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Quantifying loss of CCN by wet scavenging processes during ITCT-2K4

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Aerosol-precipitation interactions are complex. While accumulation-mode aerosols theoretically suppress the formation of precipitation, precipitation can also suppress aerosol concentration through wet scavenging processes. Low aerosol concentration measurements may be due to wet scavenging or due to physical mixing with cleaner air masses. The aerosol concentration measurement alone is insufficient to separate these two effects. We show that using ratios of soluble and insoluble trace gases provide a useful indicator for identifying air masses that have been wet scavenged. For this purpose, we use ratios of nitric acid (HNO3) and acetic acid (CH3COOH) scaled to NOx (NO+NO2). HNO3 and CH3COOH, respective tracers of anthropogenic and biogenic activity, are highly soluble and removed efficiently by wet scavenging. NOx is insoluble and has a lifetime of several days against oxidation. We use observed ratios of HNO3/NOx and CH3COOH/NOx and precipitation from the NOAA WP-3D aircraft during ITCT-2K4 to estimate the extent to which cloud condensation nuclei are removed by precipitating clouds.