ATM515 **Aerosol Physics**, Fall 2015

Instructor: Prof. Fangqun Yu; CESTM-L208, (518) 437-8767; fyu@albany.edu

**Time & Room:** TuTh 11:45AM - 1:05PM, ESB13  
**Office Hour:** Email me to set up appointments (preferred) or just stop by my office  
**Prerequisite:** Physics; Differential equations

**Course Description:**  
This course will introduce the aerosol fundamentals, the physical processes controlling the properties of aerosols in the atmosphere, and the climatic, chemical, and health effects of atmospheric aerosols. Some recent research advancement in the fields relevant to aerosol physics will be covered as well.

**Text Book/References:**  
Atmos. Chem. and Phy. - Seinfeld & Pandis, 1998  
Relevant journal papers, reports

**Grading Criteria**  
- **Homework:** 30%  
- **Mid-term examination:** 30%  
- **Term project presentation:** 20% (15%+5%)  
- **Term paper:** 20%

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**Introduction, Characterization of Aerosols**  
- Overview  
- Size distributions and statistics; Moment representation; Compositions  
- Aerosol optical properties and observations

**Aerosol Physics**  
- Dynamics of single aerosol particles (Stokes’ law, Brownian motion, deposition, effect of external forces)  
- Thermodynamic of aerosols (Basic principles, equilibrium, Kelvin/solution/charge effects)  
- Nucleation – from molecular clusters to nanoparticles (Theories, laboratory studies, and field measurements)  
- Condensation/evaporation (Diffusion, mass transport, kinetic/transition/continuum regimes)  
- Dynamics of aerosol populations (Coagulation, Mixing states, Coating)  
- Aerosol modeling (Dynamic equations, numerical schemes, box model, 3-D model, case study)

**Environmental Effects of Atmospheric Aerosols**  
- **Climate effect:** Tropospheric aerosols; Aerosol direct and indirect radiative forcing; Aerosol-cloud-climate interaction  
- **Chemical effect:** Stratospheric aerosols; Heterogeneous reaction, PSCs and ozone hole  
- **Health effect:** Urban aerosols; Ultrafine particles; Haze; Medical study; EPA PM standard