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Modeling of the Melting Layer.

Part I: Dynamics and Microphysics

Abstract

This paper introduces a numerical model developed to provide a comprehensive description of the finescale dynamical and microphysical structures within the atmospheric melting layer. The researchers integrated a bulk microphysics module into a nonhydrostatic, fully compressible dynamic framework, ensuring that dynamic, thermodynamic, and microphysical processes are fully coupled. The scheme tracks five water categories, specifically characterizing melting snow through its water content and the diameter of the snowflake. Key features include parameterizations for fall velocities based on laboratory data and size-dependent ventilation coefficients. Simulation results demonstrate that horizontal nonuniformity in snow content triggers variable melting rates and cooling, leading to the generation of convective cells and small-scale wind perturbations. Additionally, the model highlights that latent heat from condensation significantly influences the melting process. By bridging the gap between detailed 1D models and coarse mesoscale models, this work enhances the interpretation of radar-derived brightband parameters

Keywords:

Melting Layer 、 Stratiform

Reference:

Szyrmer, W., and I. Zawadzki, 1999: Modeling of the Melting Layer. Part I: Dynamics and Microphysics. *J. Atmos. Sci.*, **56**, 3573–3592, [https://doi.org/10.1175/1520-0469\(1999\)056<3573:MOTMLP>2.0.CO;2](https://doi.org/10.1175/1520-0469(1999)056<3573:MOTMLP>2.0.CO;2).