

Icelandic dust: *Importance and differences with Saharan dust.*

Jesús Yus-Díez^{1,2,*}, Marco Pandolfi¹, Adolfo Gonzalez-Romero^{1,3}, Cristina Gonzalez-Florez³, Jerónimo Escribano³, Agnesh Panta⁴, Konrad Kandler⁴, Matic Ivančič, Martin Rigler, Xavier Querol¹, Cristina Reche¹, Andrés Alastuey¹, Martina Klose⁵, Hannah Mayer⁵, Carlos Garcia Perz-Pando³

¹Institute of Environmental Assessment and Water Research (IDAEA), CSIC, C/Jordi Girona 18-26, 08034, Barcelona, Spain.

²Grup de Meteorologia, Departament de Física Aplicada, Universitat de Barcelona, C/Martí i Franquès, 1, 08028, Barcelona, Spain.

³Barcelona Supercomputing Center, Barcelona 08034, Spain

⁴Institut für Angewandte Geowissenschaften, Technische Universität Darmstadt, 64289 Darmstadt, Germany

⁵Aerosol d.o.o., Kamniška 39A, 1000 Ljubljana, Slovenia

⁶Karlsruhe Institute of Technology (KIT), Institute of Meteorology and Climate Research (IMK-TRO)

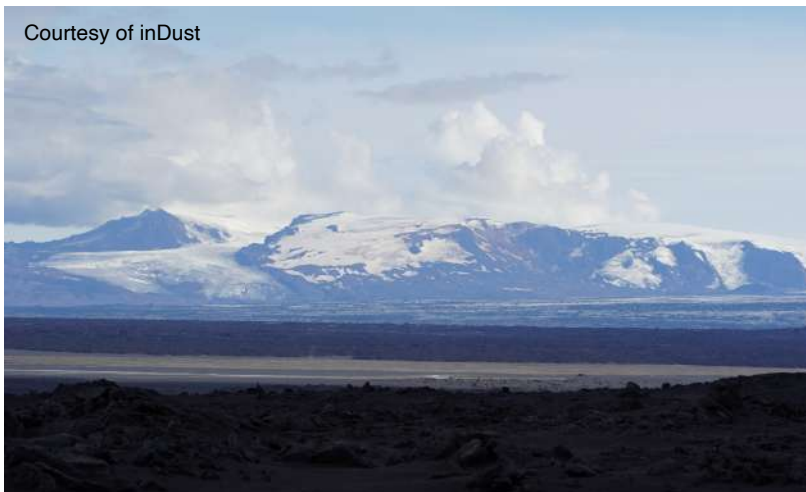
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Introduction

- Aerosol dust has one of the **highest concentrations** in the atmosphere. It heavily impacts **human health**, the **economy**, and the **earth climate**.
- Aerosol dust** impact on the radiative forcing of the Earth radiative budget has a high uncertainty and remains to be fully characterized. It also has an effect yet to be fully constrain on the aerosol-cloud formation interaction.
- FRAGMENT** (FRontiers in dust minerAloGical coMposition and its Effects upoN climaTe) is an ERC grant with the goal to understand, constrain and calculate the global mineralogical composition of dust along with its effects upon climate by combining theory, field measurements, laboratory analyses, remote spectroscopy and modelling .



Courtesy of inDust



- Up to now, 2 measurement field campaigns have been deployed:
 - North African Sahara**, sediments at a dry basin – **Saharan dust**
 - Iceland highlands**, glacier-volcanic sediments basin – **Icelandic dust**
- Saharan dust** is the **major dust emitter** in the world. **Icelandic dust**, although less known, heavily affects North Europe, with climate projections suggesting an increase in its emission.

Methodology & concepts

- Optical** measurements of **absorption** and **scattering** coefficients at both deserts. From this measurements we have been able to obtain in-situ the **single-scattering albedo** (SSA) of the different dust particles.
- The **albedo (SSA)** is a parameter that allows to measure the amount of radiation that is absorbed (only abs = 0) or scattered (only scat = 1) by the particles.
- The **lower/higher** the **SSA** through-out the radiation spectra the higher the **warming/cooling** effect of the particles in the **Earth Radiative Budget**.

Results

↑ Iron oxides abs at s-wv → ↑ absorption → ↓ albedo

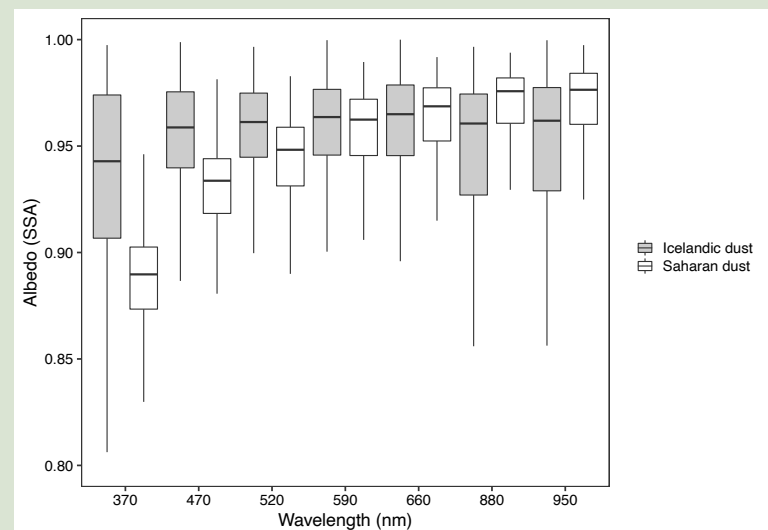


Figure 1. Single Scattering albedo for several wavelengths from the short-UV to the near-infrared for both Saharan and Icelandic dust

↑ Volcanic glass conc. → ↑ Scattering at s-wv → ↑ albedo

Conclusions

- Saharan dust** contains high iron oxide concentrations (**goethite and hematite**) that are characterized by a high imaginary refractive index at the UV-visible radiation spectra, hence with a high absorption at these wv's.
- Icelandic dust** is mostly dominated by **volcanic glass** which is **mainly a scatterer**, with not much absorption at all, regardless of the wavelength spectra.
- The **radiative effect** of the **Icelandic dust** has the potential of a **mostly cooling effect** on the atmosphere. However, the **Saharan dust** has a higher **warming potential of the atmosphere** at UV-visible wavelengths, where the radiation is the highest, hence a **positive radiative effect** on the **energy budget** is possible.