cloud supersaturations and CCN spectra

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Multiple regression analysis predictions of low altitude cloud droplet concentrations based on measured CCN spectra compared much better with measured low altitude droplet concentrations than various CCN concentrations at single supersaturations (S) in two aircraft cumulus cloud projects, RICO and ICE-T. The addition of vertical velocity (W) to the single and multiple regressions showed small improvements. For RICO the multiple regression correlations were also superior to previous adiabatic model predictions of droplet concentrations also based on CCN spectra and mean W. More adiabatic cloud parcels showed only slightly better correlations than flight-averaged droplet concentrations. Results show the value of more extensive CCN spectra and the relative unimportance of W variations for determining droplet concentrations in these Caribbean cumuli. The fact that flight-averaged droplet concentrations of all low cloud data was almost as well correlated with CCN spectra as were droplet concentrations of more adiabatic cloud parcels indicates that entrainment did not significantly perturb CCN-droplet concentration relationships.

As should be expected higher cloud S were determined for the cumulus clouds than for stratus clouds. Suppression of cloud S by higher CCN concentrations that had previously been observed in stratus was observed in ICE-T but not in RICO where the CCN range may have been too low for cloud S suppression. But ICE-T and a stratus project, POST, even showed this S suppression over the same limited maritime CCN range as RICO.