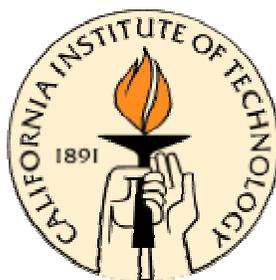# STUDIES with the AEROSOL MASS SPECTROMETER

Thesis by

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Abstract

Fast time-response of the Aerodyne Aerosol Mass Spectrometer (AMS) makes it a well-suited instrument for ambient field measurements. On the other hand, laboratory chamber experiments provide the opportunity to study a specific system in a more controlled environment. The goal of this thesis is to provide a summary of laboratory and field measurements using the AMS.

During laboratory chamber photooxidation experiments of diiodomethane (CH_2I_2), particle nucleation was observed at CH_2I_2 concentrations down to 15 ppt, which is comparable to the total gas-phase iodine species measured at coastal areas. Iodine oxides and oxyacids were observed in the aerosol mass spectra obtained by the AMS, consistent with the known gas-phase chemistry.

Airborne measurements by the AMS during the ACE-Asia field study revealed that the non-refractory submicron aerosols in the pollution layers of the boundary layer up to 3700 m were mainly composed of sulfate, ammonium, and organics. These pollution plumes originated primarily from urban and industrial areas of China and Korea.

The laboratory chamber experiments of oxidation of cycloalkenes, terpenes, and *m*-xylene provided the opportunity to study the Secondary Organic Aerosol (SOA) forming potential, i.e., yield, and determine SOA effective density and chemical composition. Evidence of acid-catalyzed heterogeneous chemistry in the ozonolysis of α-pinene was observed since the total AMS organic mass during the experiments with acidic seed particles had a greater contribution of higher molecular weight fragments. The mixtures of SOA compounds produced from similar precursors studied resulted in broadly similar

AMS mass spectra. Thus, fragmentation patterns observed for biogenic vs. anthropogenic

SOA can be potentially useful in determining the sources of ambient SOA.

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