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Titan's atmospheric aerosols as seen by SOLEIL-synchrotron VUV-light

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Titan, the largest moon of Saturn, has a dense atmosphere whose upper layers are mainly composed of methane (CH_4) and molecular nitrogen (N_2). Their photochemistry leads to the formation of aerosols at very high altitudes (>800 km). Once these aerosols are formed and through their descent towards the surface, they will still interact with persistent UV/VUV radiations, at different energies, that can reach lower atmospheric layers. This interaction has some impact, for example on the chemical composition of the aerosols or on the ionization yield of the atmospheric compounds.

So far, nothing is known on the possible photochemical evolution of the organic aerosols composing the haze. Models are a good way to study those processes, but the lack of data on the refractive index or the absolute absorption/ionization cross sections of the aerosols can be an obstacle. Here, we address this interaction process, simulating in the laboratory how solar vacuum ultraviolet irradiation affects the aerosols. In order to shed some light and quantify those processes, we synthesized analogs of Titan's aerosols (tholins) at LATMOS and exposed them under VUV radiation at the DESIRS-beamline (synchrotron SOLEIL). We both studied their photo-ionization efficiency and their chemical evolution.

Summary

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