

Interactive comment on “A new radiation infrastructure for the Modular Earth Submodel System (MESSy, based on version 2.51)” by S. Dietmüller et al.

Anonymous Referee #1

Received and published: 16 March 2016

This well-written paper describes in a clear and concise fashion how the radiative transfer modules are incorporated into ECHAM5 via the Modular Earth Submodel System (MESSy). Although the paper does not present any new science as such it makes a significant contribution to modelling science in that it provides a very clear description on how to incorporate new modules into a climate model.

Therefore I would recommend that this paper is published subject to some very minor reviews, listed below.

C1

1 Abstract

1. Could the author specify that the ECHAM general circulation model (GCM) has been developed by the 'Max-Planck Institut fuer Meteorologie' for clarity purposes.

2 Introduction

1. The authors are mentioning that the long-wave spectrum is divided into 16 bands ranging from 3.33-1000 microns. Could the authors please provide the same information for the UV-Vis and NIR. In section 2.2 it mentions that the UV-Vis band ranges from 250nm-690nm and therefore I would assume that the NIR is covered by three bands which range from 0.69micron to 3.3 microns. But I am not sure that this is the case. This needs to be made clearer.
2. The paper mentions that Rayleigh-Scattering is not considered in the submodel RAD_FUBRAD which looks at the UV-Vis regions at pressure levels below 70hPA, i.e. in the stratosphere and mesosphere. It seems to me that in the stratosphere and mesosphere Rayleigh-Scattering would be one of the most important radiative mechanism. Do the authors mean that the short-wave heating rates are not affected much by Rayleigh-Scattering: or do the submodels RAD and RAD_FUBRAD overlap in pressure levels so that stratospheric and mesospheric Rayleigh-Scattering is treated in RAD. This needs to be clarified.
3. The paper also states that the submodel RAD_FUBRAD does not consider scattering by aerosols and clouds, although stratospheric aerosols are known to have an important radiative effect. Again, do the authors mean that they do not have a large effect on the heating rates? Or are the stratospheric aerosols treated in the

C2

submodel RAD. Do the pressure levels of the submodel RAD and RAD_FUBRAD overlap? This needs to be explained more clearly.

3 Submodel RAD

1. Do the submodels RAD and RAD_FUBRAD overlap in height.
2. Is it possible for the authors to describe the differences between RAD_SHORT_v1 and RAD_SHORT_v2 in more detail.

4 Sub-Submodel RAD_FUBRAD

1. See comment B2 above
2. See comment B3 above
3. As the authors are giving a reference for the Ozone absorption cross sections in the Chappuis bands could they also specify where the other gaseous optical properties are coming from. I assume that they are either based on the HITRAN database or on GEISA.

5 Submodel CLOUDOPT

1. What are the options for cloud overlap?
2. What is the original reference for the ice-crystal optical properties. Are they based on A. Baran or P. Yang optical properties for example or something else.

C3

6 Spelling

1. Section 2.1, line 16: replace USEd by used
2. Section 3.4, line 5 : ... for cloud changes may arise in the context of direct anthropogenic...
3. Section 3.4, line 39: ... with almost arbitrary inputs.

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2015-277, 2016.