Interdisciplinary Renewable and Environmental Chemistry REU Project Description

Cloud Condensation Nuclei Measurements

Mentors: Delene (Atmospheric Science, Bowman (Chem. Eng.)

Cloud condensation nuclei (CCN) are particles that water vapor condenses onto to form cloud droplets. The size and chemistry of a particle determines if it will act as a CCN for a droplet at a particular supersaturation environment. The concentration of CCN are very important in precipitation formation processes. On-going research projects use CCN counters to conduct aircraft, surface and chamber measurements. In collaboration with these projects students will learn how to conduct CCN measurements, analyze CCN measurements along with other aerosol and cloud measurements, and conduct laboratory calibration of CCN counters. Interpretation of aerosol measurements will focus on understanding the impact of aerosol chemistry on particle hygroscopicity and CCN behavior, e.g., differences between inorganic (ammonium sulfate) and organic carbon (exhaust emissions), and on CCN instrument performance.

Website for Atmospheric Air Quality Monitor Laboratory

Mentors: Delene (Atmospheric Science), Bowman (Chem. Eng.), Kubatova (Chemistry)

Poor air quality impacts human health and can result in premature death. Monitoring particular matter (PM) and important atmospheric gases (Ozone, Sulfur Dioxide, and Nitrogen Oxides) are important for understanding, modeling and forecasting air quality. A summer project will focus on the setup of a Website that provides continuous data from the air quality instruments setup in the Clifford Hall 430 lab in Grand Forks, North Dakota. Automatic data handling will be used to process, analyze and make available measurements from the air quality lab in real-time. Analysis will be conducted to compare the lab's measurements to the North Dakota network of monitoring sites.

Calibration of Air Quality Monitoring Instruments

Mentors: Delene (Atmospheric Science), Bowman (Chem. Eng.), Kubatova (Chemistry)

Poor air quality impacts human health and can result in premature death. Accurate measurements of particular matter (PM) and important atmospheric gases (ozone, sulfur dioxide, and nitrogen oxides) are important for understanding, modeling and forecasting air quality. A summer project will focus on the calibration of air quality instruments (particular matter sampler, Ozone Analyzer, sulfur dioxide analyzer, and nitrogen oxides analyzer). Performance checks will be conducted to determine if instruments are operating within their quoted uncertainties. Quality assurance procedures will be established to ensure the collected data is suitable for analysis.