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Geoscientific Model Development Discussions

Interactive comment on "An axisymmetric non-hydrostatic model for double-diffusive water systems" *by* Koen Hilgersom et al.

Anonymous Referee #1

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This paper develops an axisymmetric non-hydrostatic model for simulating double-diffusive processes. The governing equations, numerical schemes and test cases are clearly presented. However, I have few major concerns as follows:

1. It is not clear what the main objectives are in the paper. The test cases are 2DV. Why do you have to solve the equations in cylindrical coordinates? The reason for developing a non-hydrostatic model in cylindrical coordinates should be clearly stated.

2. To my knowledge, double diffusion is sensitive to turbulence models. Usually large-eddy simulations are conducted to capture the instability. However, no turbulence model is presented in the paper.

3. The sensitivity of the numerical results on grid should also be discussed. Since the numerical diffusion would contaminate the physics.

4. eq. (12): in 2DV and 3D models, bottom friction is usually accounted for through a bottom roughness. Chezy coefficient is often used in 2DH models. Why do you choose Chezy coefficient instead of bottom roughness? How does this coefficient affect your results?

5. theta is used for the tangential direction in section 2.1. However, this becomes alpha in section 2.3. Please make it consistent throughout the paper.

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