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Infrared absorption of 23 meteorites from the Atacama Desert

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Dust particles are the dominant source of opacity at infrared and (sub)millimeter wavelengths. While accurate dust opacities are crucial for modeling protoplanetary disks properties, their estimation is highly uncertain in this regime: dust opacities values used in models are mostly extrapolations in wavelength and grain sizes. To tackle this problem we have established the UDP Cosmic Dust Laboratory, the first one of its kind in Chile. We have started operations working on infrared measurements of meteorites from the Atacama Desert, planning to extend our opacity measurements to the submillimeter regime.
Meteorites are the best analogs of the type of dust expected in protoplanetary disks, and the most accessible samples from the Earth to study in the laboratory. The semiarid to hyper arid climates of deserts allows preservation and accumulation of meteorites. Being the driest desert in the world, the Atacama Desert shows an exceptional meteorite concentration per km2 that has remained hyper-arid for several Myr and has preserved meteorites for a long time with a very low erosion rate and slow chemical weathering.

In this study, I will present measurements of dust opacities of 23 meteorites, 3 carbonaceous and 20 ordinary chondrites from the Atacama Desert. We correlated their mid-infrared spectra with chemical composition and grain size distribution. Measuring dust opacities in the laboratory, we calculate the mass absorption coefficient (MAC), that can be used in radiative transfer modeling to be compared to astronomical data of protoplanetary disks.

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