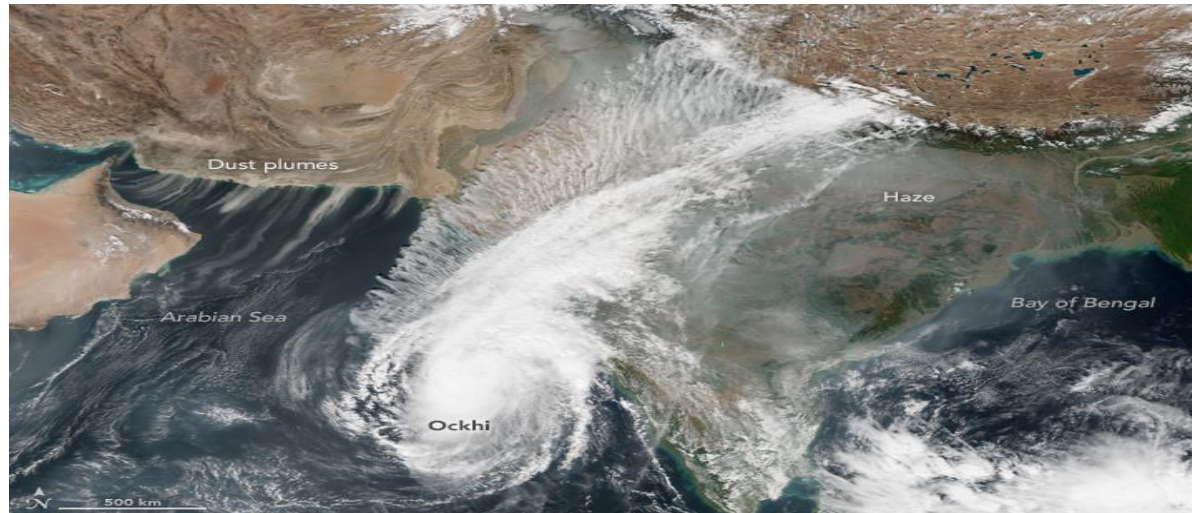
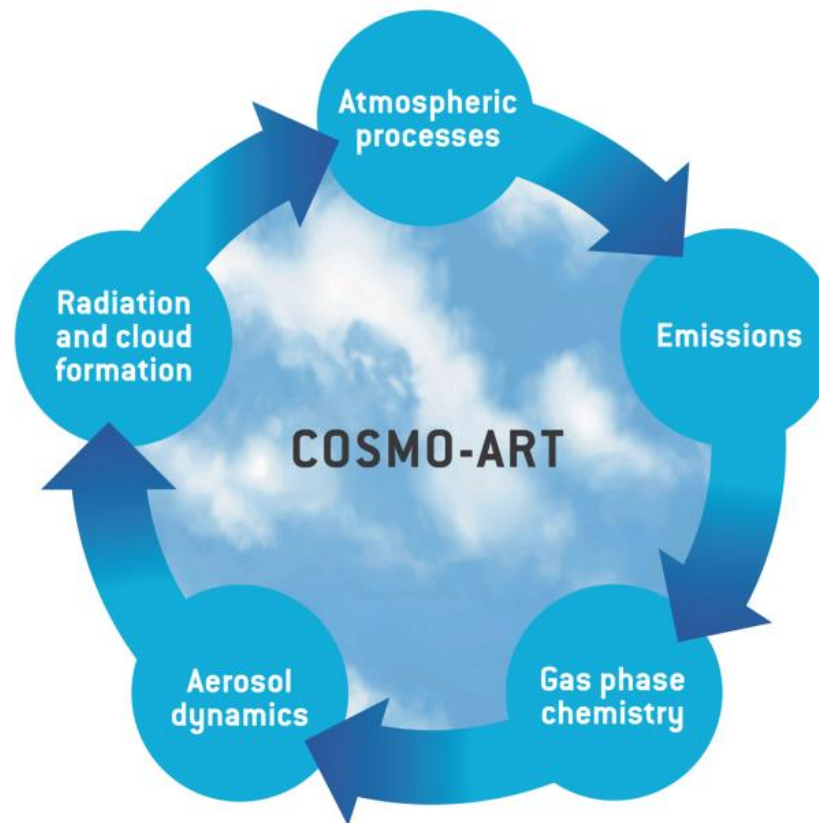


# Status of COSMO-ART & ICON-ART

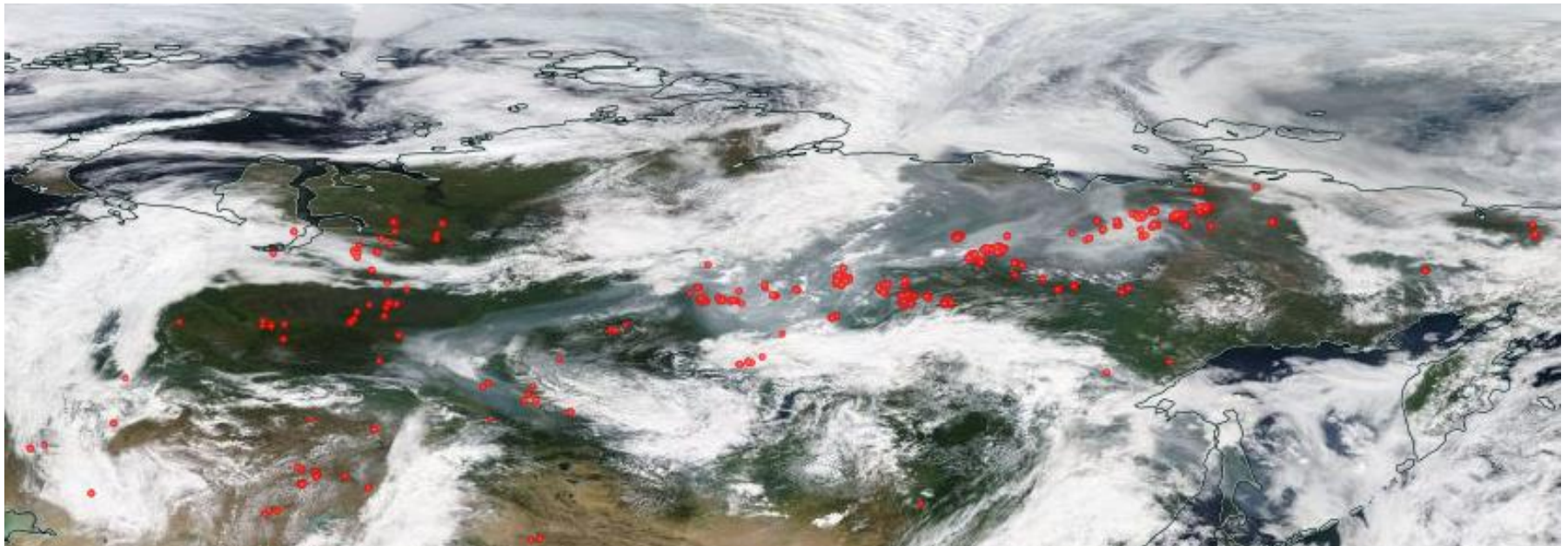
Bernhard Vogel and ART developers and users

Institute of Meteorology and Climate Research, KIT, Karlsruhe





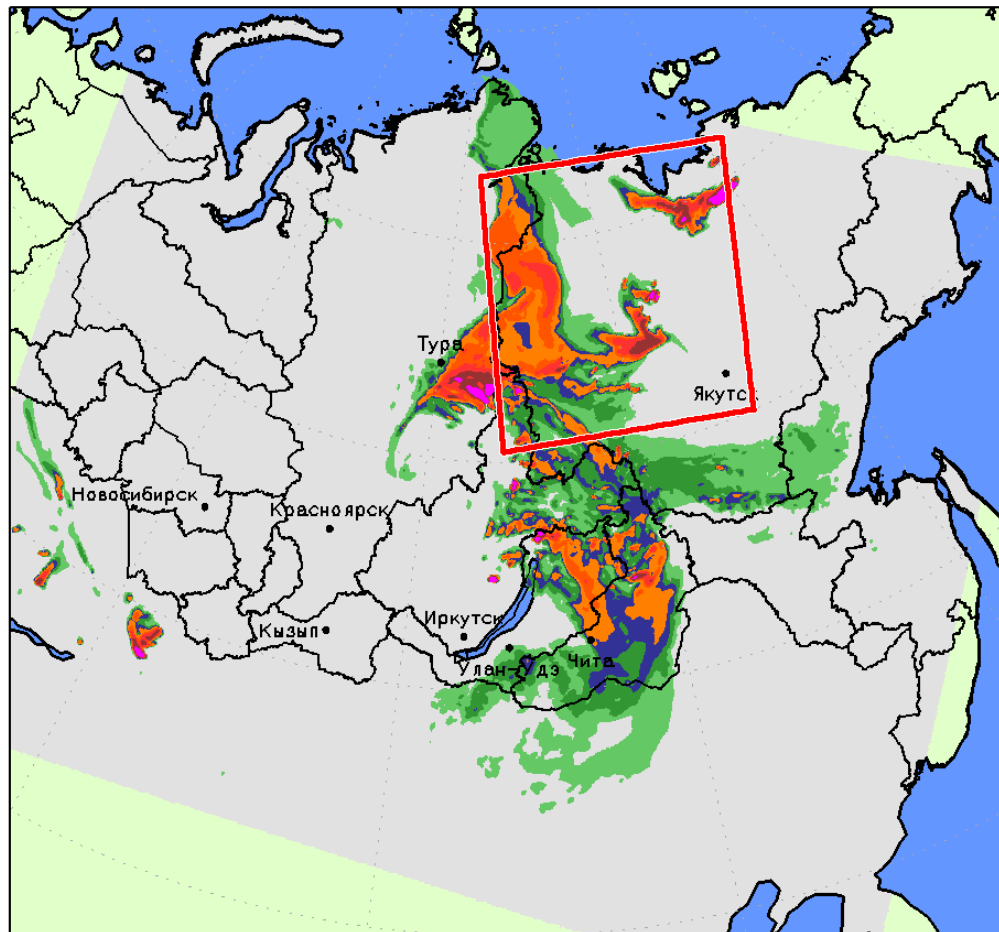
# Siberian wildfires, 2019







03:00 13АВГ2019 (BCV) СО, доля ПДК

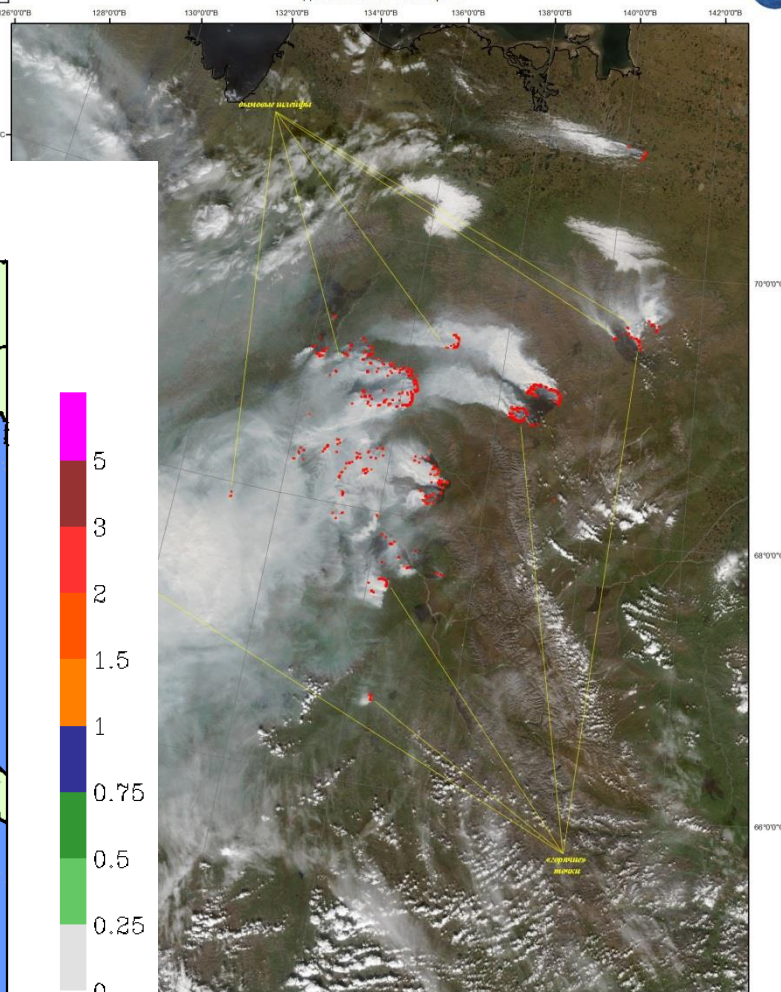


Прогноз на 3ч. от 00:00 13АВГ2019 (BCV)

COSMO-RuNA6-ARTfire



ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ГИДРОМЕТЕОРОЛОГИИ И МОНИТОРИНГУ ОКРУЖАЮЩЕЙ СРЕДЫ  
ФГБУ "НАУЧНО-ИССЛЕДОВАТЕЛЬСКИЙ ЦЕНТР КОСМИЧЕСКОЙ ГИДРОМЕТЕОРОЛОГИИ "ПЛАНЕТА"  
ДАЛЬНЕВОСТОЧНЫЙ ЦЕНТР



мониторинг пожарной обстановки по данным космического зондирования

Республика Саха (Якутия)

ИСЗ NPP-VIIRS  
Цветосинтезированное изображение с наложением маски, разрешение 375 м  
RGB (R(0.600-0.680 мм), G(0.545-0.565 мм), B(0.478-0.498 мм))  
13.08.2019 02:37 GMT



Alexander Kirsanov

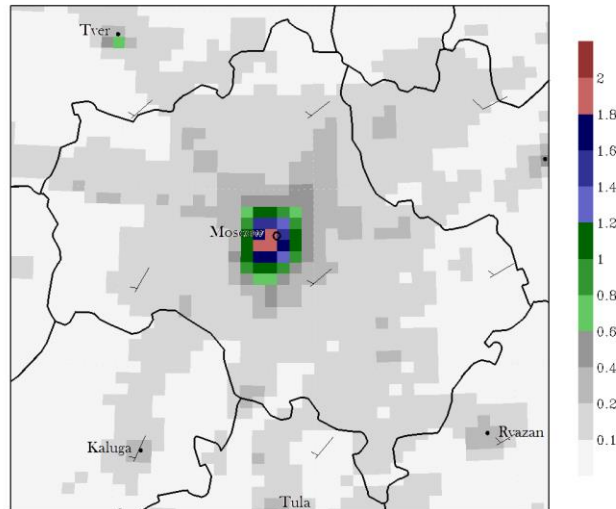


# The spatial distribution of surface BC concentration (A), PM concentrations (B), and AOD550 (C) over Moscow and Moscow suburbs according to the COSMO-ART model simulations.

April 15, 7h GMT (10h local time).  
Moscow AeroRadCity experiment

## BC

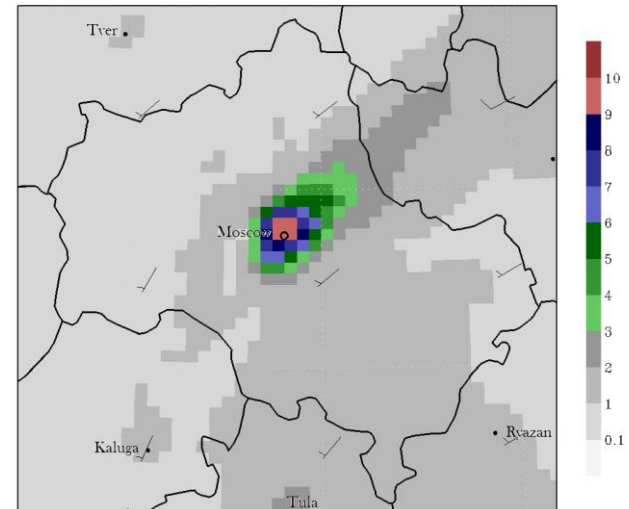
07:00 15APR2018 (UTC): SOOT (BC),  $\mu\text{g}/\text{m}^3$ , 0-10m level



Forecast on 31h from 00:00 14APR2018 (UTC)  
COSMO - RU / ART 7km

## PM2.5

07:00 15APR2018 (UTC): PM2.5,  $\mu\text{g}/\text{m}^3$ , 0-10m level



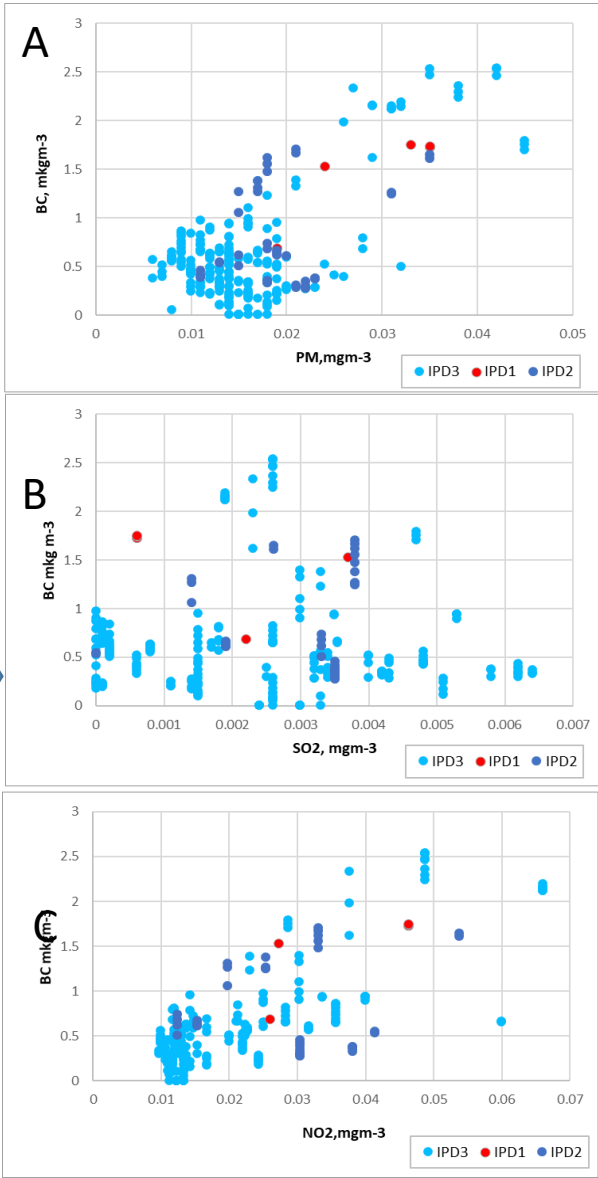
Forecast on 31h from 00:00 14APR2018 (UTC)  
COSMO - RU / ART 7km

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

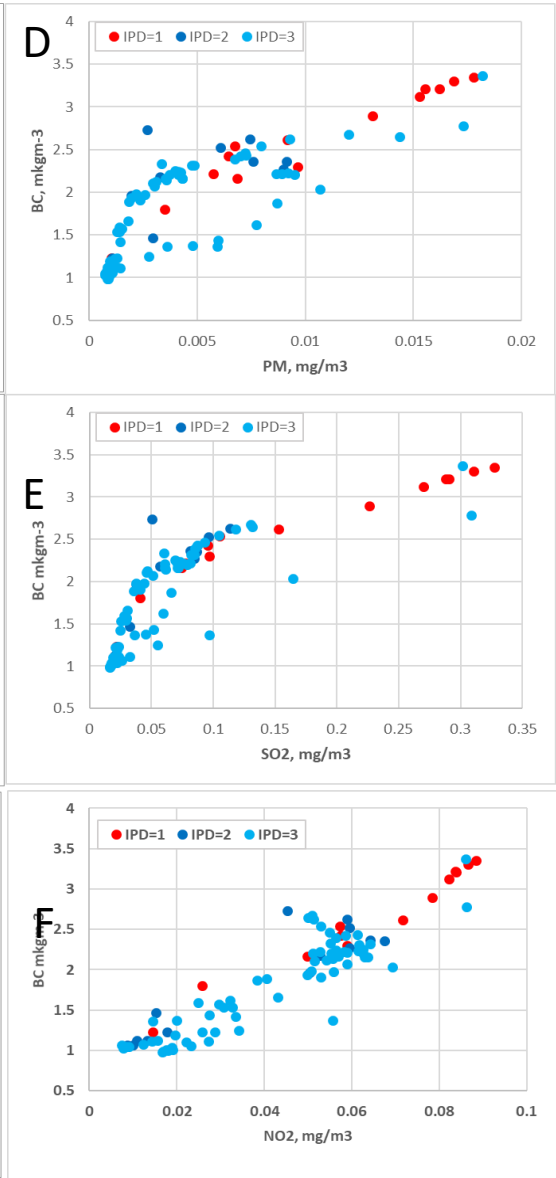
## Moscow AERORADCITY experiment

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

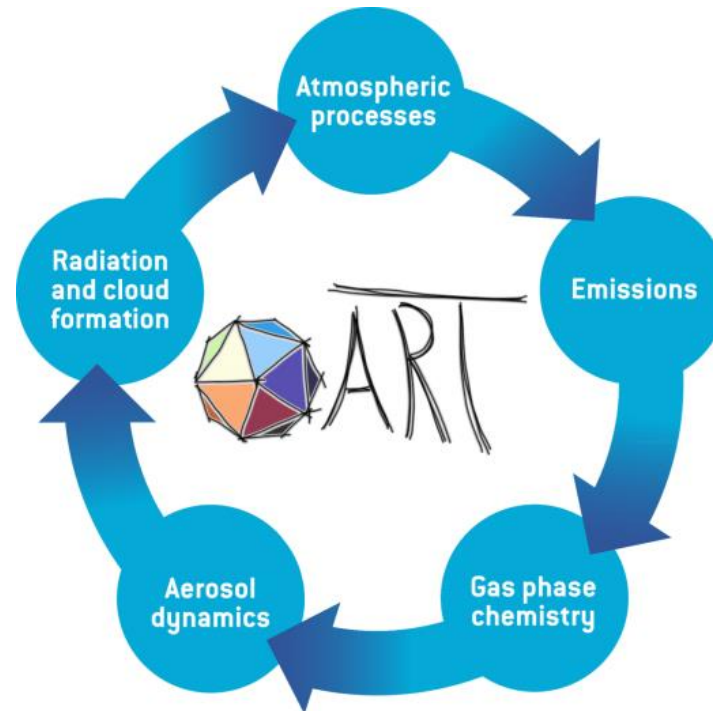
### Measurements



### COSMO-ART



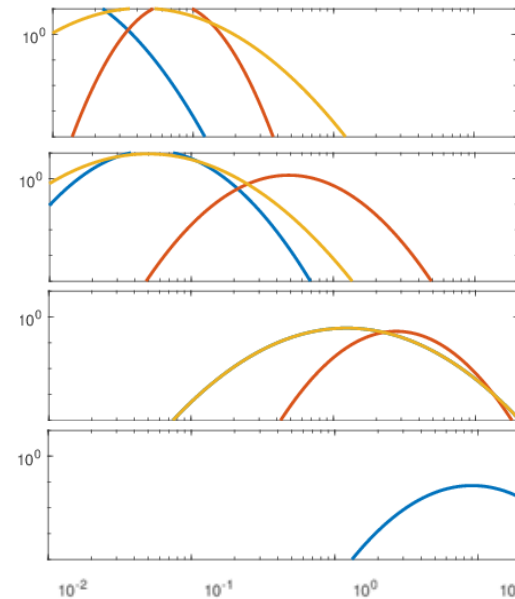
# Development and applications of ICON-ART



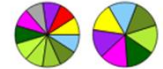
# AERODYN, a new flexible aerosol scheme

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

SOL INSOL MIXED



Soluble particles



Insoluble particles



Mixed: Soluble and insoluble

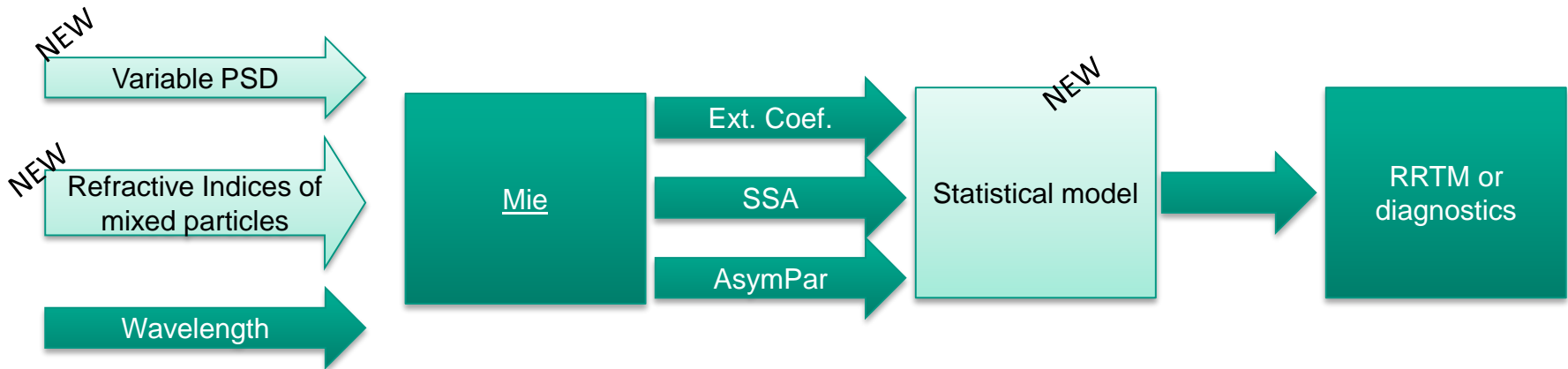


## Contributions by:

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

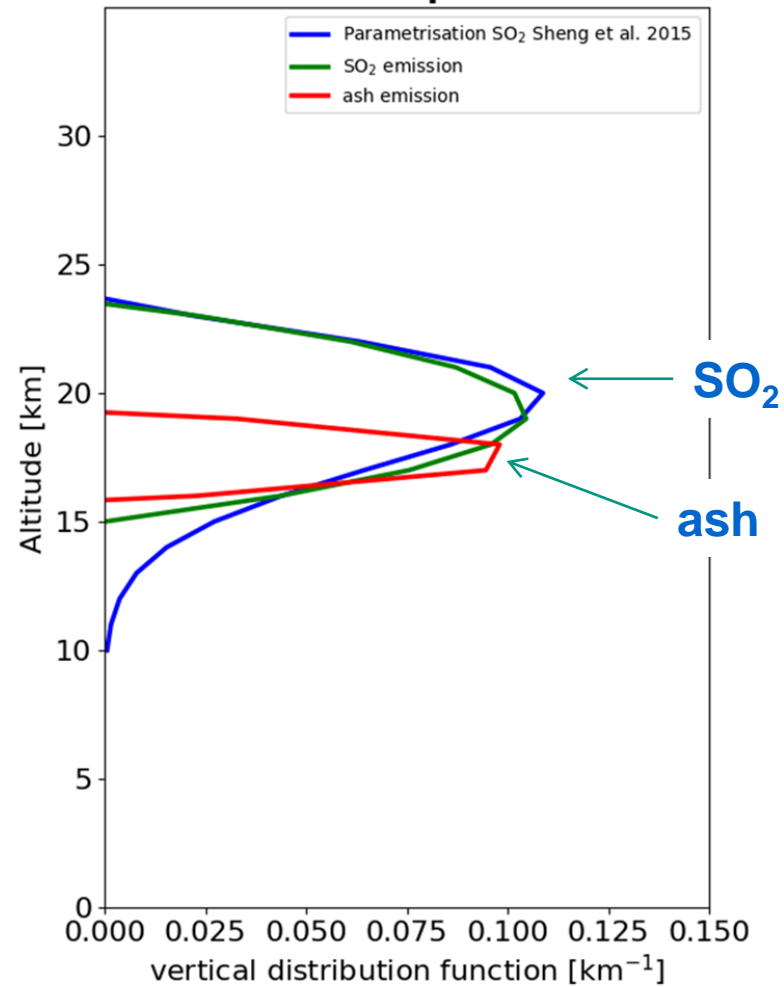


August 8, 1991

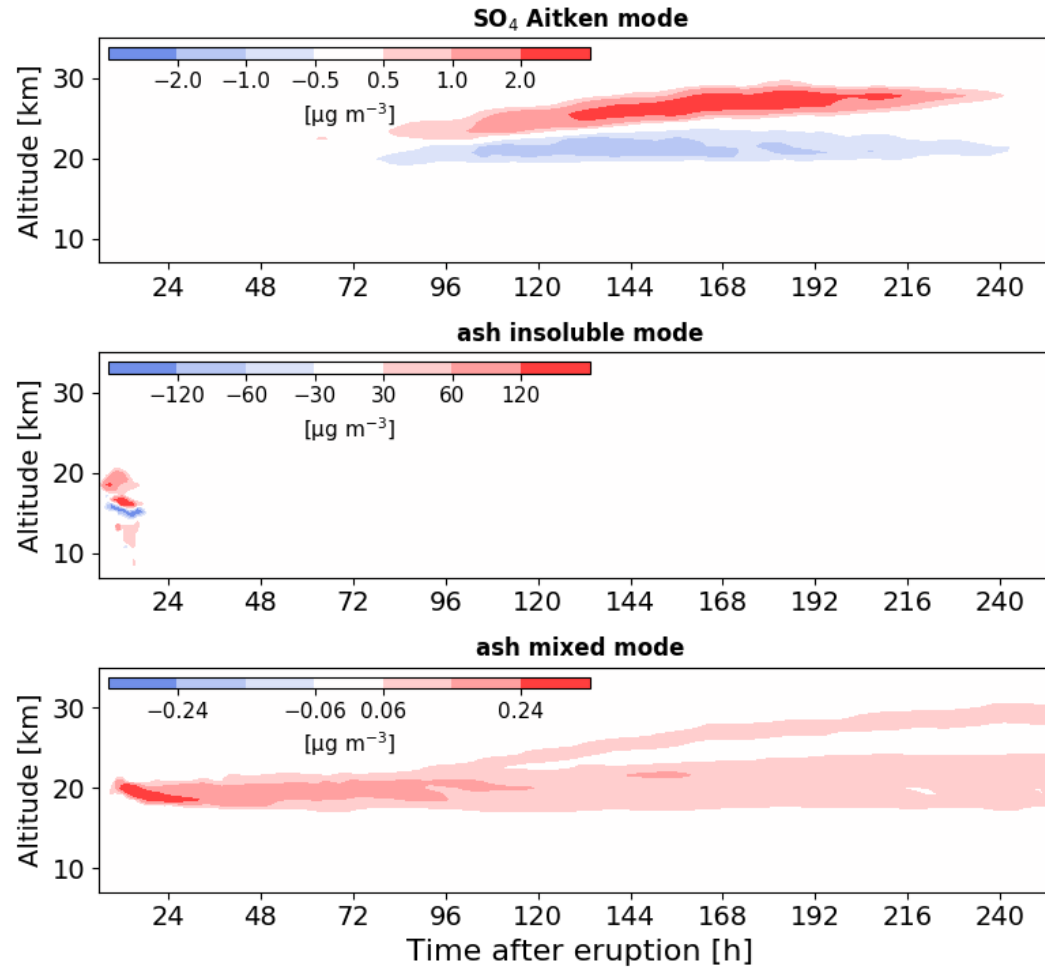
Lisa Muth

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

## Emission profiles



## Difference in mean mixing ratio Equatorial belt radiative – no radiative effects



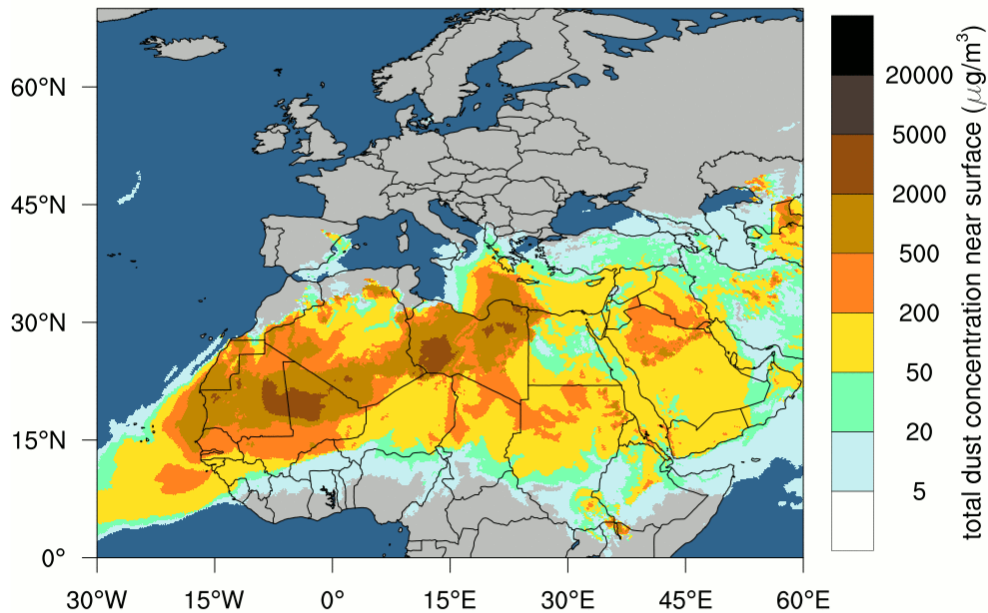
Lisa Muth

# Atmospheric impact of Mineral Dust



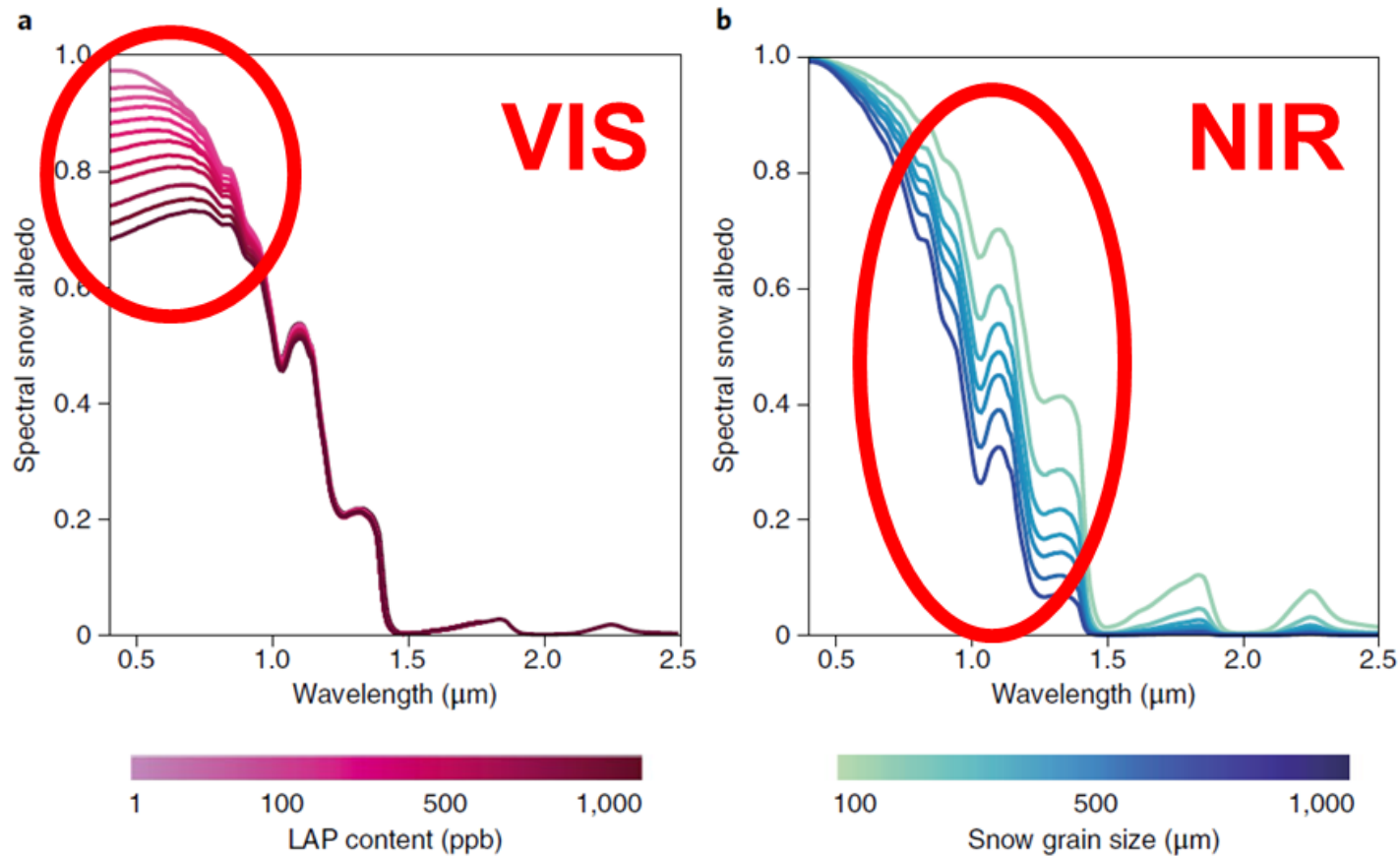
exp\_10517, r2b07

2018032200, +00 d,06 h



V. Bachman, A. Steiner, J. Förstner

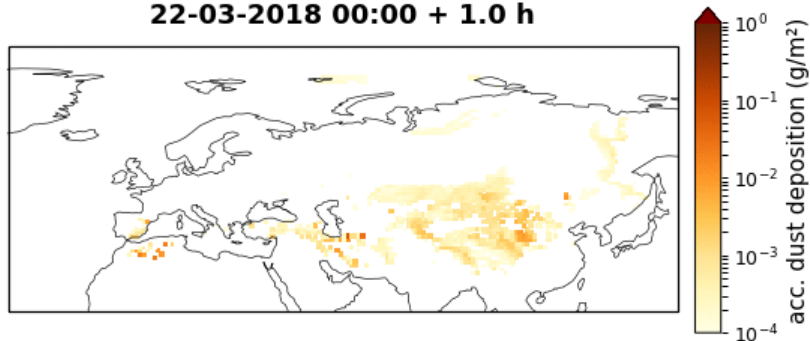




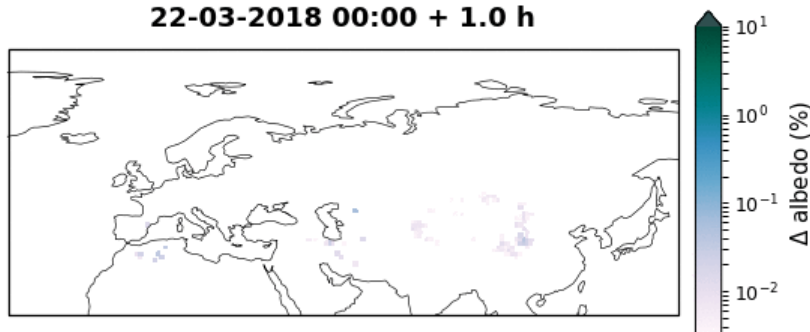
Skiles et al., 2018

Anika Rohde

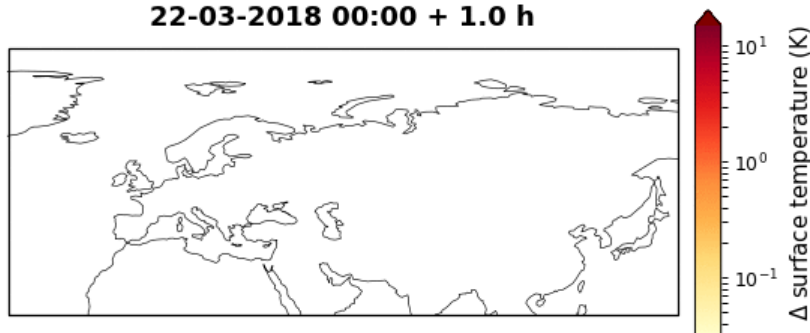
22-03-2018 00:00 + 1.0 h



22-03-2018 00:00 + 1.0 h



22-03-2018 00:00 + 1.0 h



## 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:  $800 \text{ mg/m}^2$
- decrease of albedo -7 %
- increases of surface temperature by 13.7 K

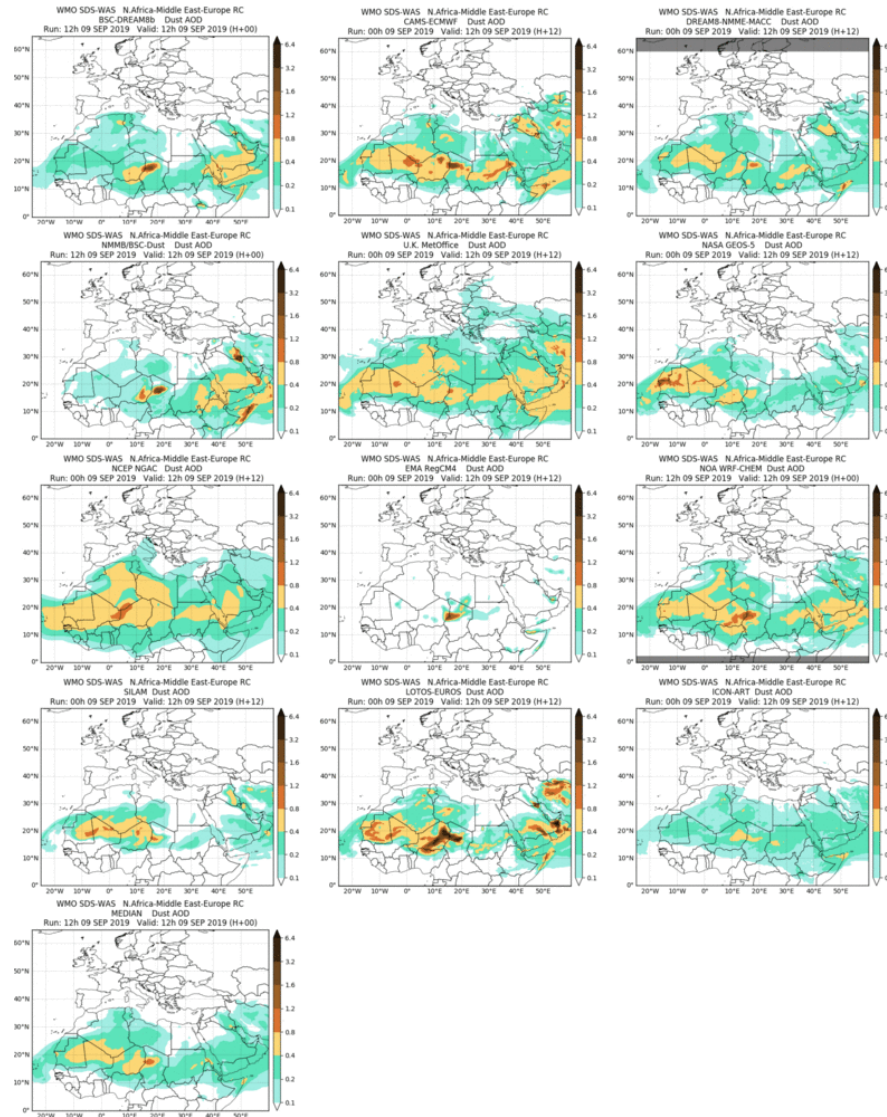


# Operational COSMO-ART

01:00 10СЕН2019 (BCV) PM2.5, доля ПДК



Прогноз на 1ч. от 00:00 10СЕН2019 (BCV)  
COSMO-RuNA6-ARTfire

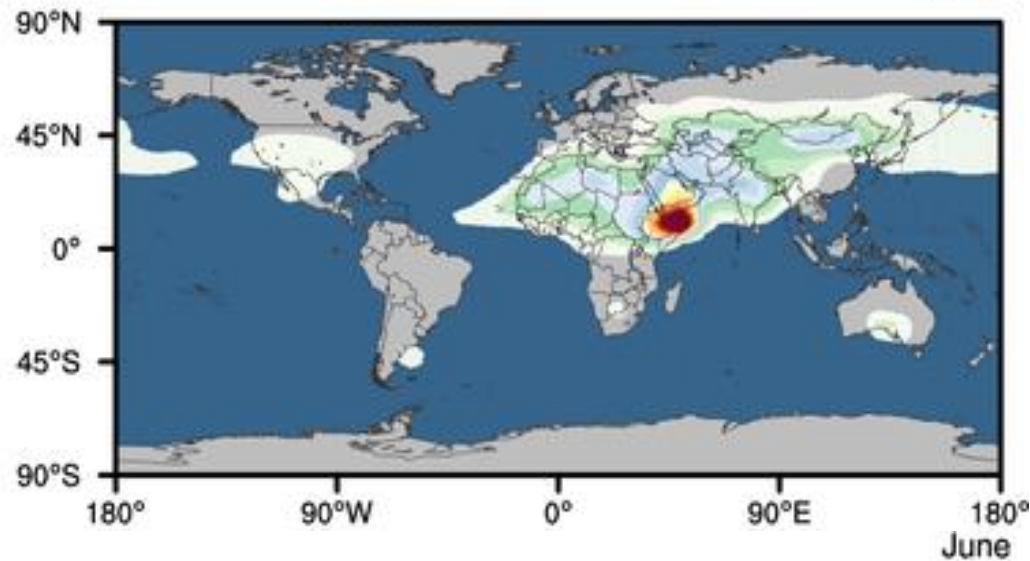


# Monthly mean AOD Dust in 2019

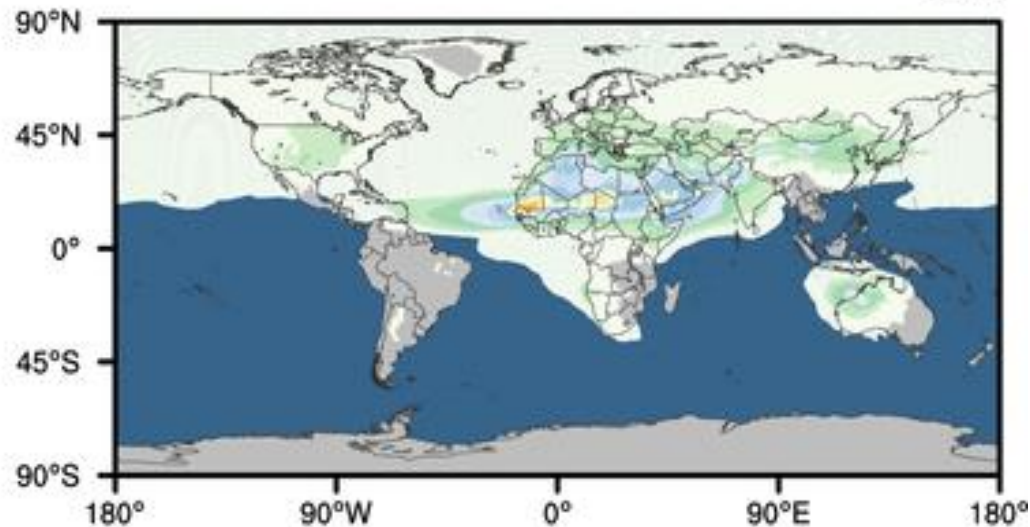
June

Tegen

Exp. 10517, r2b06



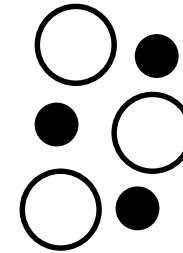
ICON-ART



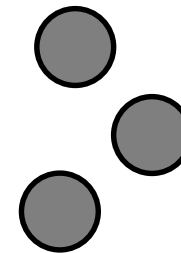


# What is new about AeroDyn?

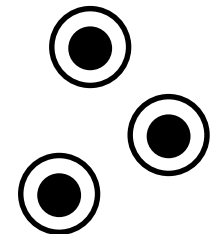
- So far: Externally mixed aerosols  
→ fixed RI → lookup tables



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



Volume-average



Core-Shell

Ali Hoshyaripour