Objectives

• Study transport of CBL DMS through clouds

• Study the distribution of $SO_2$ in and around clouds

• Estimate loss of $SO_2$ in clouds using DMS and other conservative tracers

• Study CCN formation around clouds
Atmospheric Pressure Ionization Mass Spectrometry (APIMS)

- ions are formed by ion-molecule reactions initiated by electrons emitted by nickel-63

- DMS is determined using proton transfer ionization to form DMSH⁺

- SO₂ is determined as SO₅⁻ formed by reactions initiated with ozone, carbon dioxide, and oxygen

- ion-molecule reactions are fast: leads to high rate determinations with ambient species and internal standard alternately measured (25 samples per second for each ion)

- calibration is achieved with isotopically labeled internal standards: deuterated DMS and \(^{34}\)SO₂
Advantages of the internal isotopically labeled internal standard

- *calibration for every sample*

- *determination of the ambient analyte without knowing the instrument absolute sensitivity*

- *can determine the lower limit of detection for every sample*

- *internal standard acts as a carrier for low concentrations of the analyte*

Combined effect: *can determine DMS and SO$_2$ both in and out of cloud with high precision and accuracy at high rates*