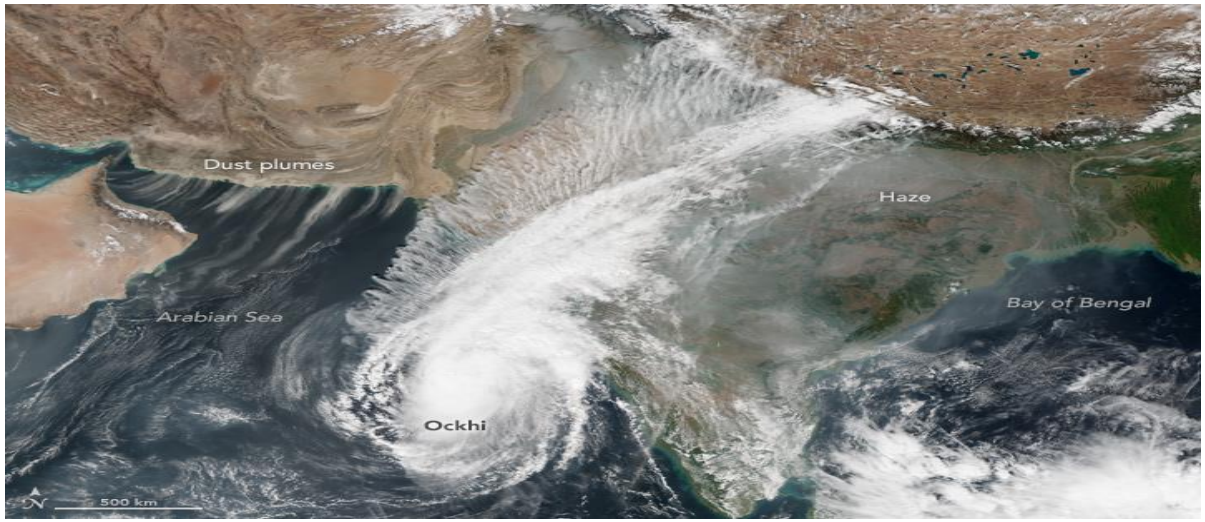
Karlsruhe Institute of Technology

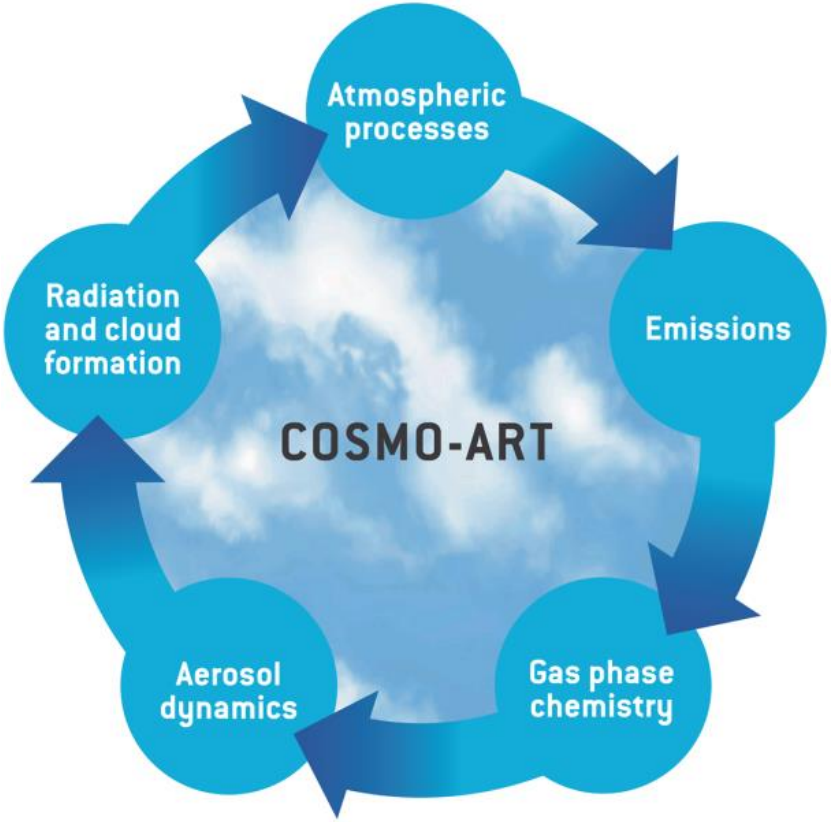
Status of COSMO-ART & ICON-ART

Bernhard Vogel and ART developers and users

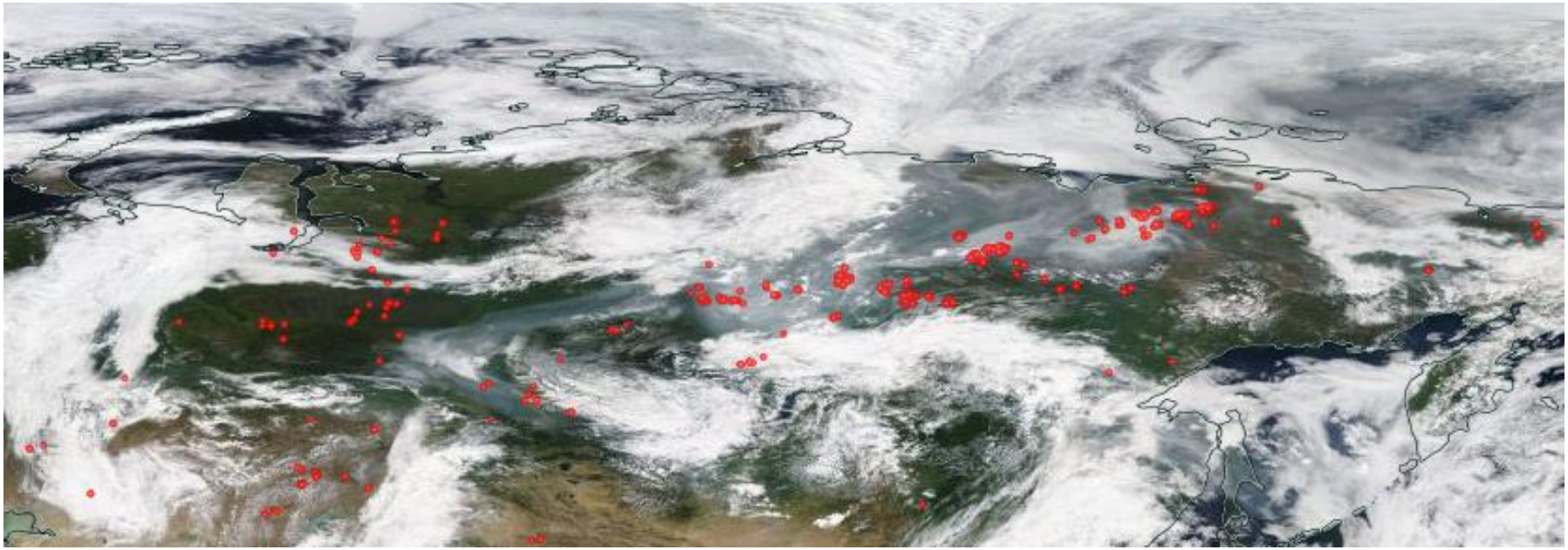
Institute of Meteorology and Climate Research, KIT, Karlsruhe



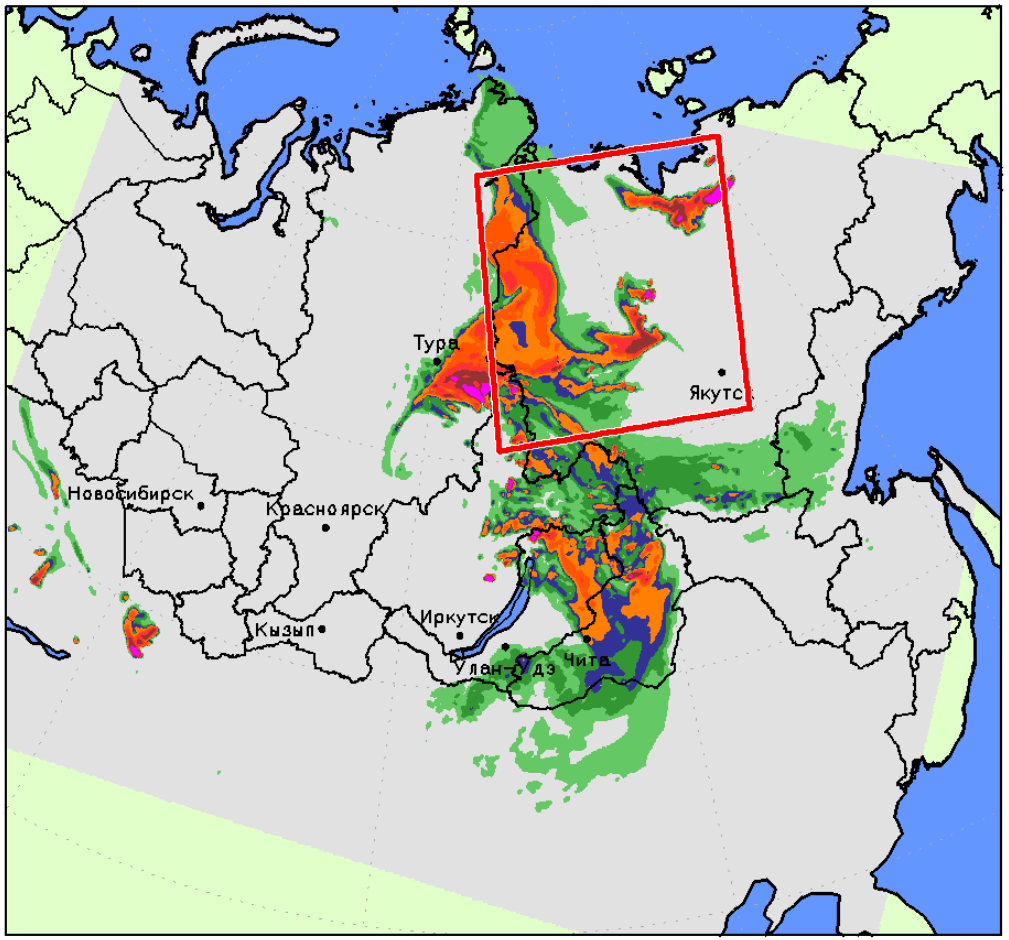
Applications of COSMO-ART

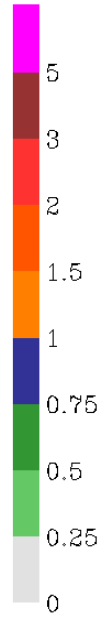


Siberian wildfires, 2019



NASA WORLDVIEW



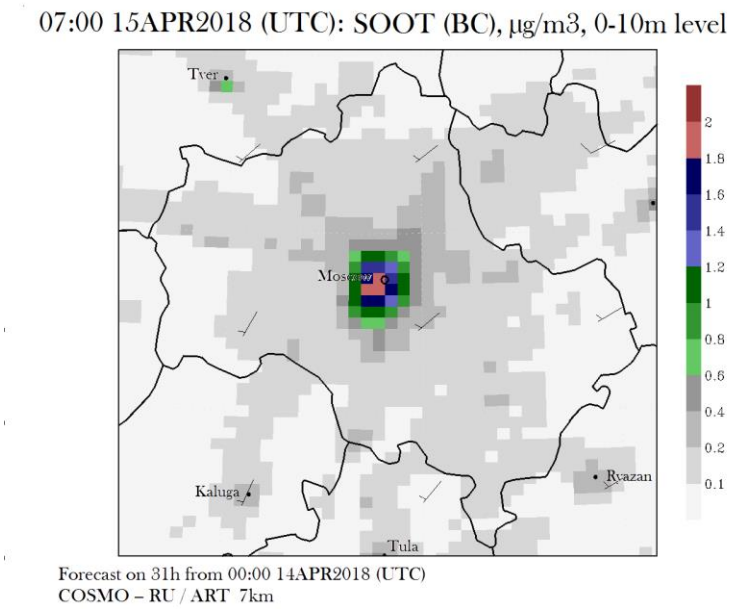


Alexander Kirsanov

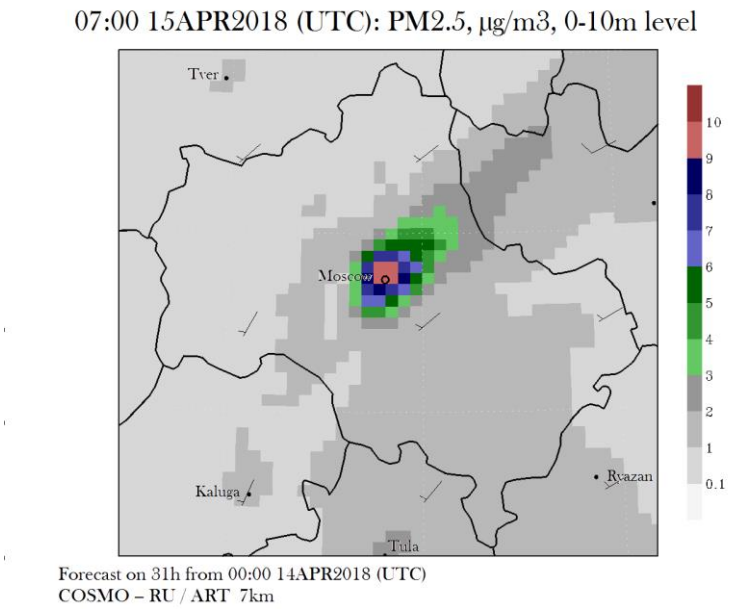
LOMONOSOV MOSCOW STATE UNIVERSITY

The spatial distribution of surface BC concentration (A), PM concentrations (B), and AOD550 (C) over Moscow and Moscow suburbs according to the COSMO-ART model simulations.
April 15, 7h GMT (10h local time).
Moscow AeroRadCity experiment

BC



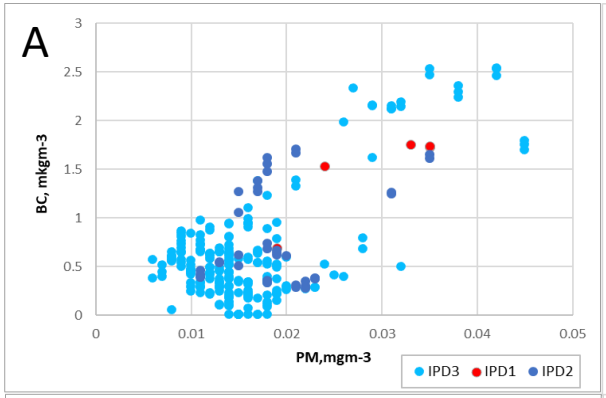
PM2.5

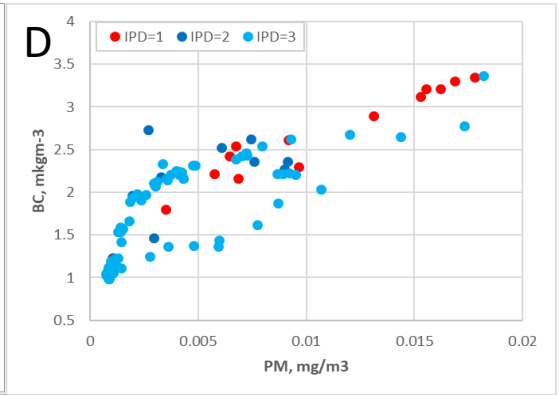


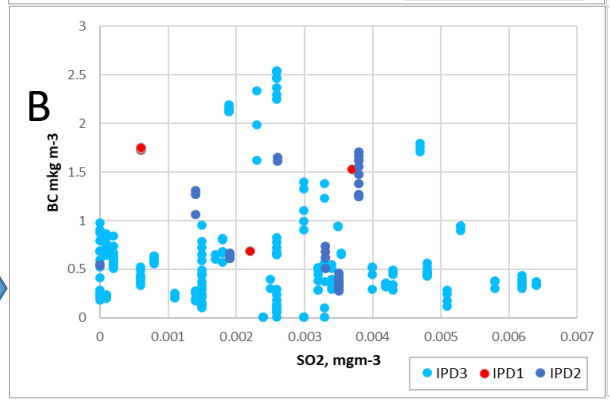
The BC concentrations versus PM10, SO2 and NO2 concentrations according to measurements and COSMO-ART modelling. Moscow AERORADCITY experiment

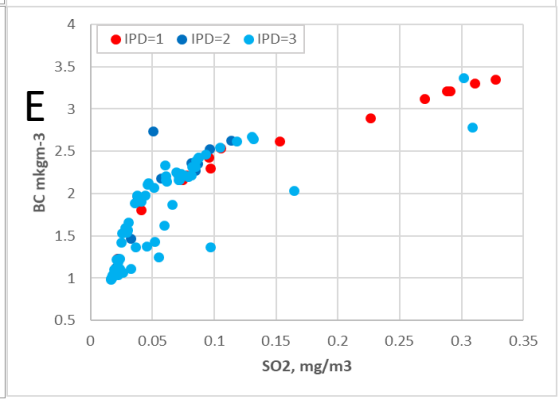
Measurements

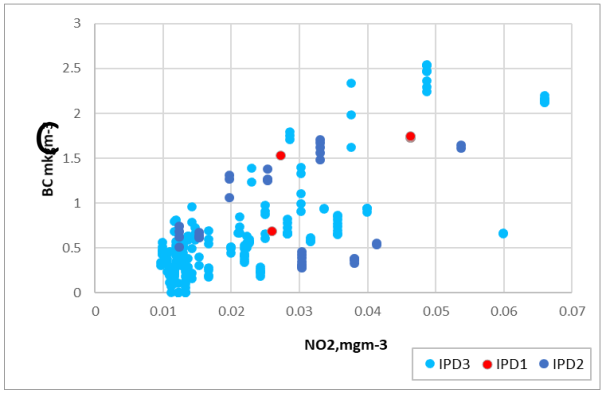
COSMO-ART

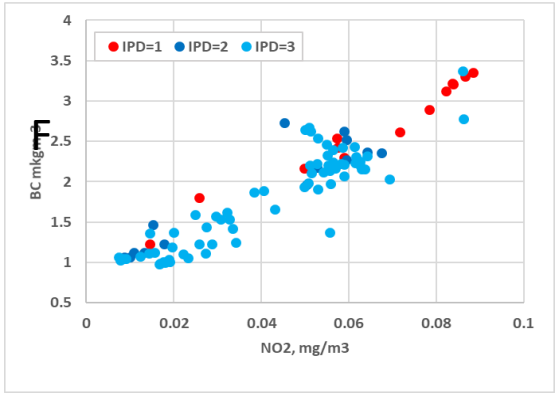








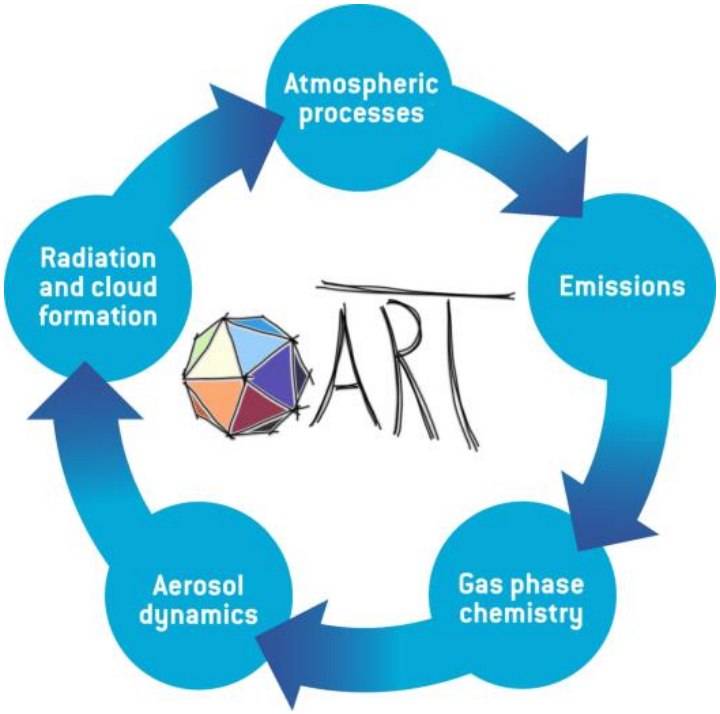




No dependence of BC on SO2 in measurements Extremely low SO2 concentrations

LOMONOSOV MOSCOW STATE UNIVERSITY

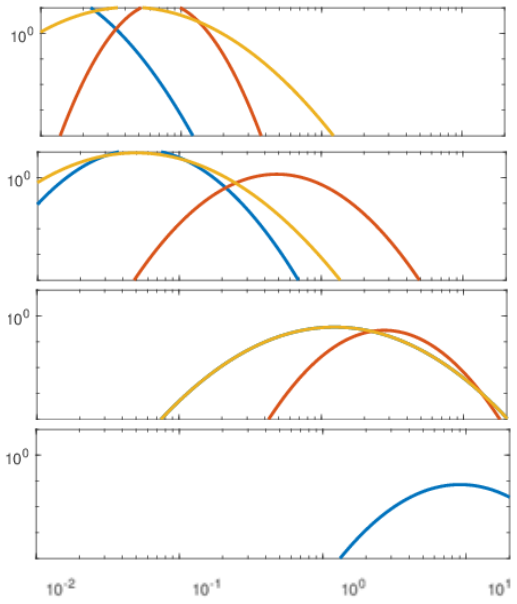
Development and applications of ICON-ART

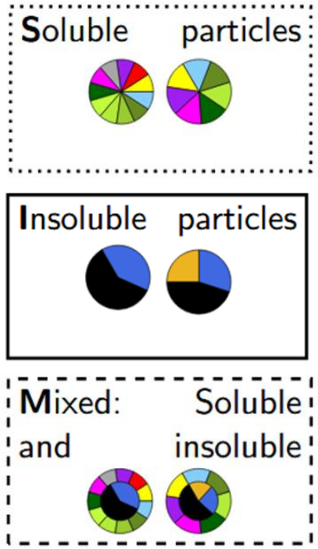


AERODYN, a new flexible aerosol scheme

- Coupling with the gas phase
- Flexible number of modes
- Flexible number of species
- Interaction with radiation and clouds
- Generic

SOL INSOL MIXED

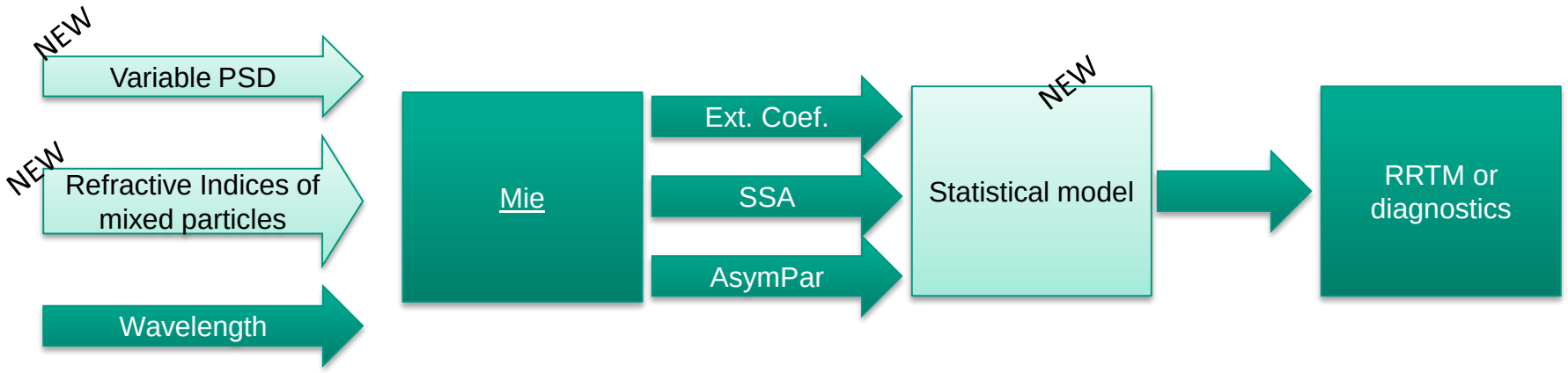




Contributions by:

Sascha Bierbauer, Simon Gruber, Ali Hoshyaripour, Lisa Muth, Lukas Muser, Anika Rohde, Jonas Straub, Heike Vogel, Sven Werchner, and many others

New concept: online calculation of aerosol optical properties



New features:

Treatment of chemical evolution
Treatment of PSD evolution
Treatment of core-shell state
Generic and Interoperable

Key challenge:

High degrees of freedom in all above parameters

Ali Hoshyaripour

Pinatubo Plume – June 1991

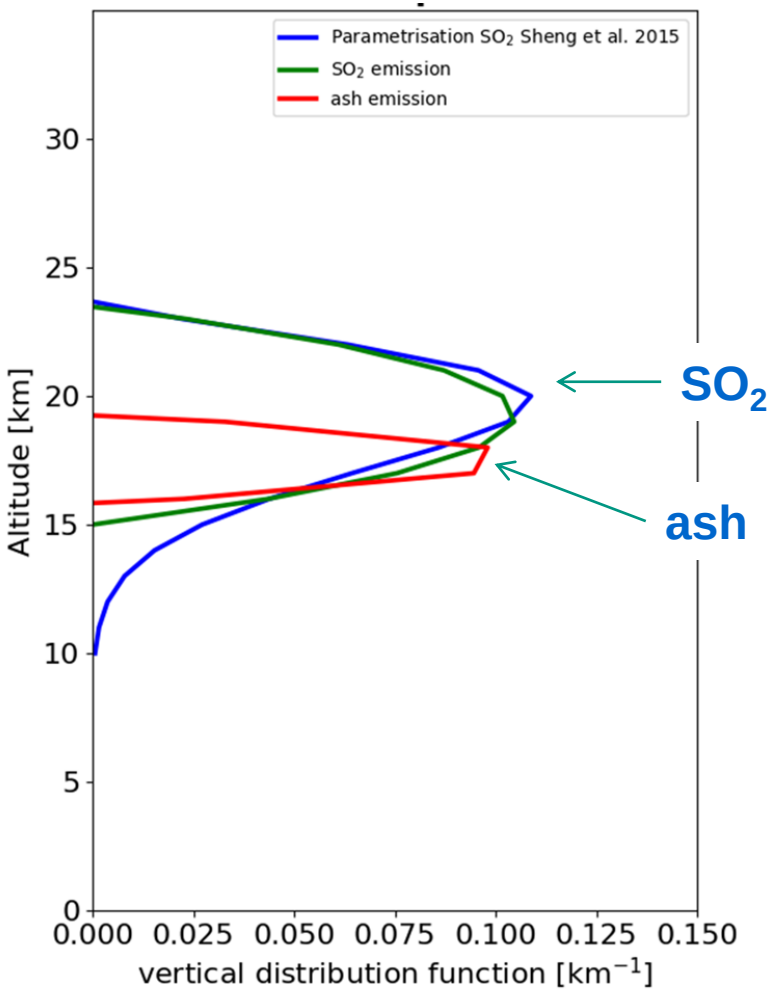
August 8, 1991

Lisa Muth

http://people.envsci.rutgers.edu/robock/

Method

Emission profiles

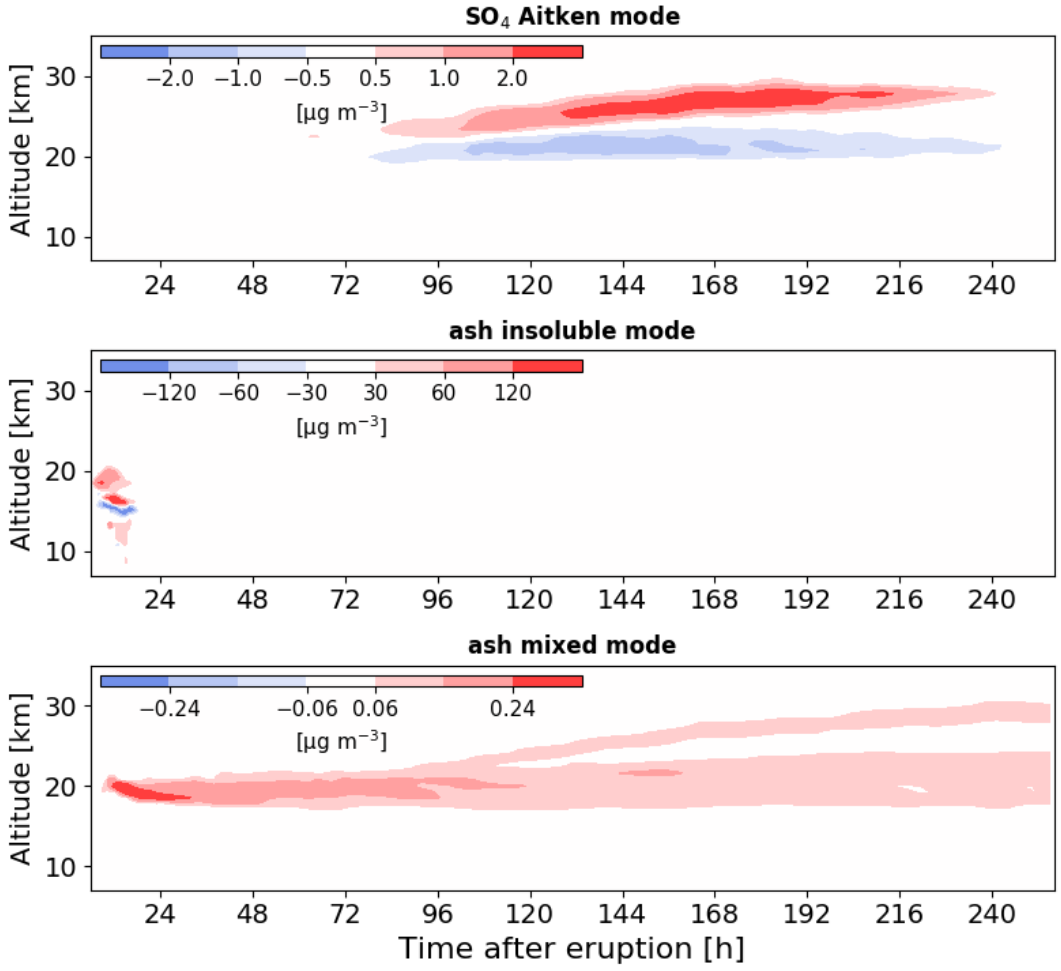


Lisa Muth

Results

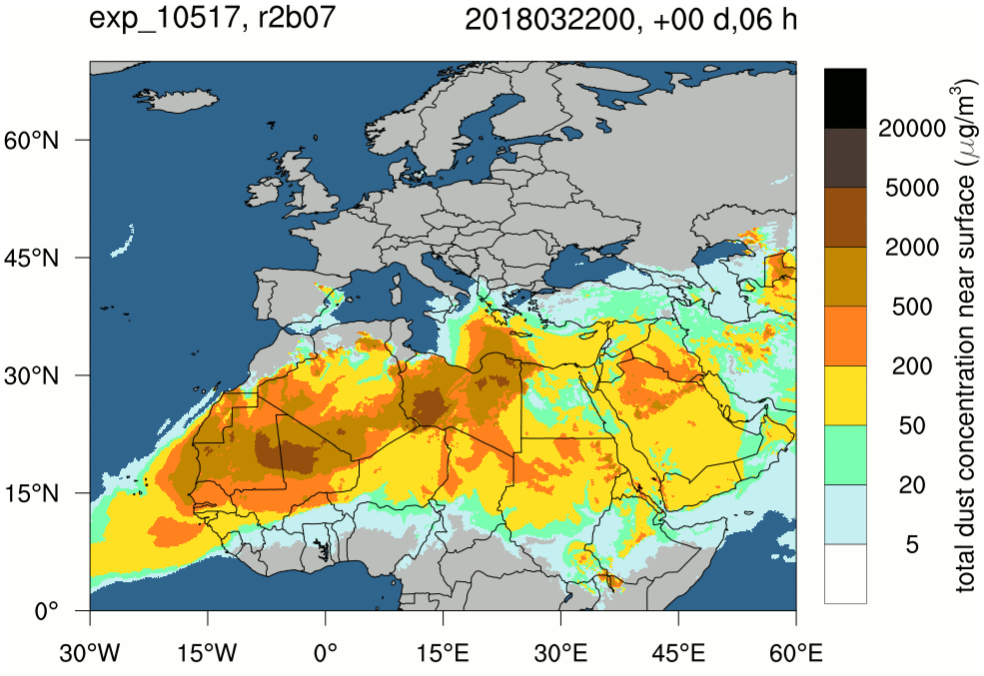
Difference in mean mixing ratio

Equatorial belt radiative – no radiative effects



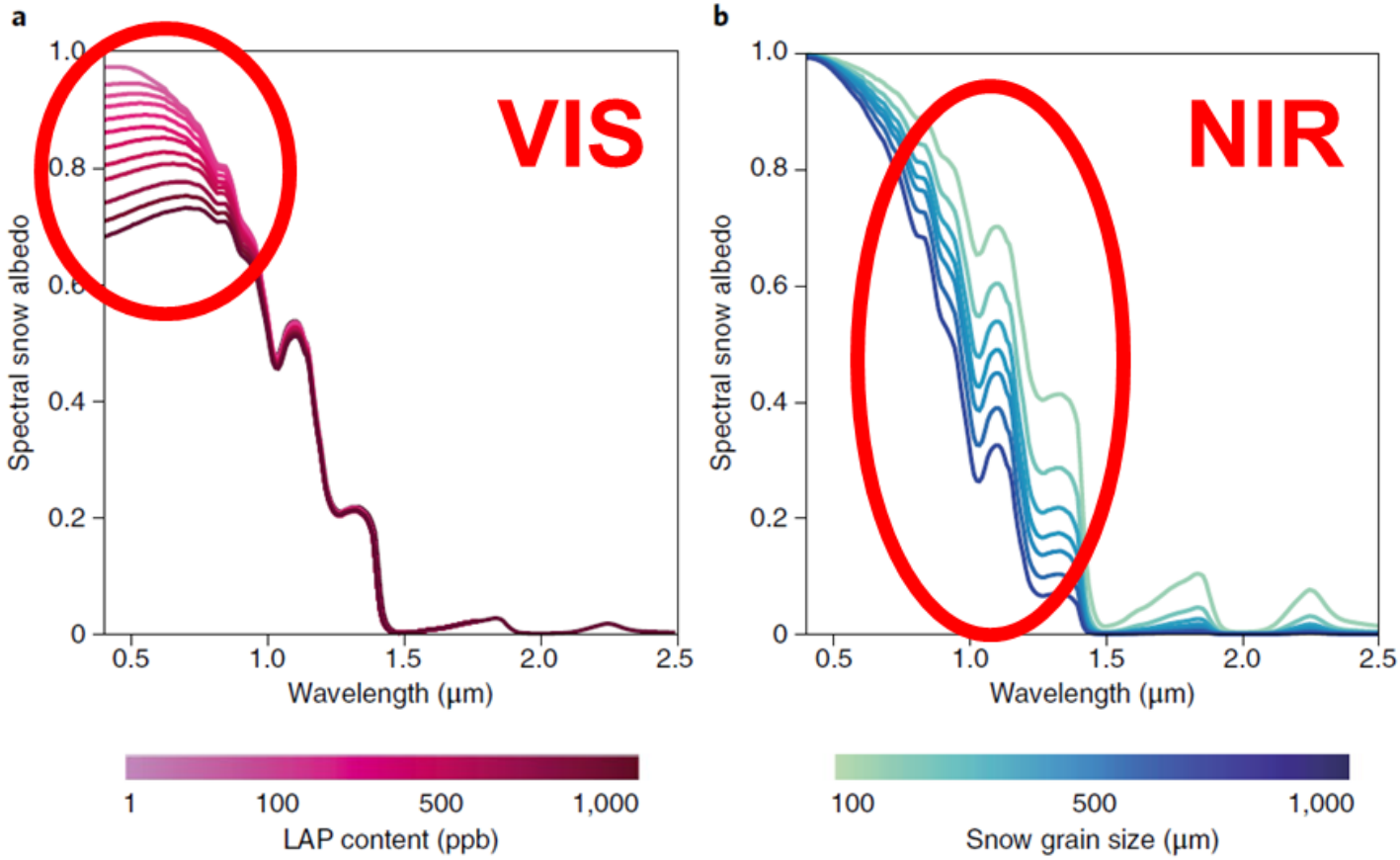
Lisa Muth

Atmospheric impact of Mineral Dust



V. Bachman, A. Steiner, J. Förstner

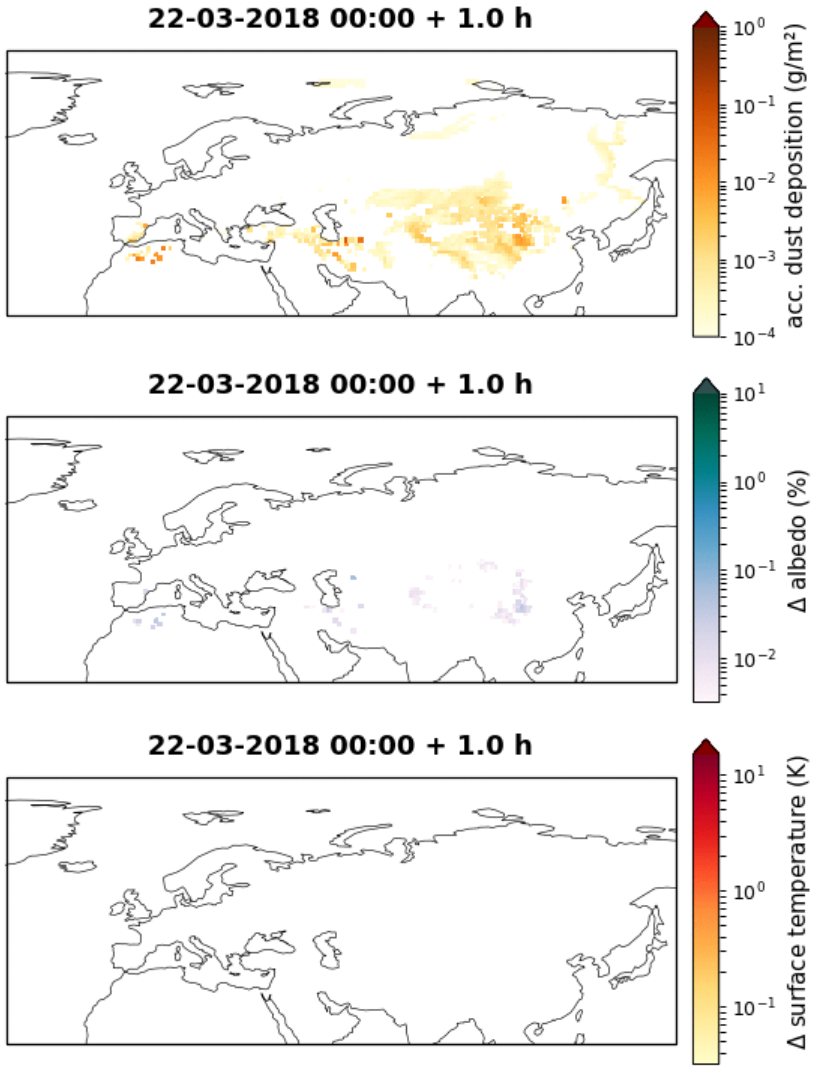
Method



Skiles et al., 2018

Anika Rohde

Result



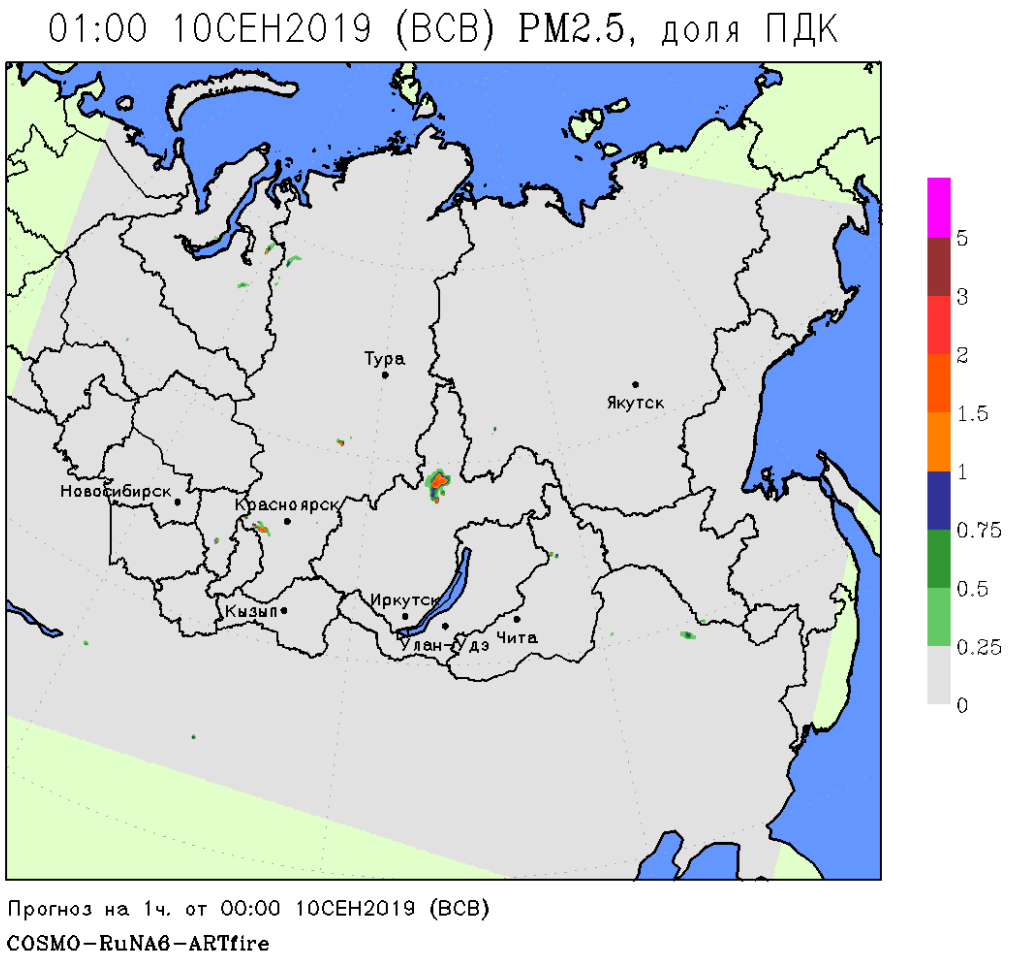
Model set up:

- horizontal resolution: 40 km
- simulation time: 3 days
- Initial data: IFS & ICON-ART dust

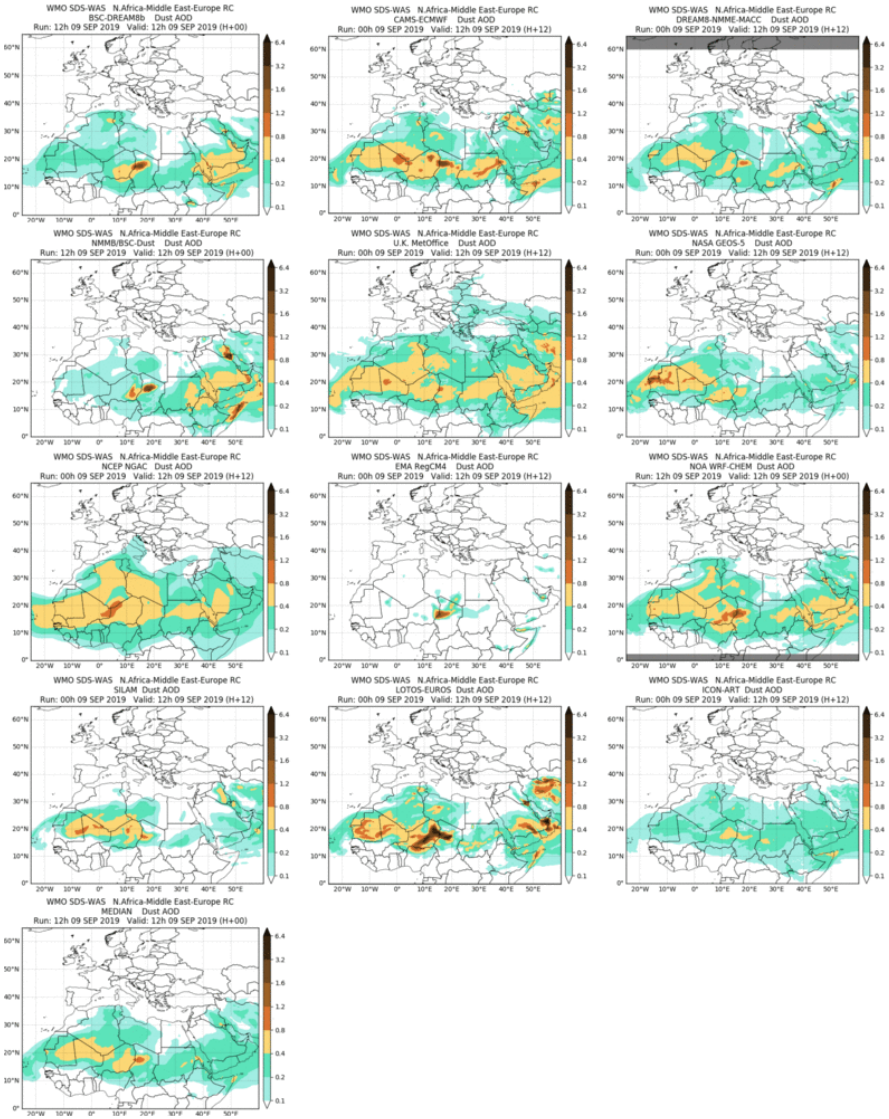
Results after 3 days (local values):

- total acc. deposition: 800 mg/m²
- decrease of albedo -7 %
- increases of surface temperature by 13.7 K

Operational COSMO-ART



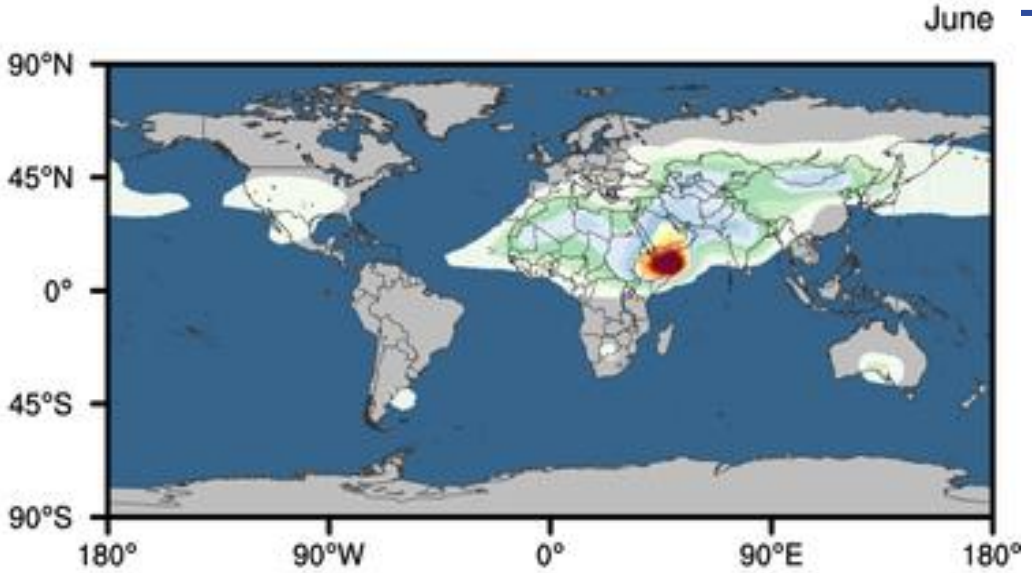
(Operational) ICON-ART



https://sds-was.aemet.es

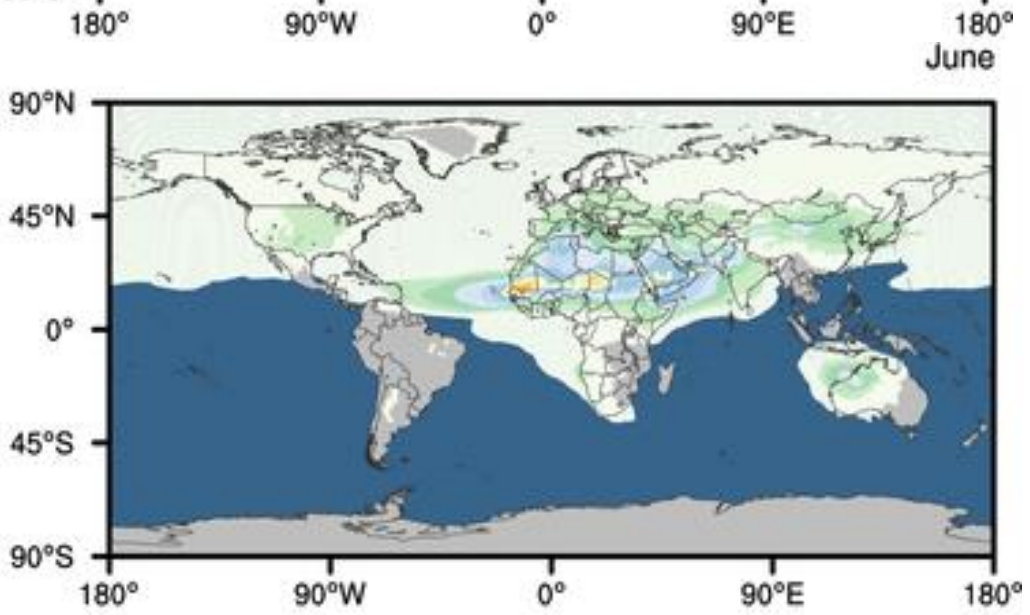
Monthly mean AOD Dust in 2019

Tegen



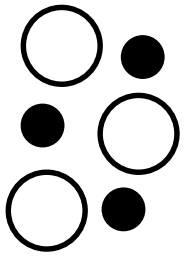
Exp. 10517, r2b06

ICON-ART

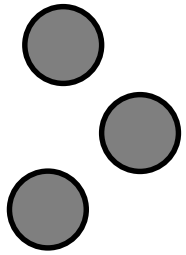


What is new about AeroDyn?

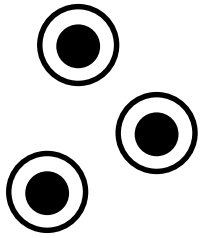
- So far: Externally mixed aerosols
  → fixed RI → lookup tables



- **New:** Internally mixed aerosols
  → RI varies with composition → ??



Volume-average



Core-Shell

Ali Hoshyaripour