

## ***Interactive comment on “Simulating deep convection with a shallow convection scheme” by C. Hohenegger and C. S. Bretherton***

**Anonymous Referee #2**

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This paper explores the extension of a shallow convection scheme to represent deep convection. Several precipitation-related modifications, such as those of the subcloud layer TKE, cloud base thermodynamic properties, and entrainment/detrainment rates are added to the UW shallow convection scheme. The new additions and their parameters are guided by cloud-resolving simulations (CRM), and the new parameterizations are tested against the CRM simulations as well. The paper is well written and a welcome contribution to the effort of developing unified convective schemes that cover both shallow and deep convection and can be published in ACP with only minor revisions.

1. There seems to be some synergy between this paper and that by Brian Mapes and Richard Neale on adding an org variable to the UW scheme. It would be useful to discuss potential connections.

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2. It seems the role of PBLH in Eq. 1 is in determining the potential energy that is released by the evaporation of precipitation: the longer the downdraft can go the more potential energy is released. But at the end of section 3.1.1, it is said that the effect of the stabilization of the PBL is also expressed by the use of PBLH in Eq. 1. The latter role seems different from the first role. Could you clarify this a bit more?

3. Eq 2 and Fig. 4: Does the data support a second-order polynomial fit? Why not just a linear fit?

4. Eq. 3. The anchor points are defined in terms of fixed height. Shouldn't they vary from one place to another? For example, if one considers ice processes to be important, the 0C line would vary from one latitude to another.

5. Pg. 19, line 14. How is the mixing rate diagnosed in SAM?

6. Pg. 20, line 15, the relative humidity threshold for the onset of stratiform cloud formation is not discussed in the paper. A brief description of what it does and the rationale would be useful.

Technical comments:

Fig. 3, the green lines are too thin and a little hard to see in some places.

Pg 13, line 1, pro bin -> per bin?

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