



Measurements of the interaction between turbulence, microphysics, and water vapour in cirrus clouds

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The EMERALD-1 airborne campaign to investigate cirrus clouds was conducted at Adelaide, Australia during September 2001. This involved the Egrett aircraft flying within cirrus clouds for in situ measurements of ice crystal properties, water vapour, and turbulence. A second aircraft, the King Air, flew directly below the Egrett with an upward viewing lidar that mapped the structure of the clouds. Results are presented here that show the interaction between turbulence, humidity, ice crystal nucleation and sublimation. The maximum intensity of turbulence was measured at the top and bottom edges of the cloud, where ice crystals were either forming or sublimating. At the cloud top the largest ice crystal concentrations were associated with the greatest turbulence intensity. The distribution of relative humidity over ice had a median value of about 105 % in the regions with greatest crystal concentration and turbulence intensity. Here the width of the RH_i distribution was inversely proportional to the crystal concentration. The RH_i distributions were approximately Gaussian in form and did not exhibit skewing toward supersaturation.