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Influences of near-surface stratification for aerosol impact on clouds over the East China sea

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Cloud microphysical properties and aerosol concentrations were measured aboard an aircraft over the East China Sea and Yellow Sea in April 2009 during the Aerosol Radiative Forcing in East Asia (A-FORCE) experiment. We sampled stratocumulus and shallow cumulus clouds over the ocean in 9 cases during 7 flights 500?900 km off the east coast of Mainland China. Cloud droplet number concentration (highest 5%, Nc_max) correlates well with the accumulation-mode aerosol number concentration (Na) below the clouds. Nc_max correlates partly with near-surface stratification evaluated as the difference between the sea surface temperature (SST) and 950-hPa temperature (SST ? T950). Cold air advection from China to the East China Sea was found to bring not only a large number of aerosols but also a dry and cold air mass that destabilized the atmospheric boundary layer, especially over the warm Kuroshio ocean current. Over this high-SST region, greater updraft velocities and hence greater Nc_max likely resulted. We hypothesize that the low-level static stability determined by SST and regional-scale airflow modulates both the cloud microphysics (aerosol impact on clouds) and macro-structure of clouds (cloud base and top altitudes, hence cloud liquid water path).

Keywords: aerosol, cloud, SST, Kuroshio Ocean current, East Asia