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Total Heating Characteristics of the ISCCP Tropical and Subtropical Cloud Regimes

Abstract

To investigate the characteristics of diabatic heating associated with various cloud mixtures, this study categorizes tropical and subtropical cloud activities into eight distinct weather states, ranging from mesoscale convective systems (MCS) to marine boundary layer cumulus, using the International Satellite Cloud Climatology Project (ISCCP) gridded dataset. Subsequently, composite profiles of the apparent heat source Q_1 and moisture sink Q_2 are calculated based on sounding data obtained from field campaign observations corresponding to each cloud regime.

Furthermore, the results for convective systems reveal significant heating throughout the entire troposphere, with the peak heating influenced by stratiform rain. In contrast, the profiles of shallow clouds indicate a role in low-level moistening while exhibiting cooling effects across the troposphere. In addition to analyzing the heating profiles, the study also calculates the heating distribution, constructed using frequency-weighted averages, to illustrate its potential for further research.

Keywords

Apparent Heat Source

Moisture Sink

Reference

Stachnik, J. P., Schumacher, C., & Ciesielski, P. E. (2013). Total Heating Characteristics of the ISCCP Tropical and Subtropical Cloud Regimes. *Journal of Climate*, 26(18), 7097-7116. <https://doi.org/10.1175/JCLI-D-12-00673.1>