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FACULTÉ DES SCIENCES ET TECHNOLOGIES

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Optical, microphysical, radiative and chemical properties of volcanic and industrial sulfate aerosols

The atmospheric lifecycle of sulfur, from precursory sulfur dioxide (SO_2) gas emissions followed by their conversion to sulfate aerosols, depends on the specific environment where it evolves. We propose here to study how different the physical and chemical properties of sulfate aerosols may be, according to their volcanic industrial or eventually ship origins.

Northern France occupies a strategic location to study such questions as it has been affected multiple times by volcanic sulfur-rich compounds issued from Icelandic eruptions in the last years (Eyjafjallajökull in 2010, Bárðarbunga Holuhraun eruption in 2014-15). This region also hosts a large harbour area in Dunkirk, ranking 7th in Europe, with a significant industrial activity, both emitters of sulfur species.

Jointly analyzing satellite observations of the volcanic cloud, sun-photometer observations of the AERONET Aerosol Robotic ground-based network at various stations in Northern Europe, a remarkable 14-month long dataset of ACSM (Aerosol Chemical Speciation Monitor) continuous ground-level observations as well as short-term HR-ToF-AMS (High-resolution Time-of-Flight Aerosol Mass Spectrometer) data in Dunkirk, we aim at determining the optical, microphysical, radiative and chemical properties of sulfate aerosols. Constraining multiple properties of aerosols will allow to discriminate the origin of these aerosols, whether volcanic, industrial/ship single or a combination thereof.

Key words: volcanic plumes, volcanic/industrial sulfate aerosols, sun photometry, AERONET network, ACSM, HR-ToF-AMS