

Review of Lake-Mountain synergy in convective clouds and precipitation over the Tibetan Plateau: a large-eddy simulation study egusphere-2026-869

Editor comments:

In the statement, “we use the base-state and perturbation fields directly output by CM1. A model variable can be expressed as $\phi(t,z,x,y) = \phi_0(t,z,x,y) + \phi_{\text{pert}}(t,z,x,y)$, ...,” the authors should explain more clearly how the base-state and perturbation fields are defined in CM1. In particular, they should describe what constitutes the base state in the model and how the perturbation field is computed relative to that base state. The relationship among the total, base-state, and perturbation fields should be specified clearly enough that the decomposition can be understood from the manuscript without relying on knowledge of CM1's internal implementation.

The functional dependence of the base-state field should also be verified and reflected correctly in the equation. If the base state is independent of time, t should not appear as an argument of ϕ_0 . Likewise, given that the LES is initialized with conditions homogeneous in the y direction, the authors should clarify whether the base state is also independent of y , and, more generally, which coordinates the base state actually depends on. The notation should be revised accordingly.

I also recommend using the more conventional ordering (x,y,z,t) , rather than (t,z,x,y) , throughout this discussion.

Reply: (1) In CM1, the base state is specified by the initial atmospheric sounding and background wind profile, with the thermodynamic reference state in hydrostatic balance. In our idealized simulations, these prescribed profiles are horizontally homogeneous and remain fixed throughout the simulation. Thus, the base-state fields depend only on physical height z and are independent of x , y , and t .

The perturbation fields are defined as deviations of the simulated total fields from the prescribed base state at the same physical height. For example, the zonal wind perturbation is calculated as

$$u_{\text{pert}}(x, y, z, t) = u(x, y, z, t) - u_0(z)$$

where u is the total zonal wind and u_0 is the prescribed background wind. The same decomposition applies to potential temperature.

(2) The random potential temperature perturbations introduced at initialization do not modify the

prescribed base state but allow three-dimensional variability to develop in the atmospheric fields. Thus, the base state remains homogeneous in the y -direction, whereas the perturbation fields vary in all three spatial dimensions.

(3) We have clarified these definitions in Section 2.4.1 and revised the equation as follows:

$$\phi(x, y, z, t) = \phi_0(z) + \phi_{\text{pert}}(x, y, z, t)$$

The coordinate ordering has also been changed to (x, y, z, t) , as suggested. (Lines. 212-223)