

Course 8802

Cloud, Aerosols, and Climate

- **Instructor:** Prof. Irina N. Sokolik
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- **Meeting Time:** Mondays 12:05 - 1:55 PM
- **Meeting Place:** L1175
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- **Office hours:** by appointment

Course Summary

This course will review the state of the clouds, aerosols and climate sciences, focusing on the major long-standing and emerging problems in the field. Discussion topics will cover fundamentals of interactions among aerosol, clouds and climate; current state and challenges in quantifying the impacts of clouds and aerosols on the Earth's energy balance, hydrological cycle, and major biogeochemical cycles; and linkages within the Earth systems (coupling and feedbacks). The course examines the regional and global impacts of wildfires, dust storms, volcanic eruptions, biogenic aerosol, Arctic haze, and urban&industrial pollutants.

The course evaluation will be based on (1) participation in class discussion, and (2) class paper.

Course organization

- What this course is about?
- How this course is organized?
- Major expectations

What this course is about

- The course is designed to provide fundamentals of aerosol and clouds, including their major sources, various properties, transport and lifecycle in the atmosphere, and diverse impacts.

How this course is organized

- The course consists of a set of lecture materials, computer modeling/data analysis labs, papers review, class projects & presentations (40 min + questions), no final exam.
- Your grade will be determined based on the overall performance as outlined above.

Lecture materials

- Lectures will be posted on the class website before each class:
http://irina.eas.gatech.edu/EAS8802_Fall2016/
- Supplemental materials will be posted on the class website
- Please print and review lecture materials before coming to the class.

Computer Labs

- Computer labs will be designed to provide you with hands-on experiences working with the data/or running the models.
- All labs will be available on the course website (Fortran source code).
- The time to perform your lab is about one week. The time will be assigned to each lab.
- Your written lab report should include full written answers to the problem provided.

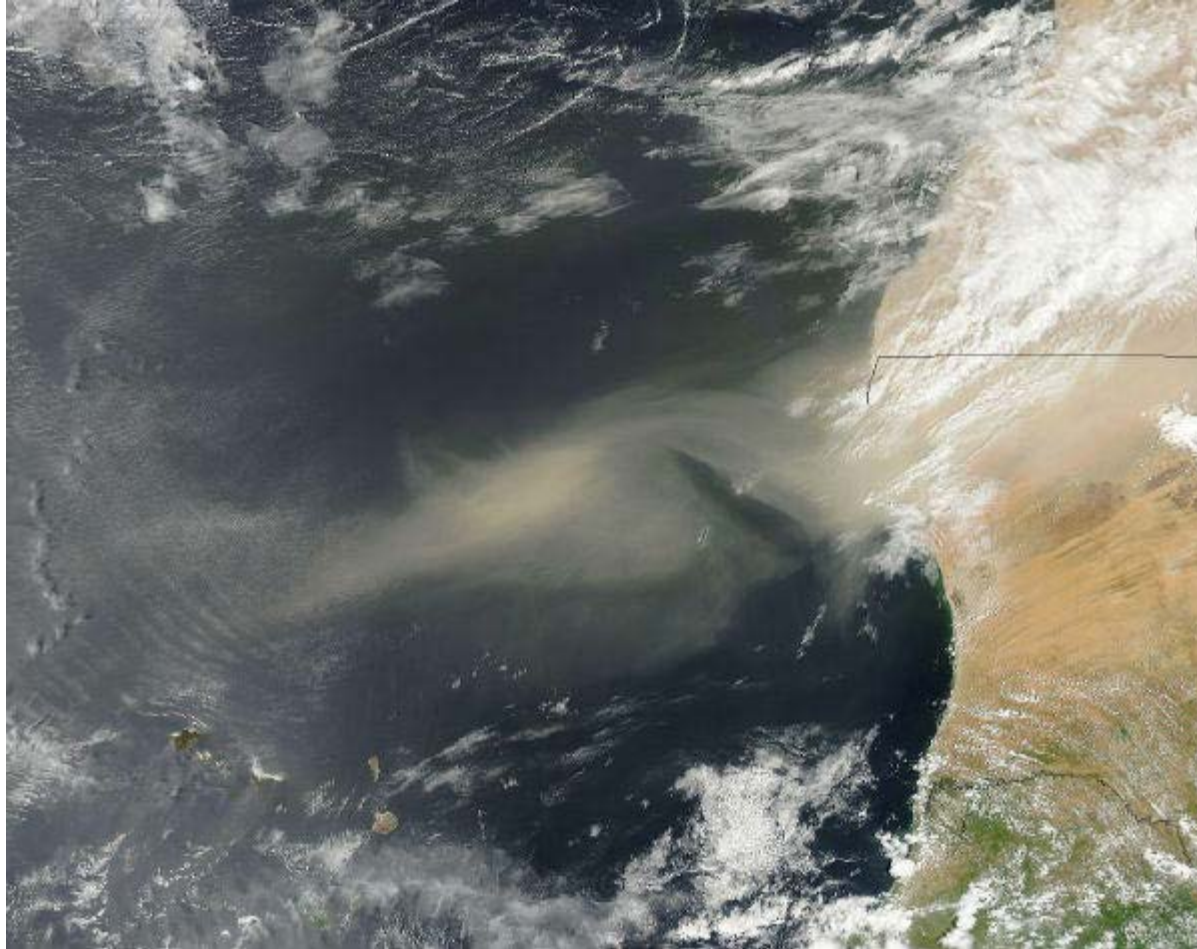
Examples of topics to be covered

- Sources, mechanisms of emissions, properties of mineral dust aerosols, and their diverse impacts
- Emission mechanisms of smoke from biomass burning events: including the diverse chemical composition, size distributions, transport in the atmosphere.
- Emissions, properties and diverse impacts of other important types of aerosols, including sulfates, nitrates, and organics.

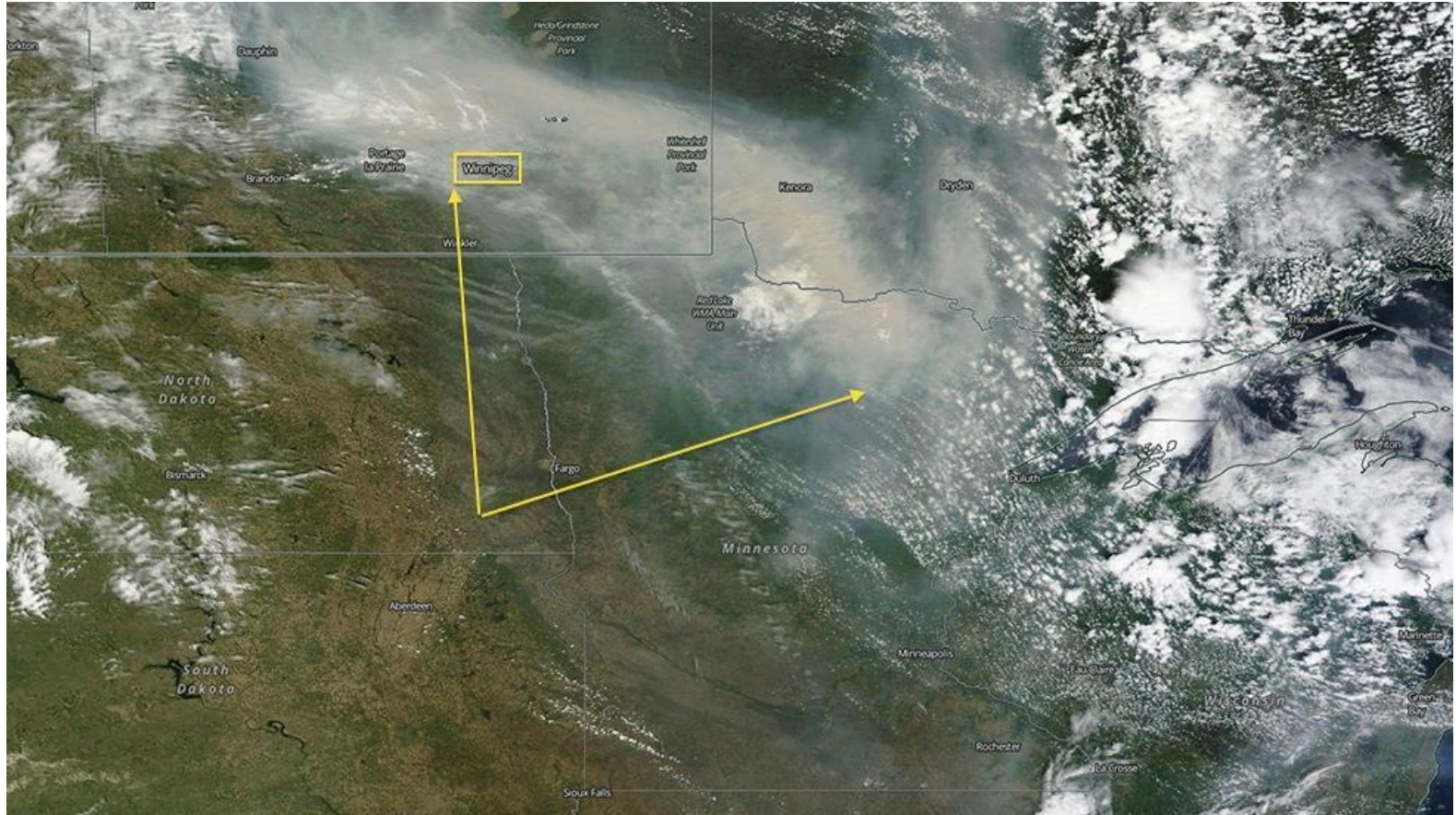
Examples of topics to be covered (continued)

- Climatology of clouds distributions, major classification of cloud types.
- Occurrences of major types of clouds, including the major mechanisms of their formation and lifecycles.
- Radiation code models (TUV and SBDART) and chemical mesoscale transport model (WRF-Chem).

Example of dust originating from the coast of Africa



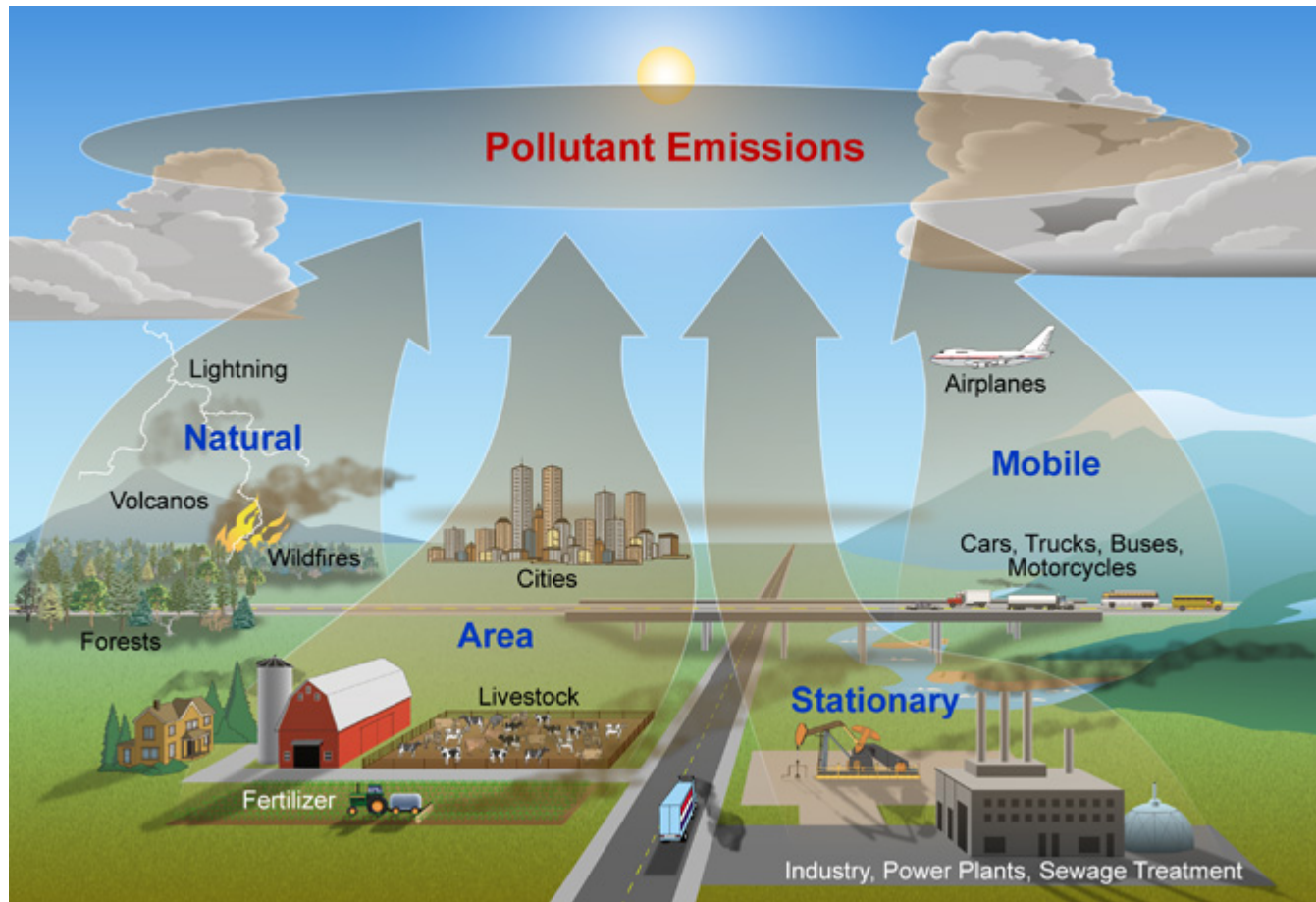
Example of smoke originating from the Canadian wildfires



Example of smoke from wildfires: California



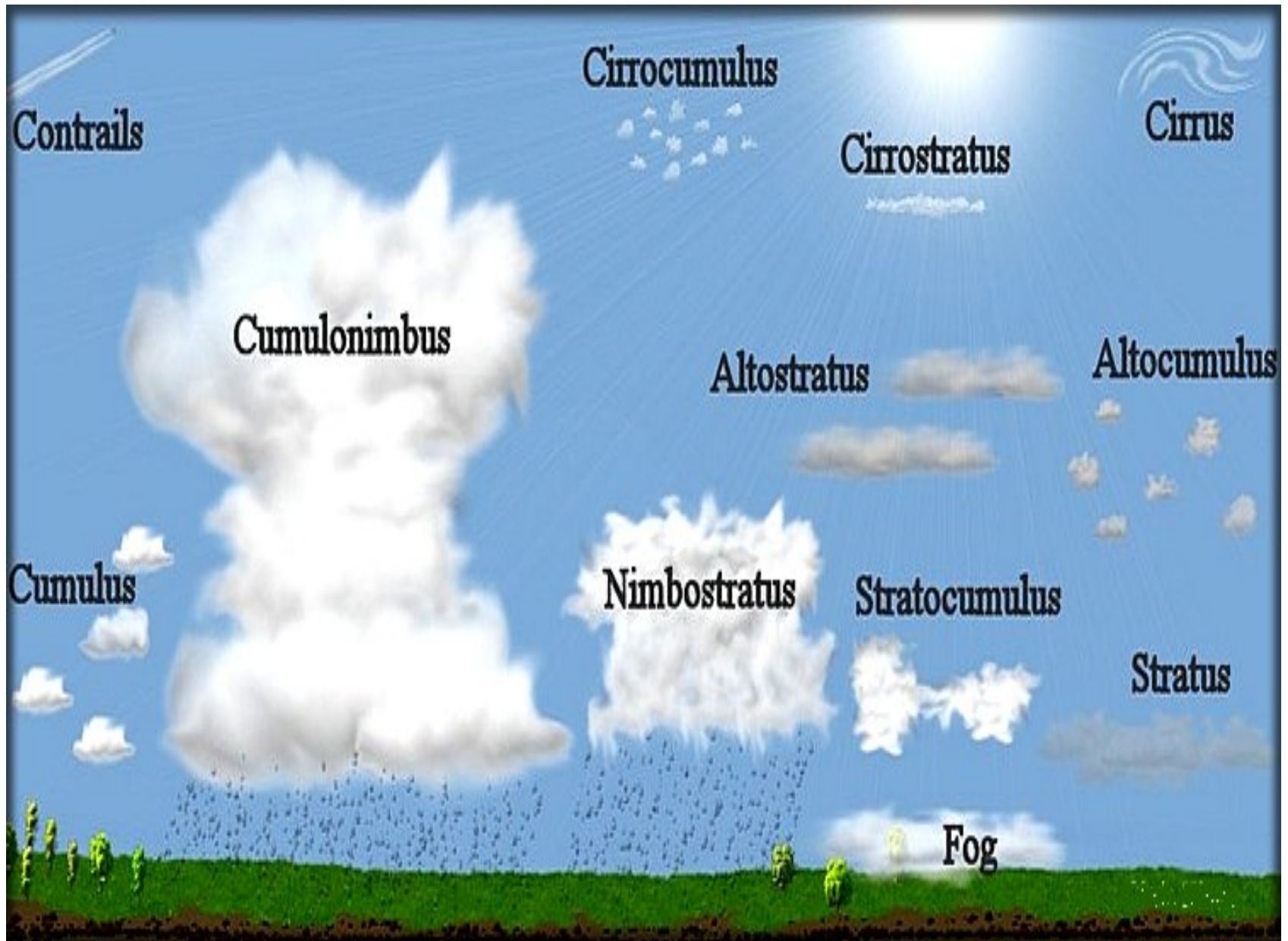
Example of air pollution (a mixture of aerosol particle of different compositions)



Example of air pollution (a mixture of aerosol particle of different compositions)



Cloud classification



Cirrus Clouds



Contrails and ship tracks

