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Tropospheric Mineral Dust Study by High Spectral Resolution Infrared Satellite during intense dust storms

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Large desert lands such as Sahara, Gobi or Australia present main sources of atmospheric mineral dust caused by intense dust storms. Transported dust particles undergo physical and chemical changes affecting their microphysical and optical properties. This modifies their scattering and absorption properties and alters the global atmospheric radiative budget.

Currently, remote sensing techniques represent a powerful tool for quantitative atmospheric measurements and the only means of analyzing its evolution from local to global scale. In order to improve the knowledge of atmospheric aerosol distributions, many efforts were made particularly in the development of hyperspectral infrared spectrometers and processing algorithms. However, to fully exploit these measurements, a perfect knowledge of Complex Refractive Index (CRI) is required.

In that purpose, a new methodology based on laboratory measurements of mineral dust in suspension coupled with an optimal estimation method has been developed. This approach allows getting access to CRI of several desert samples with various chemical compositions.

Here, we present the first results of the physical parameters (effective radius and concentration) retrievals using Infrared Atmospheric Sounding Interferometer IASI data, during dust storm events. The latter use the CRI of different desert samples obtained in laboratory and a new radiative transfer algorithm (ARAHMIS) developed at Laboratoire d'Optique Atmosphérique LOA.