Abstract:

Aerosols and their effect on the radiative properties of clouds contribute one of the largest sources of uncertainty to the Earth’s energy budget. Many current global assessments of atmospheric aerosol radiative forcing rely heavily on remote sensing observation; therefore, in situ aircraft and ground-based measurements are essential for validation of remote sensing measurements. Cavity ringdown spectrometers (CRD) measure aerosol extinction and are commonly used to validate remote sensing
observations. These instruments have been deployed on aircraft based platforms over
the years thus providing the opportunity to measure these properties over large areas in
various conditions. However, deployment of the CRD on an aircraft platform has
drawbacks. Typically, aircraft based CRDs draw sampled aerosol into a cabin based
instrument through long lengths of tubing. This limits the ability of the instrument to
measure:
1) Course mode aerosols (e.g. dust)
2) Aerosols at high relative humidity (above 90%)
Here we describe the design of a novel aircraft based open path CRD. The open path
CRD is intended to be mounted external to the cabin and has no sample tubing for
aerosol delivery, thus measuring optical properties of all aerosol at the ambient
conditions. However, the design of an open path CRD for operation on a wing-mounted
aircraft platform has certain design complexities. The instrument’s special design
features include 2 CRD channels, 2 airfoils around the open Path CRD and a configuration
which could be easily aligned and rigid at the same time. This novel implementation of
cavity ringdown spectroscopy will provide a better assessment of the accuracy of remote
sensing satellite measurements