

Interactive comment on “The Dynamical Core of the Aeolus Statistical-Dynamical Atmosphere Model: Validation and Parameter Optimization” by Sonja Molnos et al.

Anonymous Referee #1

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I have read this article with interest and not without effort. I think it is a valuable endeavor to try and reduce the complexity of models, both for the stated interest of studying very long time variability, and - I would add - to make the physical processes more transparent and easy to interpret.

This having said, I think the manuscript is very elliptic and suffers a real problem of clarity and presentation. I'm ill at ease because at many times I had real problems of understanding. It can be me, of course, but maybe other readers will be in the same situation.

Equations 3, 4 and 8-10, give a diagnostic value of the 5 variables, given a forcing field of temperature and humidity. These are not prognostic equations, they don't give a

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time evolution, despite what said in section 2.1. This is ok, but then why are figures 1 to 5 “monthly means” : they would each show field diagnosed from the forcing fields specified in section 3. There is a time evolution for the transient kinetic energy u and v and of the momentum flux, $\langle v'u' \rangle$, indeed, so I don't understand how these articulate with the diagnostic equations.

Is the above correct? In any case that's what one understands. If so, it should be stated explicitly. The captions of figures 1 to 5 are a bit in contradiction to this though. If I misunderstood, then the things should be explained better. In fact the 2D equations of Pethoukov et al (2000) for T and humidity are prognostic equations, but they are just mentioned at the beginning. Are you integrating these equations along with the equations of the kinetic energies? This is not what it seems to be implied at page 6 line 5. And also, if so, how does forcing comes in?

As you see these are all very basic doubts that clearly come from a bad structuring of the paper. Note also that the supplementary material is not well articulated with the text. The text should contain enough information to understand the basics (like my doubts above). As for now, the derivation of the equations are divided in the two parts - test and supplement - in a chaotic way. Also note that a section 2 of sup. material is referenced in the text, but it's not in there.

In addition to the clarity problem, which is in itself bad enough to require a major revision of the article, there is another point that is not clear to me. The aeolus model as it is presented has already been published in Coumou et al 2011. Is the coupling with the convection model, or the coupling with the temperature and humidity 2D equations of Pethoukov et al (2000) the novelty? Is it the optimization of parameters? Please state this clearly. I have to say that the optimization does not appear to have such a major impact to me. Note also that the method of optimization (simulated annealing) should at least be schematically described.

Below - as a help - are a few specific indications on clear problems of the text, they are

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not comprehensive at all. The above considerations should also be addressed. After that is done, a more in depth assessment of the scientific interest of the paper will be more doable.

page 2 line 32 “convective plus 3 layer stratiform” What does this mean?

Section S1.2 “With $K_z = 005$ and $\ln(4)$ ” incomprehensible

page 3 of s Supp. mat. at the bottom. Is the independency of the large scale and synoptic waves a reasonable assumption? Comment.

Repetition page 4 sup mat. Paragraphe “The contribution to the vertical...”,

Page 4 of Supp. Mat. The scale analysis attests... have you done the scale analysis, or is taken from literature?

Page 3, eq.3, could we call it geostrophic and thermal and balance?

Page 3, formula for the meridional pressure, where does that come from? Please describe it more carefully.

page 3 line 9 “Supl.Ment”

Page 3 line 25 repetition, reword.

page 4 line 5. In fact the parameters γ and a_q are not at all explained in the table. just listed along with their values.

pag 4 line7 is n_c constant or is it computed? If it is a constant, what's its value?

pag 4 line 9, is U_{sf} the same as $U_{Sprofile}$ in the supplementary material? if so, it is not clearly explained, what does “The additional calculating of $U_{sprofile}$ instead of using the calculated surface zonal velocity is done to avoid instabilities.” mean?

Page 4 last line. There is no S.2 in the supplementary material.

page 5 line 19 “equipartitioned

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in the supplementary material, the explanation of eq.4 is not complete, it is not shown why the introduction of coefficients d_1 , d_2 and d_3 is necessary and how they are chosen.

Note also that the supplementary material is not references, page numbers, line numbers...

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