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Cloud Top Ascent Speeds during SMOCC

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A study was undertaken in SMOCC to examine the strength of vertical air motions in convective clouds during the transition period from dry season to wet season. Over this transition period (September-November, 2002), the cloud condensation level at midday descends from the mid-troposphere (strongly continental conditions) to levels of order 500 m characteristic of the 'green ocean' regime (pronounced maritime conditions) of the wet season. The main goal of this study was to test the idea that updraft width and the efficiency with which CAPE (Convective Available Potential Energy) is transformed to updraft kinetic energy scales with the cloud base height (Williams and Stanfill, 2002). Theodolite measurements of cloud tops were integrated with theodolite and thermodynamic (via surface relative humidity) measurements of cloud base height to determine cloud top ascent speeds. Nearby thermodynamic soundings were acquired on the same days to provide measurements of CAPE, at 12 UT, 15 UT, 18 UT and 21 UT. Results show that the cloud top ascent speeds increase roughly as D1/2, where D is the cloud depth, consistent with simple predictions for spherical 'bubbles'. Results also show that larger ascent speeds are observed, on average, when the relative humidity is low than when it is high. CAPE is useful as a control parameter on ascent speed. Comparisons will be presented as they are available.

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