

Interactive comment on “Tracers and traceability: implementing the cirrus parameterisation from LACM in the TOMCAT/SLIMCAT chemistry transport model as an example of the application of quality assurance to legacy models” by A. M. Horseman et al.

Anonymous Referee #1

Received and published: 8 January 2010

The purpose of the paper is twofold, yet the two main issues are clearly outlined and non-conflicting. On the one hand, the paper suggests a design process for geoscientific models with standardised development and testing stages. This strategy and the successive development steps are explained by the description of the integration of a cirrus parameterisation (CP) into a chemistry transport model (CTM). Although many readers of the journal may have a rather low background in computer science (CS), the parts of the paper focusing on software engineering and CS-related topics

C493

are written in a style they should be comprehensible to anyone.

On the other hand, the newly developed model combining the CTM TOMCAT/SLIMCAT and the CP LACM is introduced and qualitatively validated. The validation section should be improved as outlined below.

The paper is accepted subject to minor revisions.

General Comments:

The paper give several ideas and advice on how to develop geo-scientific model code paying attention to formal control guidelines (different testing stages, documentation of the model development/versions and so on). This can clearly help researches/programmers designing future model development projects.

Specific Comments:

p.1300, l.27:

Besides the number and shape also the size of the crystals is important for the radiative balance.

p.1302, l11-17: This section is hard to understand when you read it the first or second time. You might split the first sentence into two parts. And the last sentence of this section should start in a new line. Both may make the text clearer.

p.1308, l.11:

In section 2.2.2 you introduced different kinds of testing (unit, integration, acceptance). Do you use the term "tested" here in an unspecific way? If so, please mention it.

p.1308, l14-19:

C494

Do you have two options to calculate the vertical wind? The first based on Prather, the second using on the divergence of the horizontal wind field. Which definition is used here? Add a few words to clarify this.

p.1313, verification section:

In LES the time step is of order seconds if nucleation occurs. What internal time step do you use in the cirrus module? Do you have as small time steps? Do the number of nucleation events and nucleated ice crystals sensitively depend on the time step?

p.1315, l. 7/8:

Lynch, 2002 is a comprehensive book. Can you thus specify the chapter and its according author you refer to? Also give short hints why the comparison is not straightforward.

p.1315/6, Ice parameter comparison:

Do you also assume sphericity like Meerkötter?

Isn't subvisual cirrus unimportant for the comparison of your model results with ISCCP data? Do satellites see subvisual cirrus? The choice of the τ -threshold should be motivated by the detection limit of the satellite detectors, not by a visibility threshold based on humans' vision. I am not sure whether your agreement with ISCCP data will be still reasonable when you raise the threshold to 0.1 or even 0.2? Even for the low threshold of 0.01, Fig. 3 reveals that the patches of tropical cirrus are smaller in the model output than in the ISCCP plots.

Generally, does your reasonable agreement validate mainly the CTM, the model input data or the cirrus parameterisation? This issues must be discussed in the paper.

Section 4.4.1:

This section is o.k., since the described limitations are pointed out in the abstract.

Technical corrections:

C495

p.1305, l.19:

This **is** rarely the context...

p.1311, l.13:

You might replace "parameterisation" by "cirrus parameterisation".

Interactive comment on Geosci. Model Dev. Discuss., 2, 1299, 2009.