

## ***Interactive comment on “A critical humidity threshold for monsoon transitions” by J. Schewe et al.***

### **Anonymous Referee #2**

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The authors applied a simple model of Levermann et al. (2009, PNAS) to show that it displays a threshold behavior depending on ocean specific humidity. The simple model, however, has two major flaws. The choice of vertical layers to define  $q_L$  and  $q_0$  is also questionable. For these reasons, I recommend rejecting the paper. The threshold idea is interesting and worth exploring. I encourage the authors to revamp the model and redo all the analysis. A retraction of the PNAS paper is in order in light of these fundamental flaws in their model.

Major concerns 1. The authors did not derive Eq. (1) in this or the PNAS paper. It does not seem right. Where is the dry adiabatic term due to vertical temperature advection, which balances the diabatic terms to first order? By contrast, horizontal advection is secondary in the tropics. The landward flow is for 1000-850 hPa. How does it advect

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temperature in the entire atmospheric column?

2. Eq. (3) was never derived either. In the tropics including monsoon regions, moisture convergence, neglected in Eq. (3), dominates over moisture advection. Why was the dominant term neglected? The choice of vertical layers for  $q_0$  (1000-600 hPa) and  $q_L$  (1000-400 hPa) is mutually inconsistent. Why is the moist layer set thinner over ocean than over land? Is it to ensure  $q_0 - q_L > 0$ ?

The above flaws are fundamental and render the rest of the paper meaningless. Figures 1-4 are almost identical to Levermann et al. (2009).

### Other comments

1. The authors appear unfamiliar with recent studies of South Asian monsoon dynamics. Some examples are Bordoni & Schneider (2008, Nature Geosci.), Prive & Plumb (2007, JC), Chou, Neelin & Su (2001, QJ).

2. The East Asian monsoon is more complicated than the South Asian monsoon, non-local and affected by the westerly wind jet. The authors' approach needs substantial change for East Asia. See Sampe & Xie (2010, JC).

3. Line 26, page 1748. The notion of wind speed increase under global warming has been recently challenged (Wentz & Ricciardulli 2011, DOI:10.1126/science.1210317)

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