Geophysical Research Abstracts
Vol. 16, EGU2014-11051, 2014
EGU General Assembly 2014

Mapping the mineralogical composition of mineral dust in Western Africa

Paola Formenti (a), Sandrine Caquineau (b), Karine Desboeufs (a), Anne Klaver (a), Servanne Chevaillier (a), Emilie Journet (a), Jean Louis Rajot (a,c)

(a) Laboratoire Interuniversitaire des Systèmes Atmosphèriques (LISA), Paris, France (paola.formenti@lisa.u-pec.fr), (b) LOCEAN, IRD, Bondy, France (sandrine.caquineau@ird.fr), (c) BIOEMCO, Créteil, France (jeanlouis.rajot@ird.fr)

In the last few years, several ground-based and airborne field campaigns have allowed exploring the properties and impacts of mineral dust in Western Africa, one of the major emission and transport areas worldwide. In this paper, we explore the synthesis of these observations to provide with a large-scale quantitative view of the mineralogical composition and its variability with time after transport and source region.
This work reveals that mineral dust in Western Africa can be represented as a mixture of illite, kaolinite, quartz, iron and titanium oxides, representing at least 92% of the dust mass. Calcite ranged between 0.3 and 8.4% of the dust mass depending on the origin. Our data do not show a systematic dependence of the dust composition with origin, likely as in most of the cases they represent the composition of the atmospheric burden after 1–2 days after emission, when air masses mix and give raise to a more uniform dust load. This has implications for the representation of the mineral dust composition in regional and global circulation models, and satellite retrievals.
We estimate that iron oxides account for 58 $\pm$ 7% of the mass of elemental Fe, and between 2 and 5% of the dust mass. We provide with first time estimates of the partitioning of hematite and goethite in major dust sources such as the Bodélé and the South Algeria deserts. Goethite represents between 47 and 71% of the iron oxide mass. Likewise, we found that titanium oxides account for between 1 and 2% of the dust mass.
On the basis of these compositional data, we provide with estimates of the complex refractive index relevant to the direct effect of mineral dust on the radiative budget.
Data presented in this paper are provided in numerical form upon email request while they are being implemented as a public database, the Dust-Mapped Archived Properties (DUST-MAP), an open repository for compositional data from other source regions in Africa and worldwide.