Remote Sensing of Aerosols, Clouds, and Precipitation

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In assessing the future trajectory of Earth's climate, scientists rely on climate models to predict potential changes to our planet. One of the largest remaining scientific uncertainties critical to improving climate model capabilities is the proper understanding and treatment of cloud processes. To reduce the uncertainty in climate model forecasts, detailed measurements of aerosol, clouds and precipitation are necessary.

Radars and lidars estimate characteristics of atmospheric particles, namely, aerosol, clouds and precipitation at various temporal and spatial scales. Radars and lidars are active remote sensing instruments. The sensitivity of these instruments for detecting atmospheric particles is proportional to the concentration and average size of the particles.

Atmospheric particle sizes and concentration detected by these instruments span many orders of magnitudes. Lidars emit shorter wavelengths than radars. They detect and characterize atmospheric particles in the nanometer to millimeter size range. Lidar and radar measurements together provide a complete picture of the atmospheric particles. These particles are the primary constituents of aerosol layers, clouds, and precipitation.

This presentation will describe lidar, cloud and precipitation radars and how these remote sensing instruments detect atmospheric particles. Examples of scientific products, namely, mean particle size, liquid and ice water contents derived from lidar and radar measurements will also be presented.