Geosci. Model Dev. Discuss., 8, C1087–C1089, 2015
www.geosci-model-dev-discuss.net/8/C1087/2015/

Geoscientific Model Development Discussions
Open Access

Interactive comment on "An automatic and effective parameter optimization method for model tuning" *by* T. Zhang et al.

T. Zhang et al.

slnazhangtao@gmail.com

Received and published: 15 June 2015

Dear Referee #1:

Thanks for your comments.

1. Page 3798, line 17, "quit" should be "quite".

Reply: Corrected

2. Page 3801, the sentence in line 16 is a repeat of the 1st sentence on the same page. It should be removed.

Reply: Corrected

3. Page 3802, line 25: This long sentence is not clear. It should be rewritten.

Reply: The sentence has been rewritten as: Two other strategies, a "two-step" method including the initial value pre-processing before the downhill simplex method, and a "three-step" method with an extra step to determine parameters for tuning by sensitivity analysis, are proposed to overcome the inherent ineffectiveness of the downhill simplex method.

4. Line 3804, 2nd paragraph: The physical explanations should be improved. If the model used the stratiform fractional cloud condensation scheme of CAM3 or CAM4 (Zhang, et al. 2003), reducing the "rhminh" threshold will not only increase the cloud amount, but also increase the stratiform condensation rate and decrease the atmospheric humidity. Likewise, increasing the "rhminl" will do the opposite. This is why you see clear opposite changes of RH and CLOUD in the lower troposphere and upper troposphere in Figure 6.

Reply: We thank the reviewer for pointing out this important linkage and the illuminating explanation for Fig. 6. Yes, the stratiform fractional cloud condensation scheme of CAM4 (Zhang, et al.2003) was used in GAMIL2. Accordingly, we have included the following to the model description section on page 3797, line 6 with the rewritten 2nd paragraph on page 3804.

Compared to the previous version, GAMIL2 has modifications in cloud-related processes (Li et al. 2013), such as the deep convection parameterization (Zhang and Mu, 2005), the convective cloud fraction (Xu and Krueger, 1991), cloud microphysics (Morrison and Gettelman, 2008), and the stratiform fractional cloud condensation scheme (Zhang et al. 2003).

With reduced RH threshold for high cloud (from 0.78 in CNTL to 0.63 in EXP, Table 1), the stratiform condensation rate increases and the atmospheric humidity decreases (Zhang et al. 2003). In addition, with increased auto-conversion coefficient in the deep convection, less condensate is detrained to the environment. As a result, mid- and upper-troposphere is overall drier, especially over the tropics where deep convection dominates the vertical moisture transport (Fig. 6a). Although the mid- and upper-troposphere become drier over the tropics, reduced RH threshold for high cloud makes clouds easier to be present. Consequently, middle and high clouds increase over the globe, especially over the mid- and high-latitudes with the largest increase up to 4–5 % (Fig. 6b). In the tropics, due to the drier tendency induced by the reduced detrainment, high cloud increase is relatively small (2–3%) compared to the mid- and high-latitudes. On the contrary, low cloud below 800 hPa decreases by 1–2% over the mid- and high-latitudes with slightly decreased RH because of the negligible change of RH threshold for high cloud (Table 1). Overall, the atmospheric humidity and cloud fraction changes result from combined effects of all relevant parameterizations.

Other issues were not picked up by the reviewer

Page 3800, line 25: The insensitive parameters, ke, capelmt, and c0 of shallow convection, will not be taken into consideration in the next step.

Page 3804, the last paragraph: There is no Fig. 8 in our paper. It should be Fig. 7 here.

Best wishes, zhangtao

Please also note the supplement to this comment:
http://www.geosci-model-dev-discuss.net/8/C1087/2015/gmdd-8-C1087-2015-supplement.pdf

---

Interactive comment on Geosci. Model Dev. Discuss., 8, 3791, 2015.