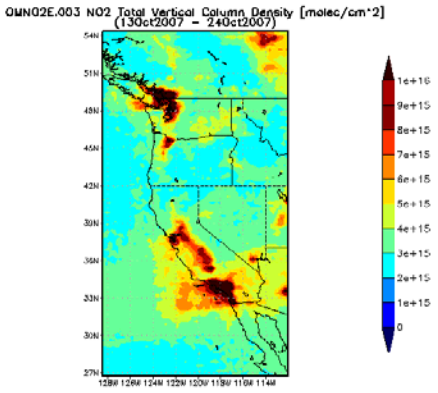
Senior thesis opportunities in Atmospheric Chemistry, 2008-2009

The Big Picture: Studying air quality – climate interactions via combustion-released NO_x (=NO + NO_2) effects on atmospheric aerosol production and chemical composition.

Project Area 1: Measurements of aerosol chemical composition

We will filter-sample aerosol in a variety of NO_x -influenced and non- NO_x -influenced locations (downtown Portland, power plant outflow, forested region nearby) at various times (seasons, day/night). The collected aerosol will then be analyzed using FTIR, GC-MS, HPLC, and/or NMR, with particular focus on the nitrate component of the aerosol. With inputs of NO_x and O_3 from available air quality datasets, we will interpret the differing chemistry of formation of aerosol in these various locations.

Hi-vol aerosol sampler



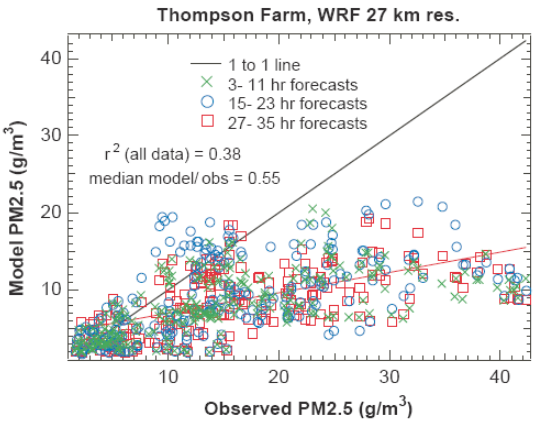
Satellite NO_2 measurements

Project Area 2: Satellite aerosol/NO_x data analysis

We will use satellite NO_2 (NASA OMI) and aerosol (NASA MODIS) measurements to look in regions around urban areas for correlations between NO_2 and total aerosol loading, to assess whether in general high NO_x leads to enhanced or depressed aerosol formation. We will interpret these correlations with proposed chemical mechanisms.

Project Area 3: Regional modeling of aerosol/NO_x

We will use the Weather Research and Forecasting Model with Atmospheric Chemistry (WRF-Chem) to simulate the chemistry of aerosol formation in the Portland urban plume and/or Pacific Northwest region. In particular, we will investigate varying scenarios of NO_x effects on aerosol production, and compare model results to ground-based aerosol measurements or satellite data.



Measured vs. modeled fine particulate matter

Email Prof. Juliane Fry for a more detailed description of these projects: fry@reed.edu
I will be at Reed starting August 25, 2008, and would like to mentor 1 or 2 thesis students.