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Clouds of solid particles are present in many regions of the Solar System (comets, interplanetary dust cloud, planetary atmospheres). These clouds can be remotely studied by the light they scatter. There is a need for a data base of the light scattered by a large variety of samples at different wavelengths to interpret such measurements. The PROGRA2 instruments are used for this purpose.
The PROGRA2 instruments, PROGRA2-VIS and PROGRA2-IR, are imaging polarimeters with a rotating arm to change the phase angle (angle between directions of illumination and observation). They allow to retrieve the complete polarization phase function between 10° and 165°. The light sources are at around 550 and 650 nm for PROGRA2-VIS, and 1000 and 1500 nm for PROGRA2-IR. The detectors are cameras, with a spatial resolution between 20 and 40 micrometers per pixel (PROGRA2-IR uses now new high sensitivity cameras). Measurements are conducted in the laboratory by an air draught technique for grains smaller than about 20 micrometers (which can be included in porous aggregates), and during parabolic flights on-board the A300 ZeroG and now the A310 ZeroG for larger grains; these flights campaigns are funded by the French and European Space Agencies. Hundreds of scattering phase functions have been obtained since 20 years, for a large number of samples (sands, silicon carbide, basalt, volcanic ashes, lunar and Martian simulants, tholins, meteoritic material, black carbon, carbonaceous compounds, . . .); the main results are available at www.icare.univ-lille1.fr/progra2/.
Several samples have been already studied by the two instruments, showing a large diversity of wavelength dependences, from close-to-zero dependence for yellow and ocher sand grains to high dependence for silicon carbide and anthracite grains. These variations should be related to the wavelength dependence of the real and imaginary parts of the refractive index of the particles.
We present a summary of the main results of the wavelength dependence of polarization already obtained with PROGRA2. We present also the interest of conducting new measurements for meteoritic material, tholins, and carbonaceous particles that can be analogues of the cometary and interplanetary grains. Since PROGRA2 is well adapted to study the large (porous) particles, as those detected by Rosetta, these new measurements will be useful to tentatively relate the wavelength dependence of linear polarization detected within several cometary comae with the main composition and nature of the particles.
References : Renard et al., JQSRT, 146, 424-430, 2014 ; Hadamcik et al., Earth Planets Space, 65, 1175-1184, 2013.