

Interactive comment on “A subgrid parameterization scheme for precipitation” by S. Turner et al.

Anonymous Referee #3

Received and published: 1 November 2011

The authors describe a parameterization scheme for the subgrid-scale variability of cloud water and precipitation. The scheme is tested against observations and large-eddy simulations for two cases of boundary-layer clouds over the ocean in a SCM framework, and for a precipitation system over Europe simulated with a NWP model. The issue discussed in this study is relevant for improving the skill of atmospheric models, the analysis is comprehensive, and the results show that this parameterization scheme leads to an improved simulation of clouds and precipitation processes. The paper is also in general well written and clear.

I recommend acceptance after some minor corrections.

General comments:

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p1651 l25: does it mean that rain cannot decrease below (e.g., rain evaporation)? Is not it a serious inconsistency which leads to overestimation of rain at the surface? Detail also more what you mean by inconsistencies at line 26.

p1652 l15-20: could you add a schematic?

Could you schematically show the PDFs and their major parameters of Table 2 in some graphic form?

Specific comments: p1644 l4: clouds and precipitation “formation”

p1644 l7: model grid box

p1644 l23: reaches a threshold of 10-12 μm .

P1644 l26: “ALL” cloud droplets?

P1645 l1: ...radius. This depends on the local...

p1645 l7: ... (NWP) and climate models...

p1645 l15: “overcast grid boxes”: what does it imply? Is it relevant?

P1645 l19: add reference

p1645 l23: ...model grid (≥ 50 km), empirical ...

p1646 l1: At larger horizontal resolutions, however, only few clouds occupy the model grid, and simulating....

p1646 l23: cloud formation depends jointly on temperature and humidity through relative humidity...

p1646 l25-27: is the sentence necessary?

p1647 l7: ... of the system with the purpose of increasing the cost....

p1648 l4-8: I would rewrite as: “The horizontal resolution of most of current state-

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of-the-art operational mesoscale forecast models now reaches 1-5 km, which allows to explicitly resolve...". The following sentence "Meteo-France for instance..." is not needed.

p1649 l18: describe how you go from CCN to droplets number.

p1650 l4: not clear. Why?

p1650 l14-15: which are the values of q_{cR} and q_{cM} ?

p1650 l23: give references

p1651 l7-8: not clear

p1652 l12: DM-100 and SM

p1652 l15: "within"? Not clear

p1653 l23: precipitation comparable to the observed amounts, but overall the precipitation...

p1655 l7: why do you chose to show DM-50?

p1655 l10-12: could you comment more on this feature?

p1655 l18-20: this sentence should be moved up in the text

Table 1: given how the discussion is organized in the text (DYCOMS first), I would switch the columns of RICO with those of DYCOMS

Fig. 2: "..., rain water content (), and surface ..."

Fig. 12: when was the simulation initialized (how many hours ahead)? Ouest→ West

Interactive comment on Geosci. Model Dev. Discuss., 4, 1643, 2011.