - Radiative transfer tools, Tech. Rep. ESTEC Contract No AO/1-5433/07/NL/HE, Deutsches Zentrum für Luft- und Raumfahrt, Wessling, Germany, 2008a.
- Emde, C., Buras, R., Faure, F., Hamann, U., Mayer, B., and Zinner, T.: WP1200: Literature survey - Needs for current and future forward modelling capabilities for remote sensing, Tech. Rep. ESTEC Contract No AO/1-5433/07/NL/HE, Deutsches Zentrum für Luft- und Raumfahrt, Wessling, Germany, 2008b.
- Emde, C., Hamann, U., Kylling, A., and Mayer, B.: Consolidation of a nominal set of requirements for libRadtran demonstration version, Tech. Rep. ESTEC Contract No AO/1-5433/07/NL/HE, Deutsches Zentrum für Luft- und Raumfahrt, Wessling, Germany, 2008c.
- SoW: Statement of Work: Towards a Generic Radiative Transfer Model for the Earth's Surface-Atmosphere System:ESAS-Light, Tech. Rep. TEC-EEP/2007.180/MB, ESTEC, European Space Agency, 2007.