Geophysical Research Abstracts
Vol. 17, EGU2015-7690, 2015
EGU General Assembly 2015

UV-VIS backscattering measurements on atmospheric particles mixture using polarization lidar coupled with numerical simulations and laboratory experiments

Alain MIFFRE, Mirvatte FRANCIS, Christophe ANSELMO, and Patrick RAIROUX
University of Lyon Claude Bernard Lyon1, Institute of Light and Matter ILM, Physics, Villeurbanee, France (patrick.rairoux@univ-lyon1.fr)

As underlined by the latest IPCC report [1], tropospheric aerosols are nowadays recognized as one of the main uncertainties affecting the Earth's climate and human health. This issue is not straightforward due to the complexity of these nanoparticles, which present a wide range of sizes, shapes and chemical composition, which vary as a function of altitude, especially in the troposphere, where strong temperature variations are encountered under different water vapour content (from 10 to 100 % relative humidity). During this oral presentation, I will first present the scientific context of this research. Then, the UV-VIS polarimeter instrument and the subsequent calibration procedure [2] will be presented, allowing quantitative evaluation of particles backscattering coefficients in the atmosphere. In this way, up to three-component particles external mixtures can be partitioned into their spherical and non-spherical components, by coupling UV-VIS depolarization lidar measurements with numerical simulations of backscattering properties specific to non-spherical particles, such as desert dust or sea-salt particles [3], by applying the T-matrix numerical code [4]. This combined methodology is new, as opposed to the traditional approach using the lidar and T-matrix methodologies separately. In complement, recent laboratory findings [5] and field applications [6] will be presented, enhancing the sensitivity of the UV-VIS polarimeter.

References

[1] IPCC report, Intergovernmental Panel on Climate Change, IPCC, (2013).
[2] G. David, A. Miffre, B. Thomas, and P. Rairoux: "Sensitive and accurate dual-wavelength UV-VIS polarization detector for optical remote sensing of tropospheric aerosols," Appl. Phys. B 108, 197–216 (2012).
[3] G. David, B. Thomas, T. Nousiainen, A. Miffre and P. Rairoux: "Retrieving simulated volcanic, desert dust, and sea-salt particle properties from two / three-component particle mixtures using UV-VIS polarization Lidar and T-matrix," Atmos. Chem Phys. 13, 6757-6776 (2013).
[4] M.I. Mishchenko, L.D. Travis and A.A. Lacis: "Scattering, absorption and emission of Light by small particles," 3rd edition, Cambridge University Press UK, (2002).
[5] G. David, B. Thomas, E. Coillet, A. Miffre, and P. Rairoux, Polarization-resolved exact light backscattering by an ensemble of particles in air, Opt. Exp., 21, No. 16, 18624-18639, (2013).
[6] G. David, B. Thomas, Y. Dupart, B. D'Anna, C. George, A. Miffre and P. Rairoux, UV polarization lidar for remote sensing new particles formation in the atmosphere, Opt. Exp., 22, A1009-A1022, (2014).