

A person wearing a blue shirt and a hat is riding a bicycle on a long wooden pier that extends into the ocean. The sky is filled with large, white, fluffy clouds. The ocean is visible on both sides of the pier, with waves breaking in the distance.

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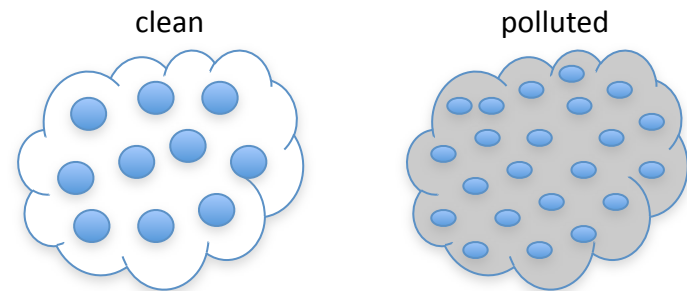
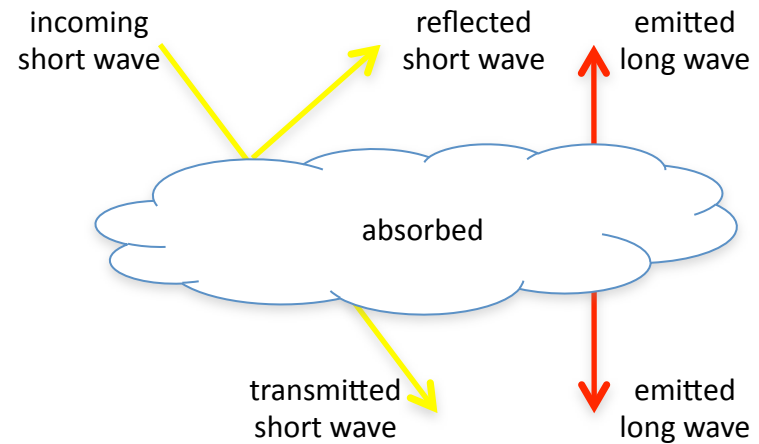
**First (Almost Second) Year Graduate
Student in Climate Science**

Image from Scripps Institution of Oceanography

Upcoming Projects and Research

1. Cloud-Radiation Interactions and Parameterizations

- Cloud-Aerosol-Climate Interactions, Regional and Global Impacts



Cloud-Radiation

Stochastic Approach

Ultimate goal: Use stochastic radiative transfer theory to develop shortwave radiative transfer parameterizations.

- To account for additional cloud characteristics.

Theory: Calculate radiative transfer through a cloudy atmosphere using statistics of cloud geometry and optical properties.

- Use the statistics of a line, imagining photons traveling through a clear sky with clouds.

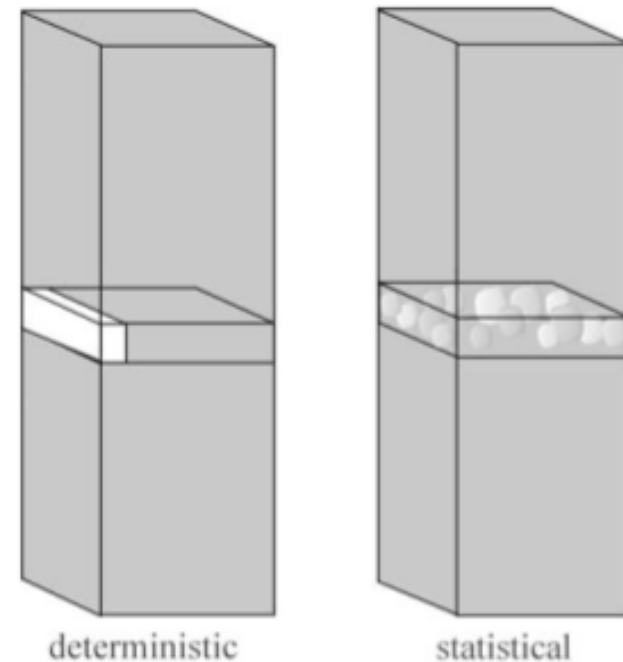


Figure 5. Diagram showing the difference in how cloud fraction is treated in (left) SUNRAY and (right) DSTOC. In SUNRAY the typical cloud fraction model is employed. DSTOC calculates the domain-averaged radiative flux over all possible cloudy scenes with the same statistics (three possible scenes).

Lane and Somerville (2004)

Cloud-Radiation

Upcoming Work

- Improve representation of observations of cloud statistics as PDFs to be used in the stochastic radiative transfer model.

- Using Single Column Model (SCM) simulations and in situ Atmospheric Radiation Measurement (ARM) observations.

- Determine which attributes of cloud fields, that can be inferred from climate model simulations, will serve as the necessary inputs to the stochastic model.

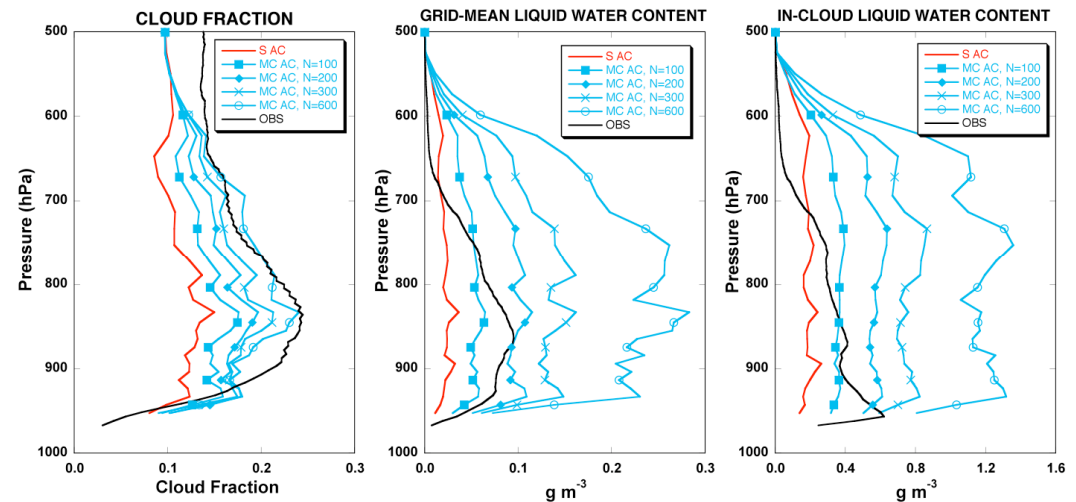


Figure 4. Mean vertical profiles of cloud fraction, in-cloud LWC, and grid-mean LWC during March 2000 for run SCM-S and several runs of SCM-MC using different values of droplet concentration N_c . Values derived from ARM MMCR and MWR measurements are shown in black.

Iacobellis and Somerville (2006)

Cloud-Aerosol-Climate



www.nasa.gov/centers/goddard/news/topstory/2008/pollution_measure.html

A satellite-based assessment of transpacific transport of pollution aerosol.

Yu et al. (2008)

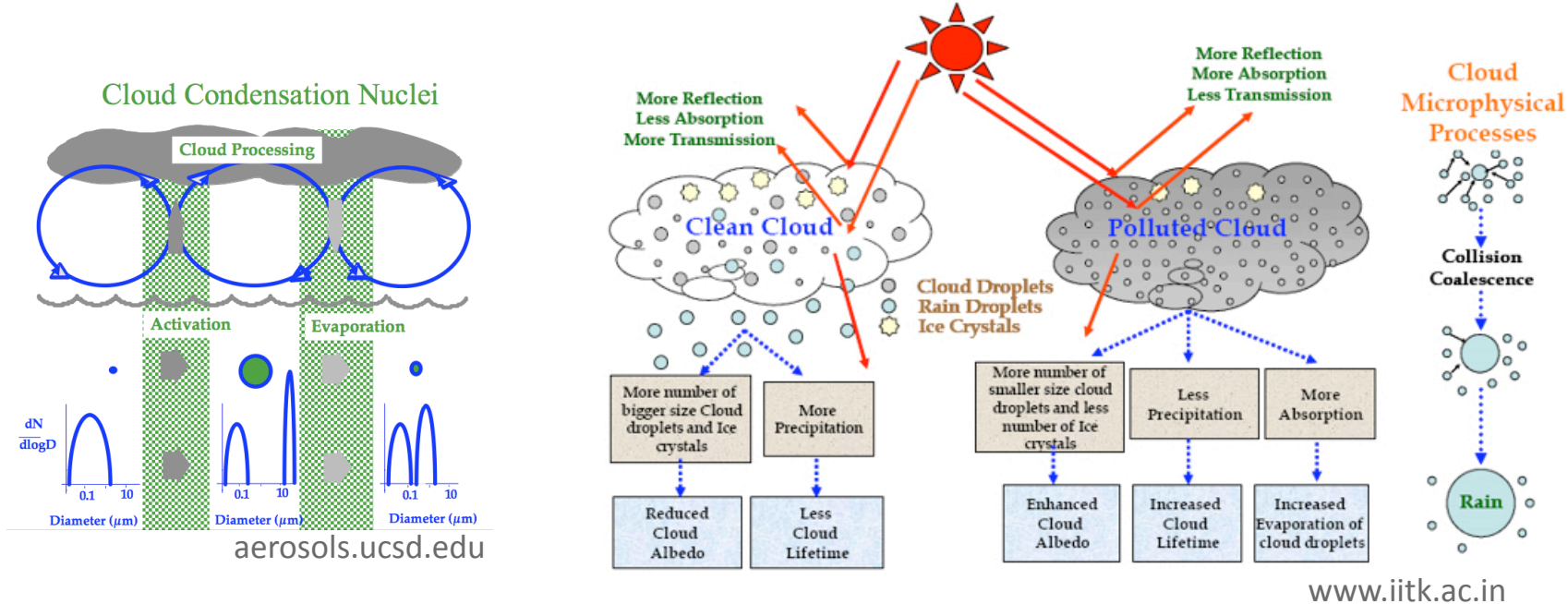
- Visualization shows estimate of aerosol transport from East Asia to North America using MODIS.

- Study the interaction of regional clouds with both non-locally and locally emitted aerosols; focusing on multi-scale climate-aerosol interactions that are important to climate change.

- Drive boundary conditions of an Aerosol Embedded Regional Climate Model (AE-RCM) with a Global Aerosol Embedded Multiscale Modeling Framework (AE-MMF).

Cloud-Aerosol-Climate

Aerosol and Climate



Regional

- Cloud formation, cloud evolution, and precipitation
- Cloud modification of aerosols

Global

- Direct effect on scattering/absorbing of radiation
- Indirect effects on cloud albedo and lifetime

Cloud-Aerosol-Climate

Regions of Interest

Intense Observing Periods

- Northern California (CIFEX)
- North Indian Ocean (INDOEX)
- Eastern United States (ICARTT)

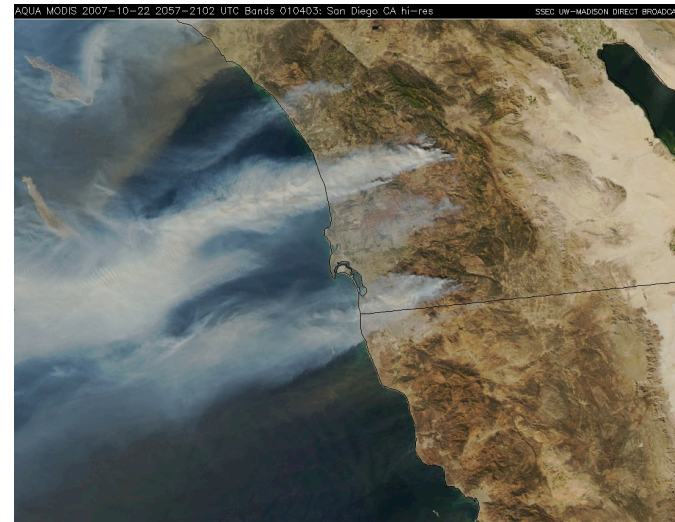
Northern California

Background

- Significant transport of pollution aerosol emitted from Asia reaches North America each year.
- Transport from Asia to North America can take less than a week.
- California is already at risk from decreased snow pack and supply of water for food and hydropower, as well as fire risk.

Study

- Relative impacts of high altitude (non-local) vs. low altitude (local) pollution on the precipitation that feeds the Californian watershed, and potentially impacts extreme precipitation.



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Thank You



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