

Vertical grid spacing necessary for simulating tropical cirrus clouds

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The distribution of simulated cirrus clouds over the tropics is affected by the particular model's vertical grid spacing. To examine this effect, we use a high-resolution atmospheric general circulation model NICAM with 28-km and 14-km horizontal meshes. We show that a vertical grid spacing of at least 400 m is necessary to resolve the bulk structure of cirrus clouds. As one reduces the vertical grid spacing below about 1000 m, the visible cirrus cloud fraction decreases, the cloud thins (optically and geometrically), the cloud-top height lowers, and consequently, the OLR increases. These effects are stronger over the tropics. When using a vertical grid spacing of 400 m or less, the vertical profiles of effective radii and ice water content converge toward measurements (CloudSat satellite and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation).

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