

Master 2 - Research Training – 01/02 to 30/06/2026

Laboratory: LOA

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Combining ground and space measurements to assess aerosol impacts on cloud microphysical properties

Abstract.

Aerosol-cloud interactions (ACI) remain among the largest sources of uncertainty in Earth's radiative budget and in future climate projections. While the existence of aerosol effects on cloud properties is well established, the magnitude of these effects is still highly uncertain due to the complexity of atmospheric processes and observational challenges.

Satellites offer nearly global coverage and provide key information on cloud top properties, which are directly relevant to Earth's energy balance. However, they cannot accurately characterize aerosols located directly beneath the clouds—the ones that most strongly influence cloud microphysics. Ground-based in-situ measurements, on the other hand, provide detailed and continuous characterization of aerosols, including their concentration, size distribution, and chemical composition, but are limited geographically and temporally.

Combining these two complementary datasets offers a promising approach to better constrain ACI. This strategy leverages the strengths of both: satellites for spatial coverage and cloud radiative properties, and ground stations for precise local aerosol characterization.

Keywords: Aerosols, Clouds, Interactions, In-situ measurements, Satellite, Radiometers