GRAHAM FEINGOLD

Summary of Research Interests

Modeling of marine stratocumulus clouds – The "Indirect Effect"

- Development of size-resolved cloud microphysical schemes.
- Inclusion of size-resolved microphysical schemes in a large eddy simulation (LES).
- Studies of the sensitivity of cloud micro/macrophysics to enhanced cloud condensation nucleus (CCN) concentrations.
- Impact of giant CCN on optical properties of stratocumulus clouds.
- New parameterizations of warm microphysics to bridge the gap between bulk and bin-resolving schemes.
- Drizzle production is stratocumulus clouds in relationship to turbulent kinetic energy and in-cloud residence time.
- Collision-coalescence as a means of modifying the boundary layer cloud condensation nucleus distribution.
- Impact of collision-coalescence on cloud optical depth and susceptibility.
- Numerical simulations of microphysical/dynamical/radiative feedbacks in warm arctic stratus clouds.
- Modeling smoke-aerosol indirect effects and comparison with satellite observations.
- Possible effects of organic surfactants on drop spectral broadening and suppression of droplet activation.

Remote-sensing of the "indirect effect"

- Satellite remote sensing of biomass burning smoke and its impact on clouds.
- Modeling the effects of heavy smoke on clouds and saturation of the indirect effect.
- Measurement of the indirect effect using ground-based remote sensors at a continental site.

Cloud-Chemistry Modeling

- Cloud processing of aerosol through aqueous chemistry.
- Coupled microphysical/sulfate-chemistry modeling.

- Use of the trajectory ensemble model approach for cloud processing studies.
- Examination of the impact of aqueous chemistry on drop spectral broadening.
- Climatic implications for cloud processing of aerosol through aqueous chemistry.
- Cloud processing of peroxides
- Simulation of aqueous chemistry within a large eddy simulation model

Lidar Studies

- Studies of wavelength-dependent backscatter from non-hygroscopic and hygroscopic aerosol.
- The use of lidar and radar in determining ice-particle size-distribution information in cirrus clouds.
- Retrievals of cloud condensation nucleus parameters using lidar, radar, and radiometer.
- Water vapor uptake by aerosol particles as viewed by differential absorption lidar (DIAL) in the marine boundary layer, and comparisons with models.
- Water vapor uptake by aerosol particles as viewed by backscatter lidar in the marine boundary layer, and comparisons with observations.

Radar Studies

- Analysis of remote sensing techniques to measure cloud water and drizzle with K_α-band Doppler radar and radiometer.
- Study of the impact of drizzle on the stratocumulus-capped boundary layer using K_α-band Doppler radar.
- Relationship between turbulence and drizzle production based on K_α-band radar data.

Parameterization of cloud microphysics for use in GCMs

- Numerical and observational studies of the microphysics of wave-clouds.
- Parameterization of the nucleation and condensational growth of droplets for use in general circulation models. Predictions of droplet concentration, effective radius and cloud optical thickness. Sensitivity to cloud condensation nucleus spectra.
- Parameterization of the evaporation of precipitation for use in general circulation models.

The evolution of raindrop spectra below cloud base

- Measurements of raindrop spectra on the ground.
- Parameterization of drop-size-distributions for the purpose of solving the inversion of rainrate from radar measured variables.
- Developing accurate algorithms for treating mass transfer equations.
- Dynamical and microphysical modeling of raindrop spectral evolution.
- Studies of the processes of impaction scavenging of aerosols by raindrops.
- Studies of the generation of microbursts by evaporative cooling and their sensitivity to collision-coalescence and breakup.
- Comparisons between observations of spectral evolution with altitude and model results.
- Graupel melting studies.
- Modeling of the effect of precipitation on the shelter temperature.