

**Bio:**

**Name:** Prakash Gautam, Ph.D.

I did my Ph.D. in Physics, focusing on electromagnetic and light scattering from aerosol particles. I am passionate about conducting light-scattering experiments and advancing instrument technology.

**Current position:** A Post-Doctoral Research Associate at Desert Research Institute, Reno, Nevada.

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Alongside my interest in science, I enjoy playing tennis and soccer.

**Project Title: Optical Characterization of Soot Properties Using a Novel Multi-Angle Light Scattering Setup****Project Overview:**

Soot consists of carbonaceous black particles, often with a fractal morphology, produced during the incomplete combustion of fossil fuels and biomass. Soot is the second largest anthropogenic cause of global warming. It is of environmental interest because of its strong light absorption over the solar spectrum. Thus, studying light scattering from soot particles is essential in understanding its effect on radiation budgets and climate models. Mie theory, the analytical solution to Maxwell's equations for scattering by homogenous spherical particles, remains the primary approach for calculating the radiative properties of irregularly shaped, complex atmospheric aerosol particles, including soot. However, soot particles are typically non-spherical aggregates, which cannot be approximated as spheres. Recent advances in the computational and experimental study of fractal soot have been notable. Yet, characterizing irregular soot aggregates and understanding the scattering mechanisms remains challenging. Our multi-angle light scattering setup aims to gather experimental data over a broad angular range to uncover significant patterns and facilitate comparisons with computational models.

The proposed project closely relates to NASA's strategic objective of "Understanding the Earth system and its climate" and remote sensing techniques. This setup facilitates measuring the highly sensitive backscattering, which is useful for remote sensing techniques. For example, active remote sensing applications preferentially use backscattering because the light source is collocated with the receiver. Some passive techniques also use backscattering (e.g., Earth Polychromatic Imaging Camera (EPIC) onboard NASA's Deep Space Climate Observatory (DSCOVR), where the satellite is located at the gravity-neutral Lagrange point 1 (L1), directly between the sun and Earth.