Revisit of the fixed anvil temperature hypothesis from nonhydrostatic global simulations

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The applicability of the fixed anvil temperature (FAT) hypothesis is examined using data of a global nonhydrostatic model, focusing particularly on high cloud size dependency. Decomposition of outgoing-longwave radiation (OLR) into three components, including cloud top temperature (TCT), upward cloud emissivity (ε), and clear-sky OLR (FCLR), reveals that the relative contributions of these three components to changes of OLR are highly dependent on cloud size. That is, the FAT hypothesis is applicable only for smaller clouds, because the contribution of TCT by those clouds is small, and ε is more important. In contrast, for larger clouds, the contribution of ε is comparable to that of TCT, and thus, both components are equally important. FCLR slightly reduces OLR but shows dependence on cloud size. We will further discuss the latest results from subsequent nonhydrostaic global simulations.