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PARTICLE NUCLEATION AND GROWTH PRECURSORS

F. L. Eisele, A. Jefferson, D. J. Tanner, R. L. Mauldin, R. J. Weber, J. J. Marti, and P. H. McMurry

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The nucleation and growth of particles in the troposphere is not well understood but is gaining increasing attention in a variety of areas of atmospheric science. At least two major gaps exist in our knowledge of both of these processes. Neither the growth nor nucleation mechanisms are well understood and the precursors required for either of the latter processes are ill defined. One thread common to both processes is that they are each thought to involve the incorporation of sulfuric acid. Thus, recent measurements of sulfuric acid vapor will be discussed, along with new insight gained by combining these measurements with those of ultrafine particles during several recent field campaigns. The applicability of bimolecular nucleation theory to tropospheric aerosols formation is questioned and new insight into particle growth via H_2SO_4 incorporation is presented. A second important particle growth precursor in the marine troposphere is thought to be methane sulfonic acid (MSA). While probably not involved in particle nucleation, this DMS oxidation product is commonly found in marine aerosols. Temporal and vertical profiles of gas phase MSA have also recently been measured and will be displayed and discussed. Unexpectedly high concentration of MSA found in several thin, dry, free tropospheric layers provide new insight into the partitioning of MSA. The potential role of hydrocarbons as particle growth precursors will also be discussed.