Karlsruhe Institute of Technology

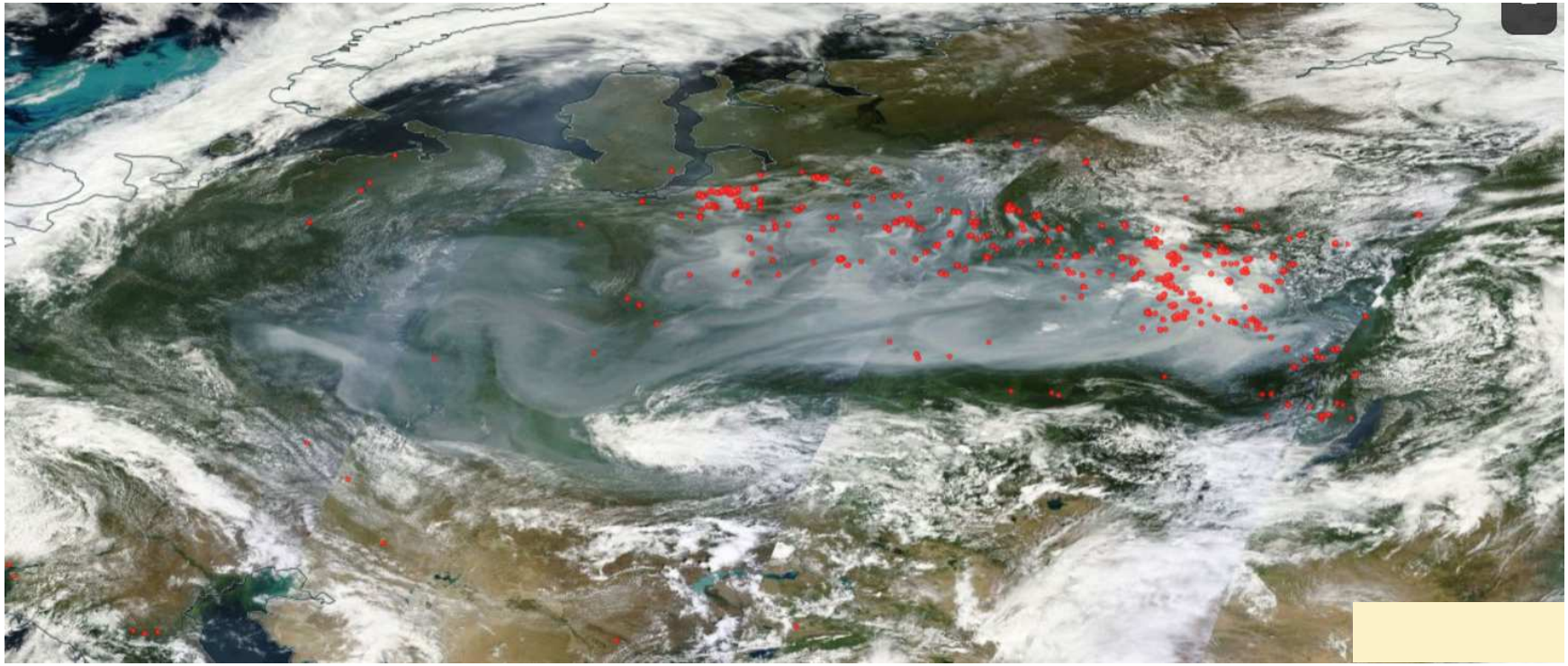
Status and first applications of the modelling system ICON-ART

Institute for Meteorology and Climate Research

Bernhard Vogel

The atmosphere contains aerosol!

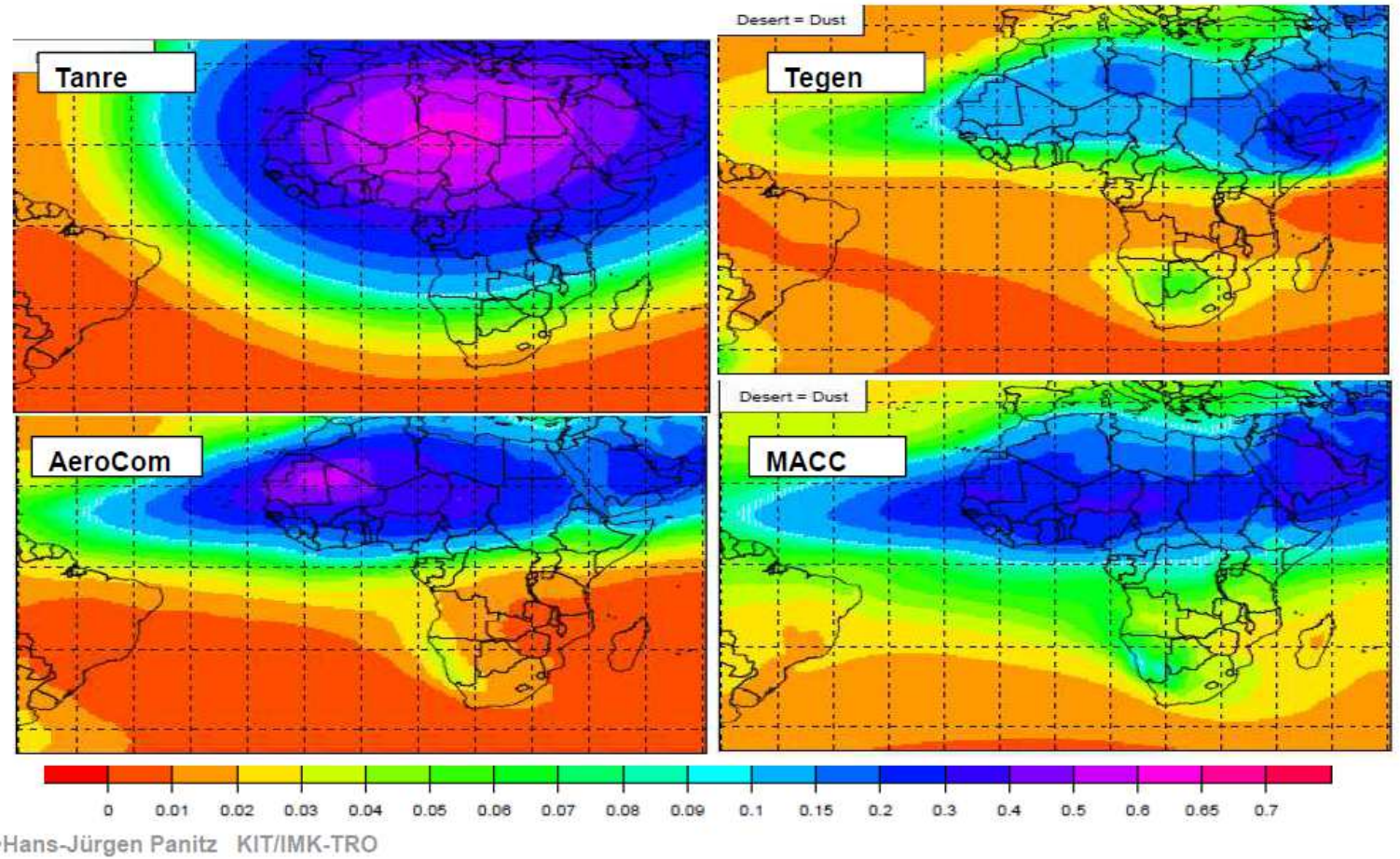
20 July 2016



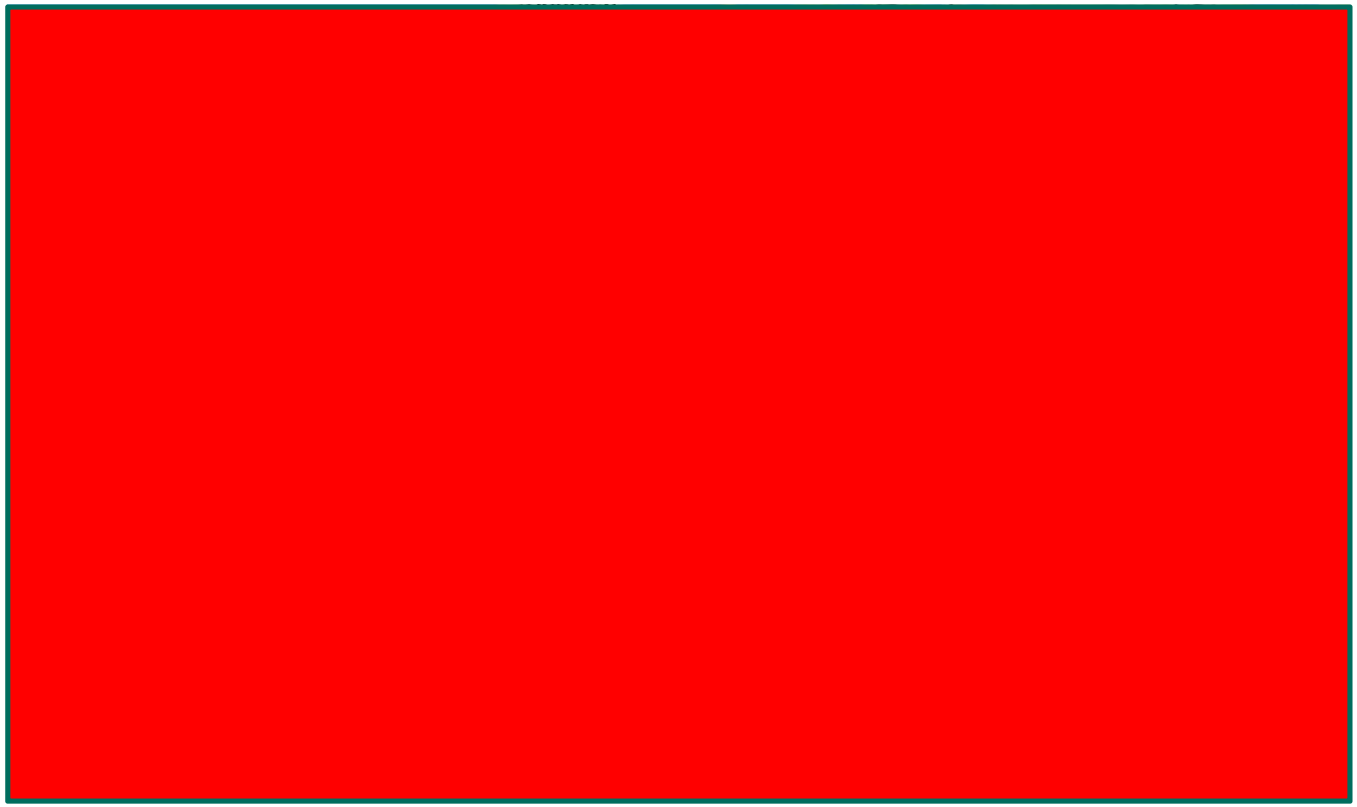
Link to the gas phase

Todays forecast models (radiation)

Dust AOD Climatolgies

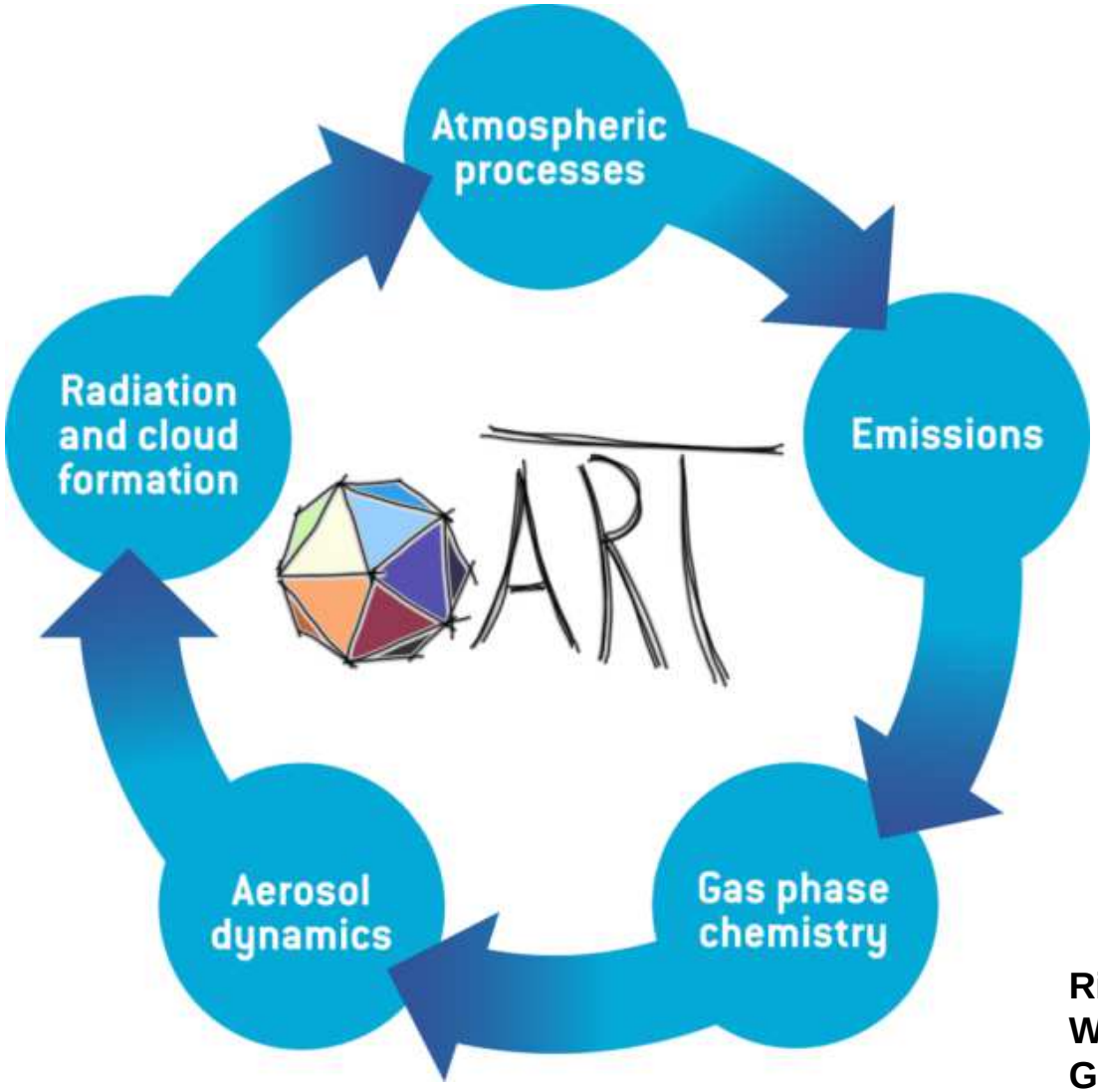


Todays forecast models (clouds)



Number of cloud droplets  100 cm^{-3}

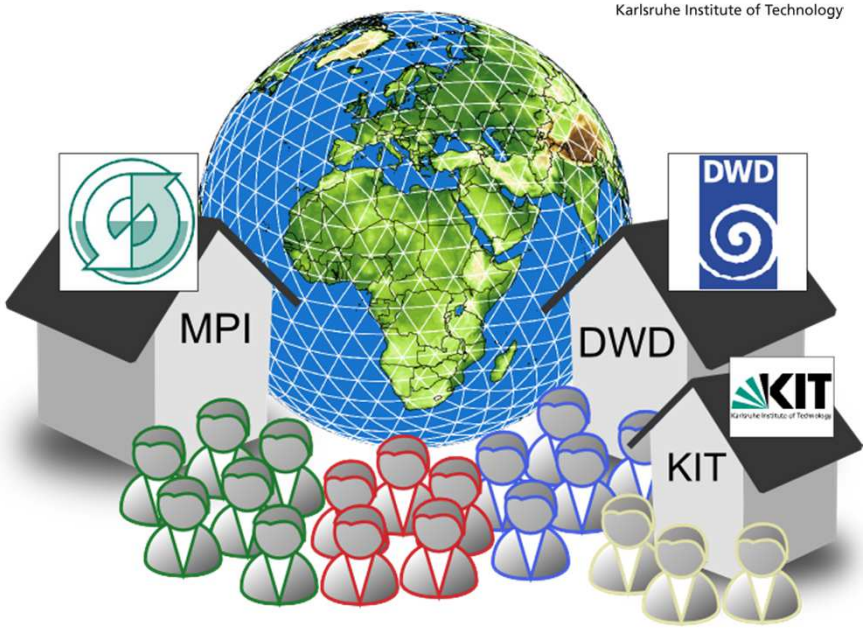
Feedback processes realized



05/11

Rieger et al., 2016
Weimer et al., 2016
Gasch et al., 2017

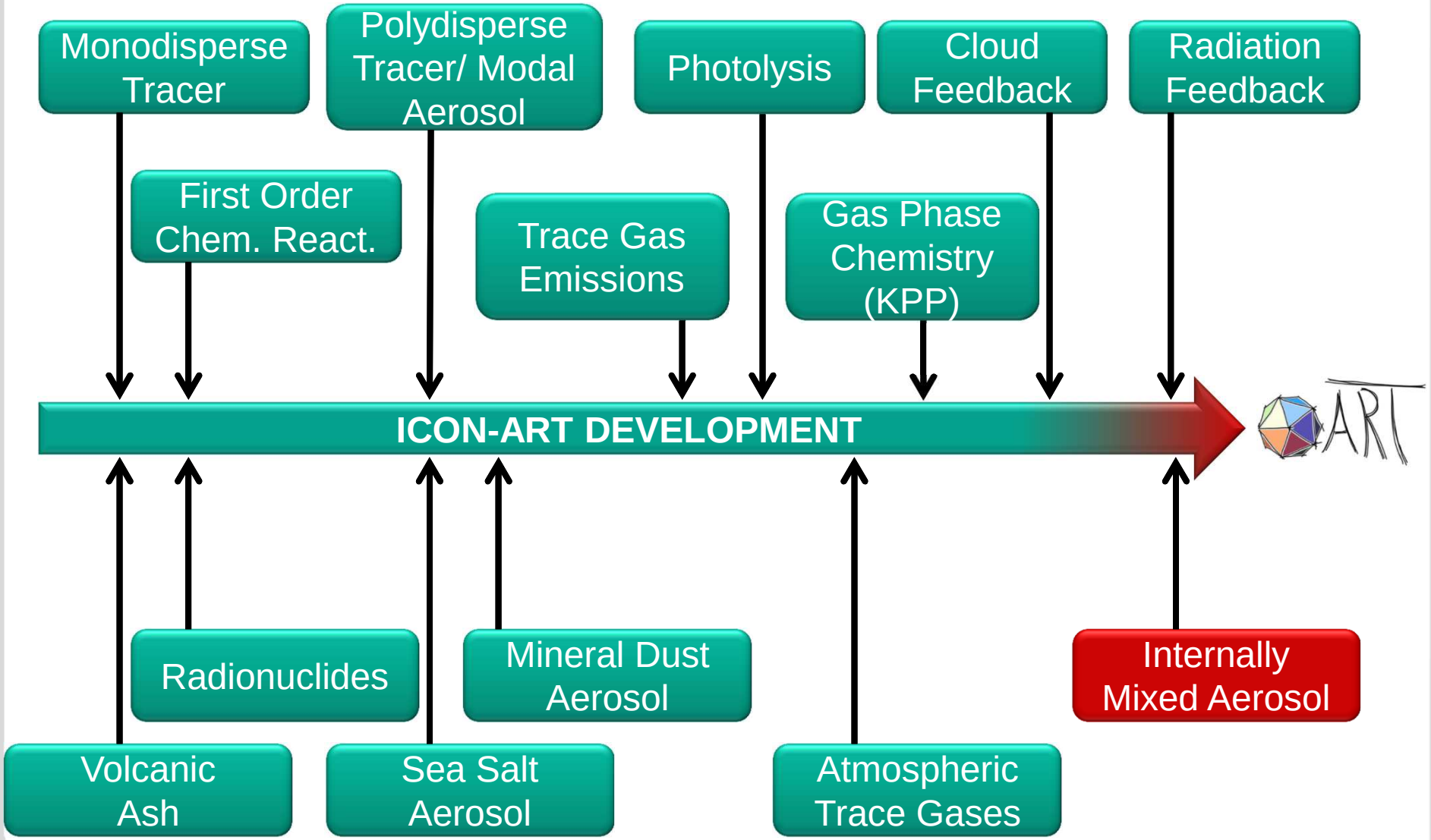
Bernhard Vogel[1]
Peter Bräsicke[2]
Ingeborg Bischoff-Gauss[4]
Christopher Diekmann[2]
Johannes Eckstein[2]
Jochen Förstner[3]
Philipp Gasch[1]
Tobias Göcke[3]
Simon Gruber[1]
Daniel Rieger[1]
Roland Ruhnke[2]
Andrea Steiner[3]
Jennifer Schröter[2]
Jonas Straub[1]
Heike Vogel[1]
Carolin Walter[1]
Vanessa Bachmann[3]
Michael Weimer[4]
Sven Werchner[1]



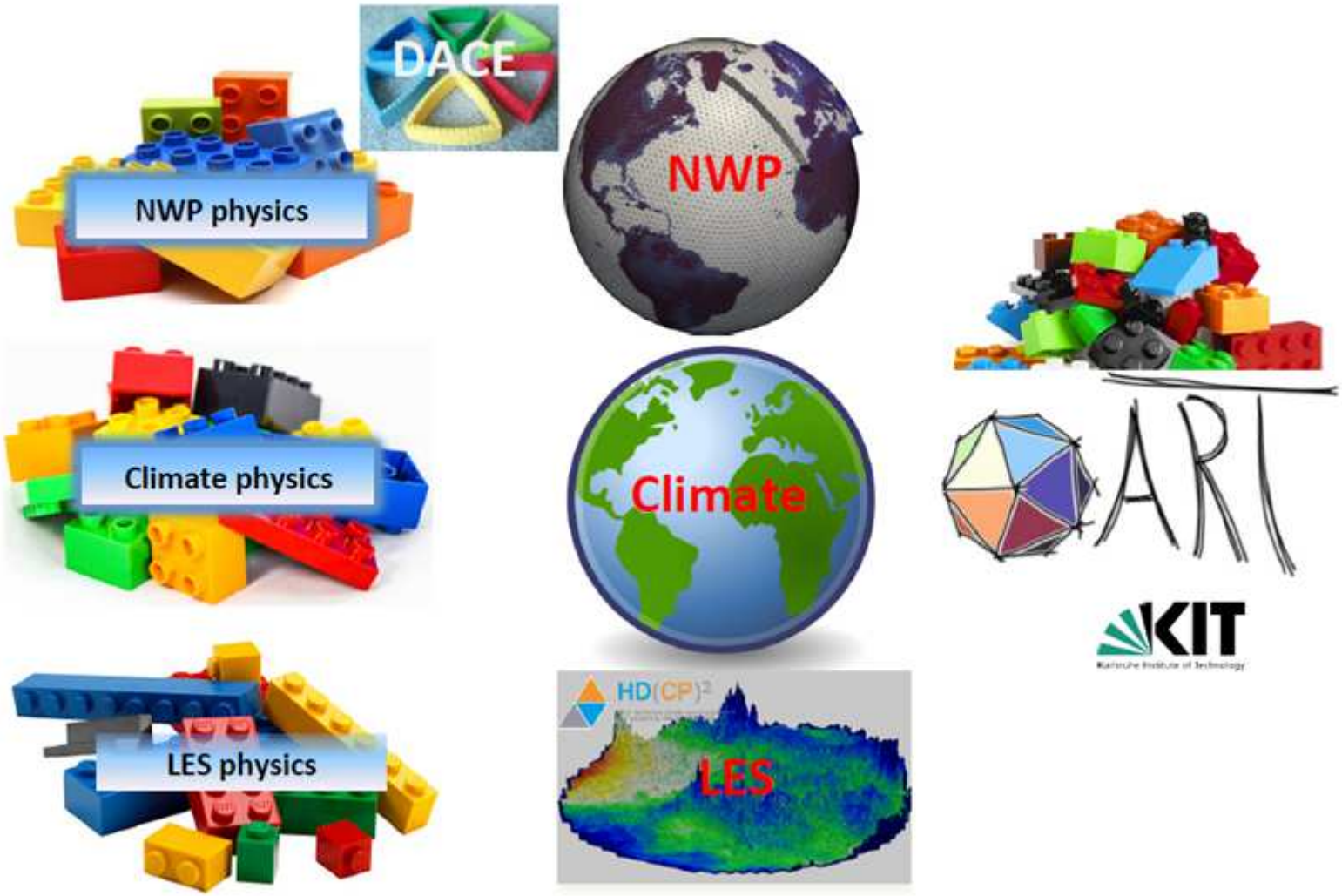
[1] KIT, Institute of Meteorology and Climate Research – Troposphere Research
[2] KIT, Institute of Meteorology and Climate Research – Atmospheric Trace Gases and Remote Sensing
[3] Deutscher Wetterdienst (DWD)
[4] KIT, Steinbuch Centre for Computing

Collaboration to built up a common chemistry aerosol package for ICON based on ICON-ART coordinated by KIT

Milestones


Monodisperse Tracer
Polydisperse Tracer/ Modal Aerosol
Photolysis
Cloud Feedback
Radiation Feedback
First Order Chem. React.
Trace Gas Emissions
Gas Phase Chemistry (KPP)
ICON-ART DEVELOPMENT
ART
Radionuclides
Mineral Dust Aerosol
Internally Mixed Aerosol
Volcanic Ash
Sea Salt Aerosol
Atmospheric Trace Gases

Seamless in space and time



The ICON Modelling Framework

Joint research/application of DWD and KIT

Volcanic Ash

Mineral Dust: Project **PerduS**

Radionuclides: coordinated work with BfS

Toxic Chemical Substances: ICON-heARTs – emergency cases

Research KIT (synoptic scale)

Karlsruhe Institute of Technology

Impact of volcanic ash on atmospheric processes

Dust-cloud-radiation feedback

Scale dependency of aerosol cloud interaction

Climate engineering

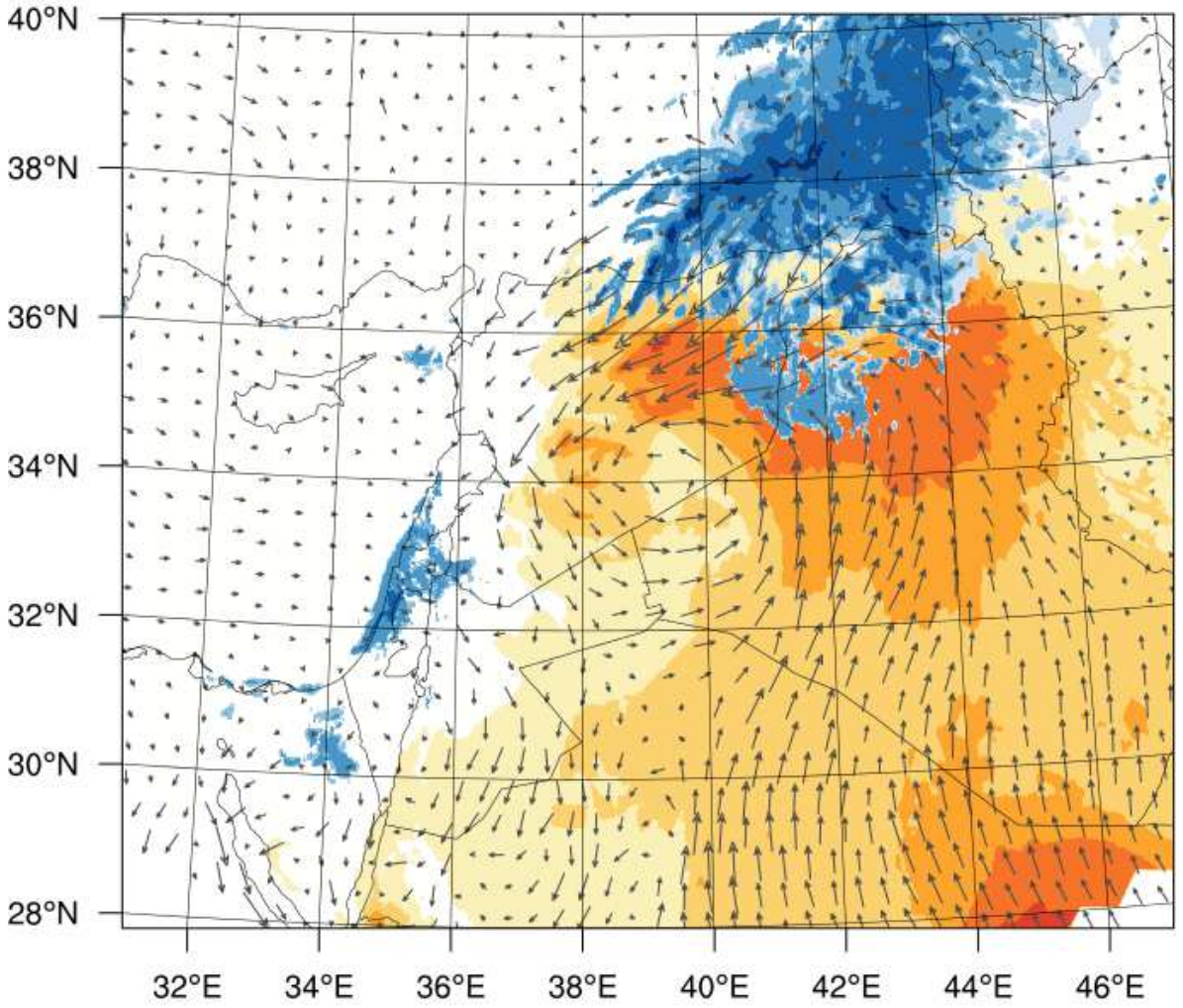
September Dust storm Israel, 2015


© AFP/Getty Images/Ahmad Gharabli


© SANA via AP


© AP Photo/Hassan Ammar

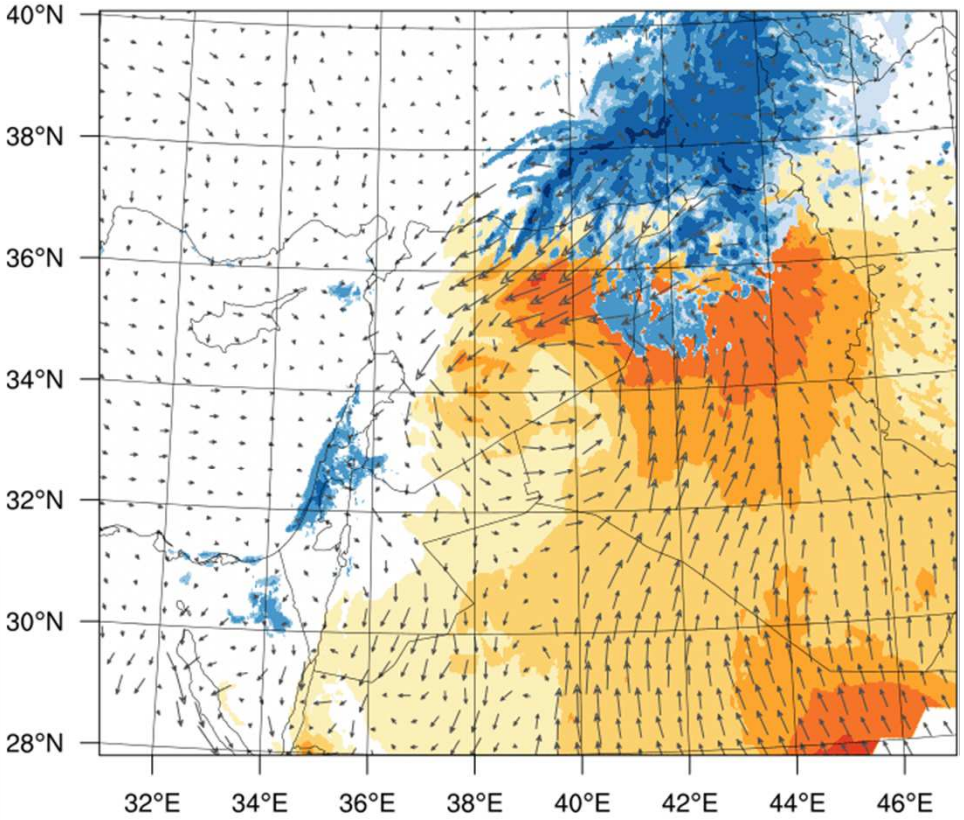
Cloud water content and AOD



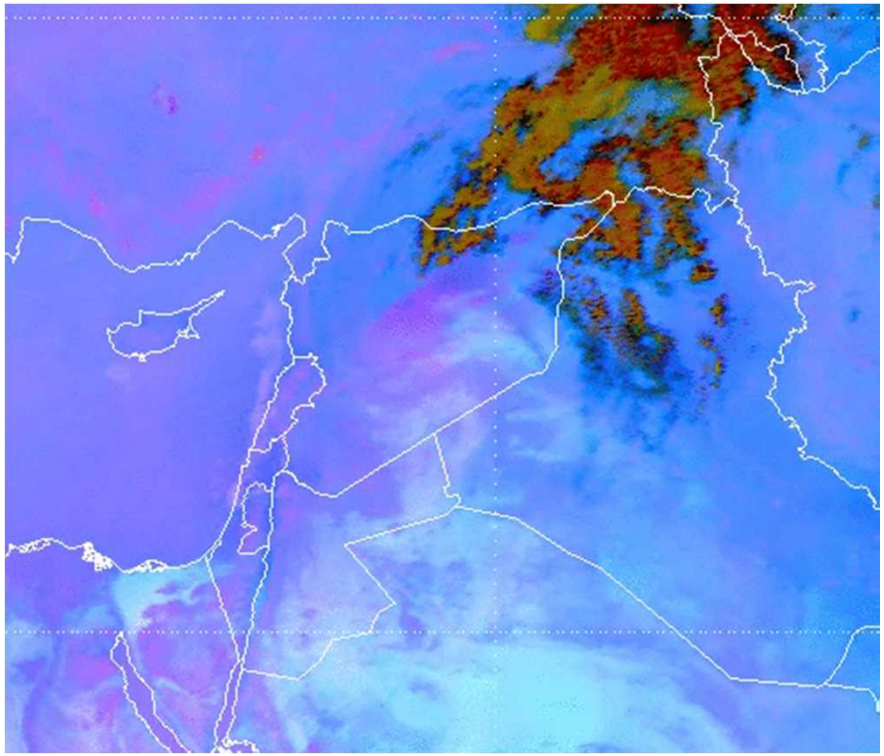
06 | 6/9 | 7/9 | 8/9

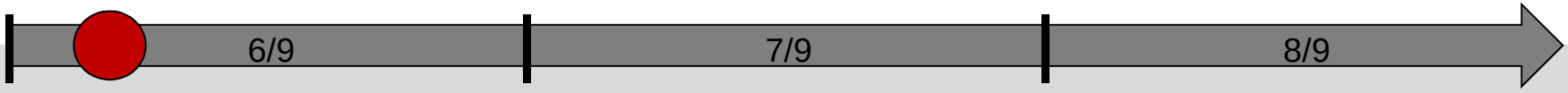
Validation of ICON-ART

ICON-ART



EUMETSAT

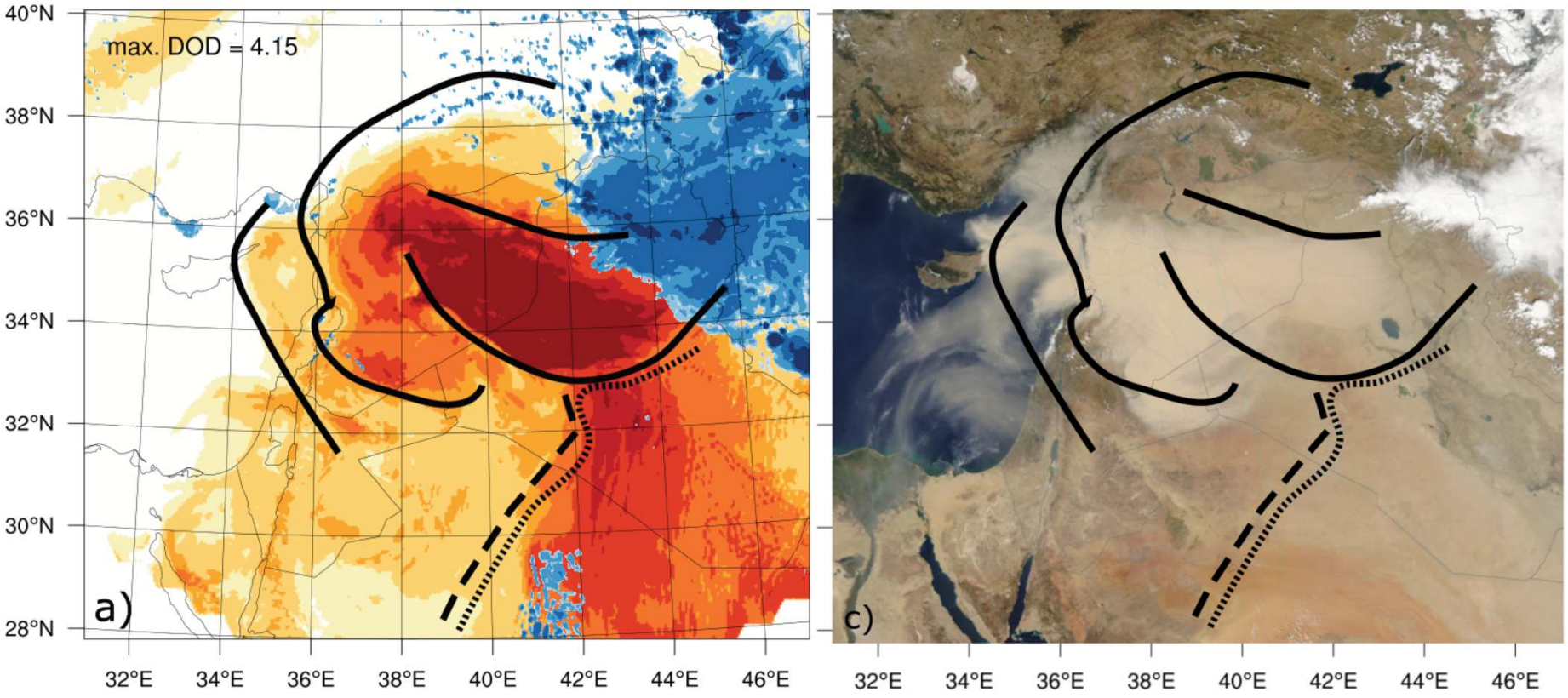




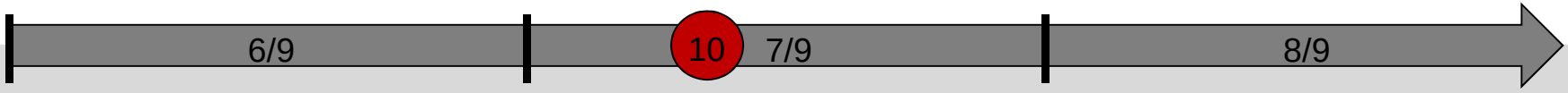
Validation of ICON-ART

ICON-ART

MODIS TERRA VIS



Gasch et al., 2017



Research at KIT (global climate)

Karlsruhe Institute of Technology

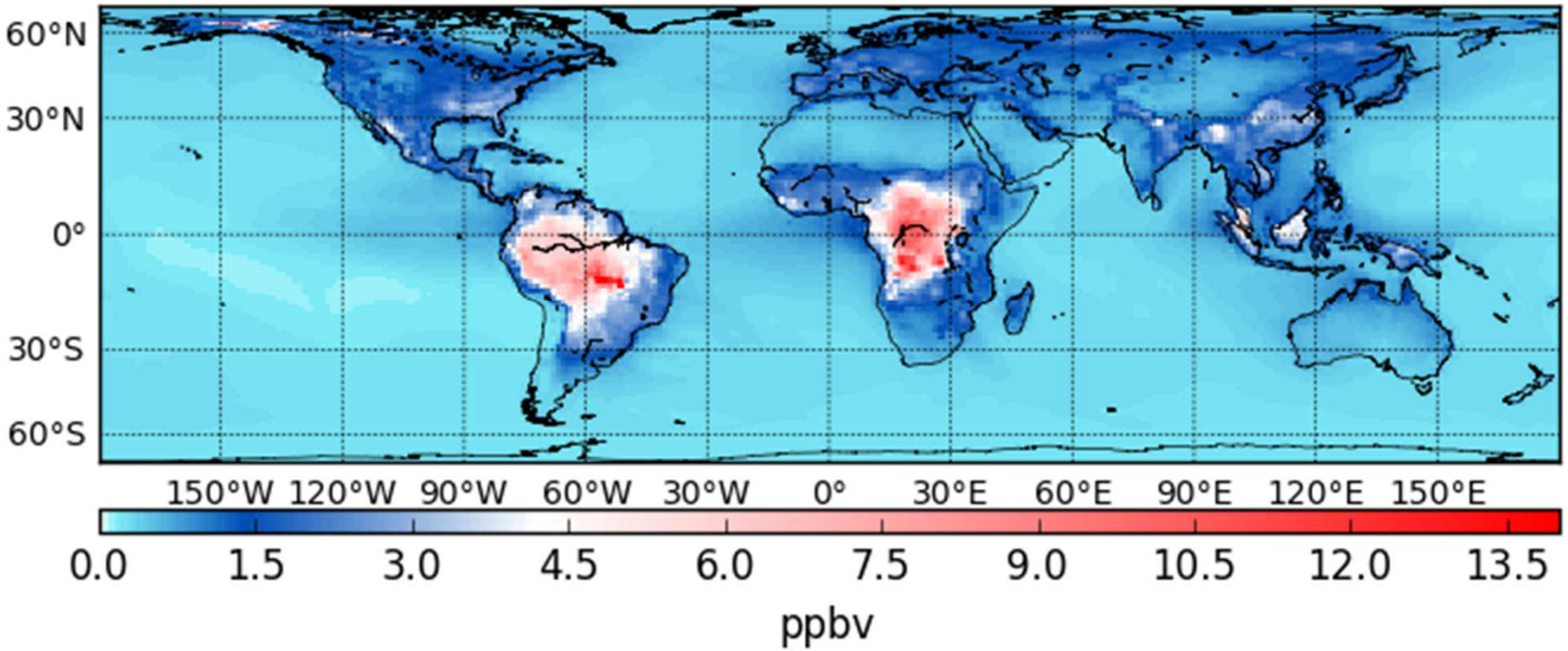
Chemistry climate interaction

Troposphere-Stratosphere exchange

Decadal runs with the climate physics package

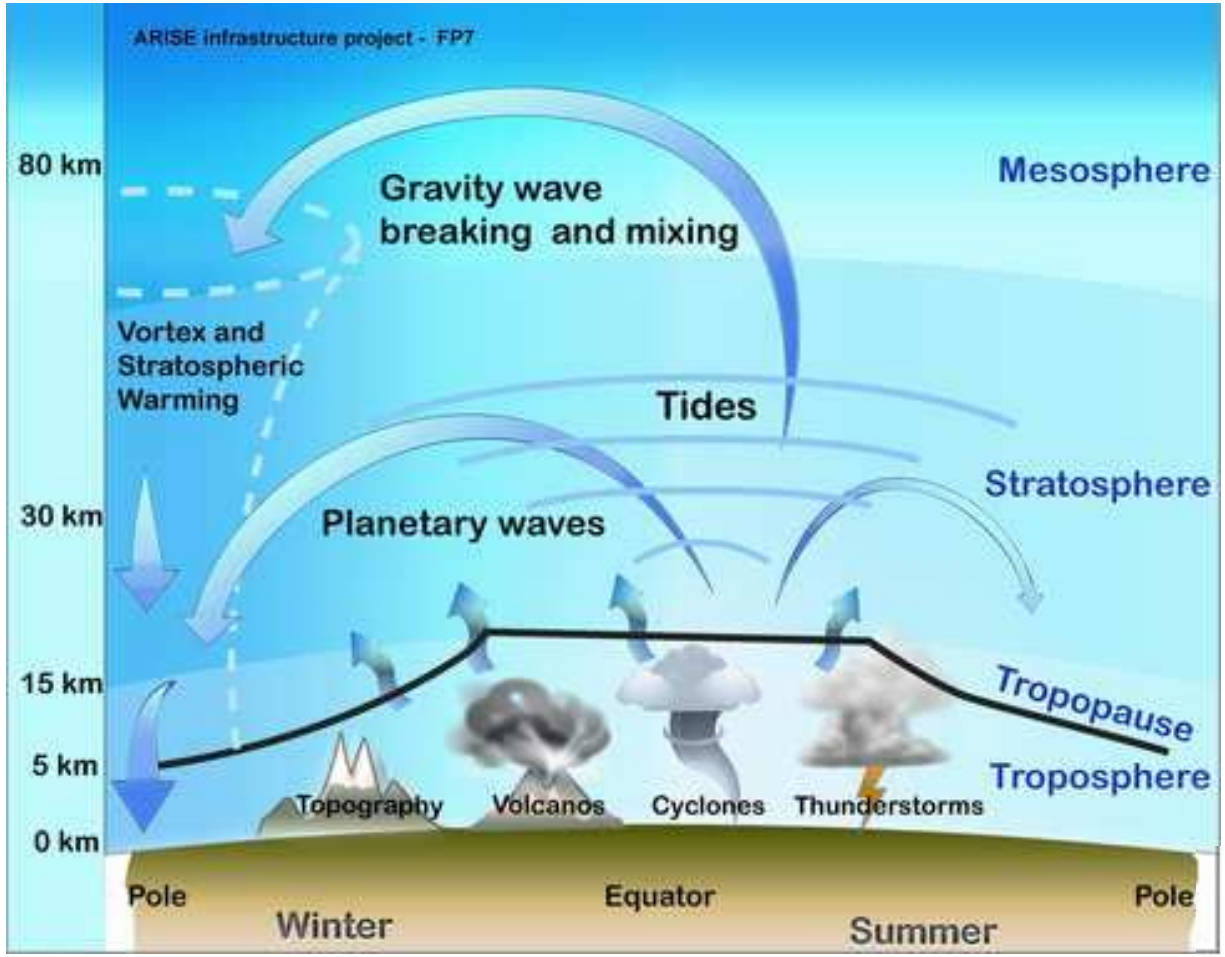
Emission module

Monthly mean acetone volume mixing ratio 3 years after initialisation



Weimer et al., 2016

Seamless in the vertical direction



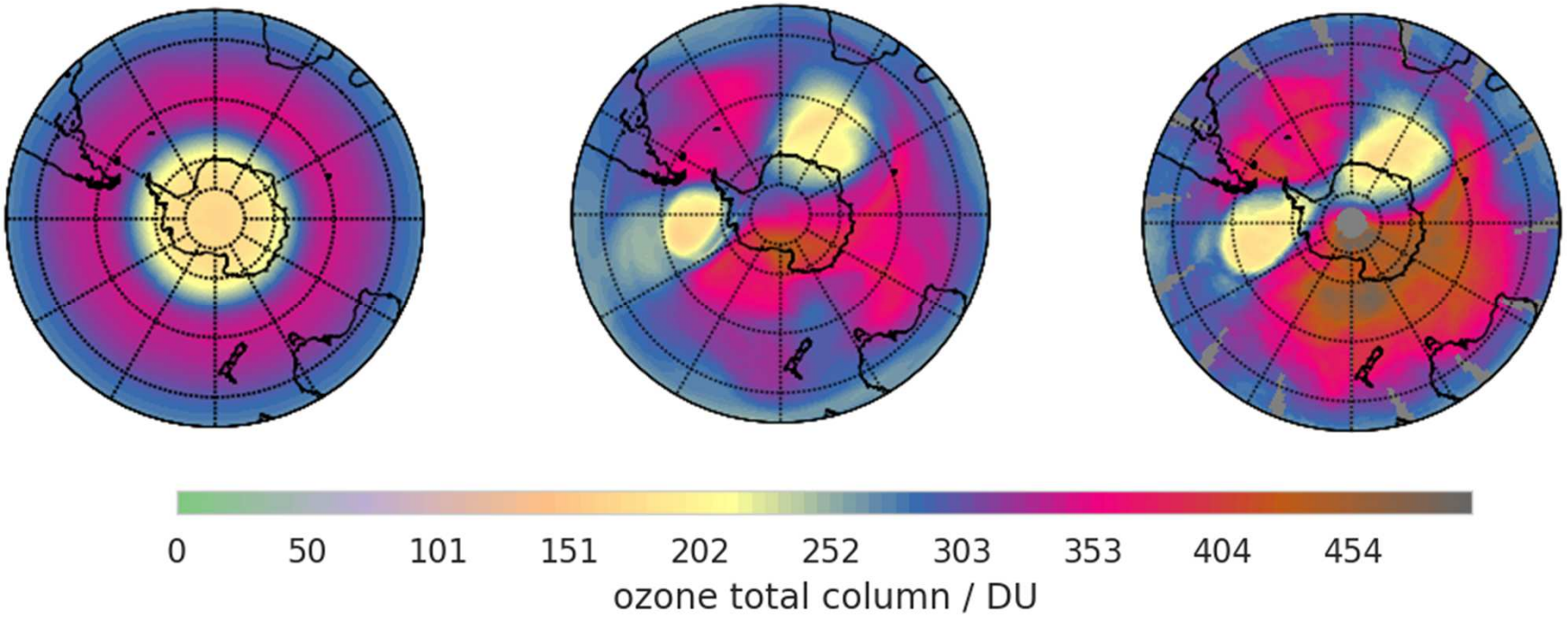
ARISE
Atmospheric dynamics Research InfraStructure in Europe

Ozon: Split of the Polar vortex (2002)

Climatology

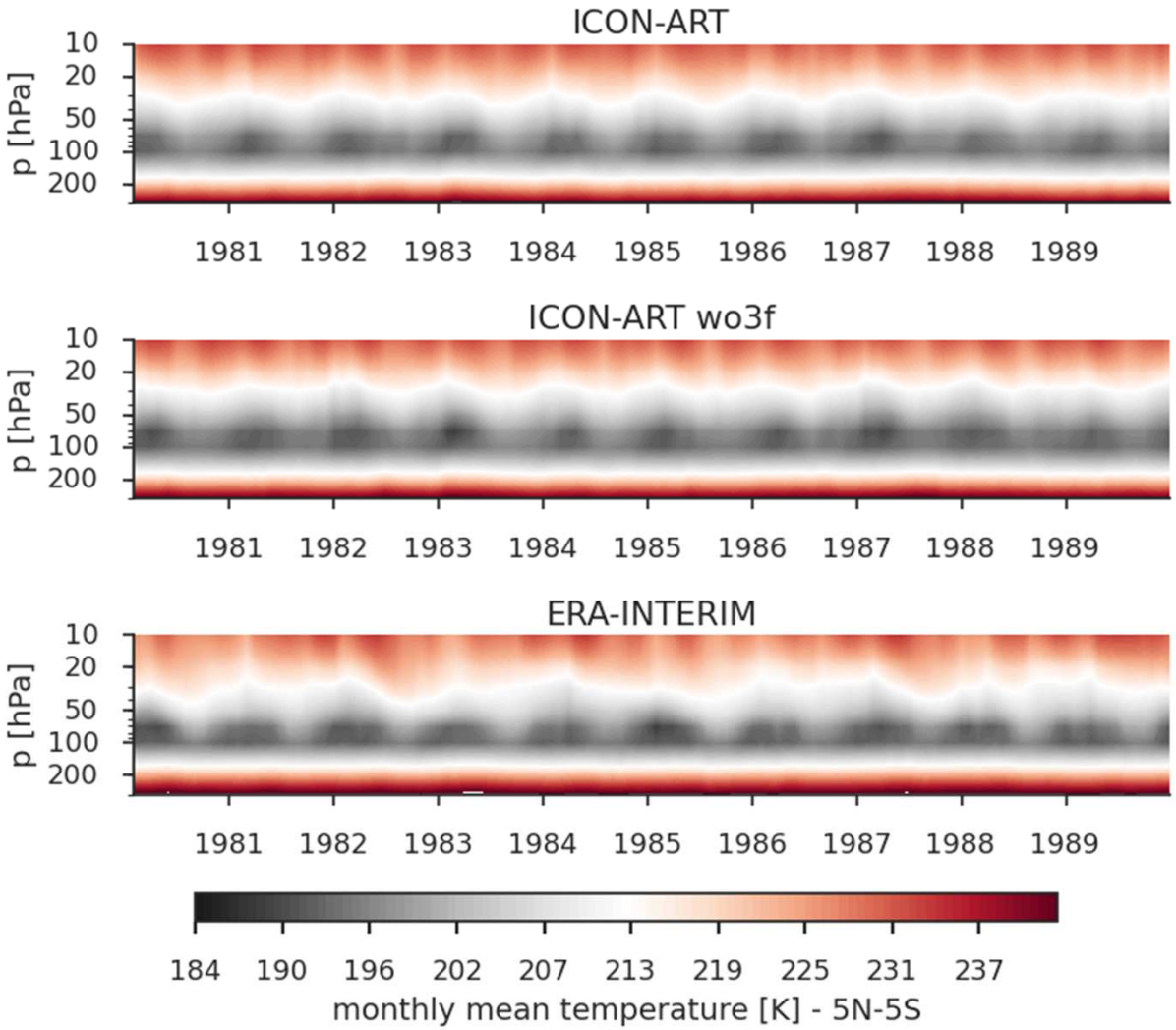
ICON-ART
15 d Simulation

TOMS



Jennifer Schröter und Roland Ruhnke (KIT)

Impact of ozone feedback on monthly mean temperature

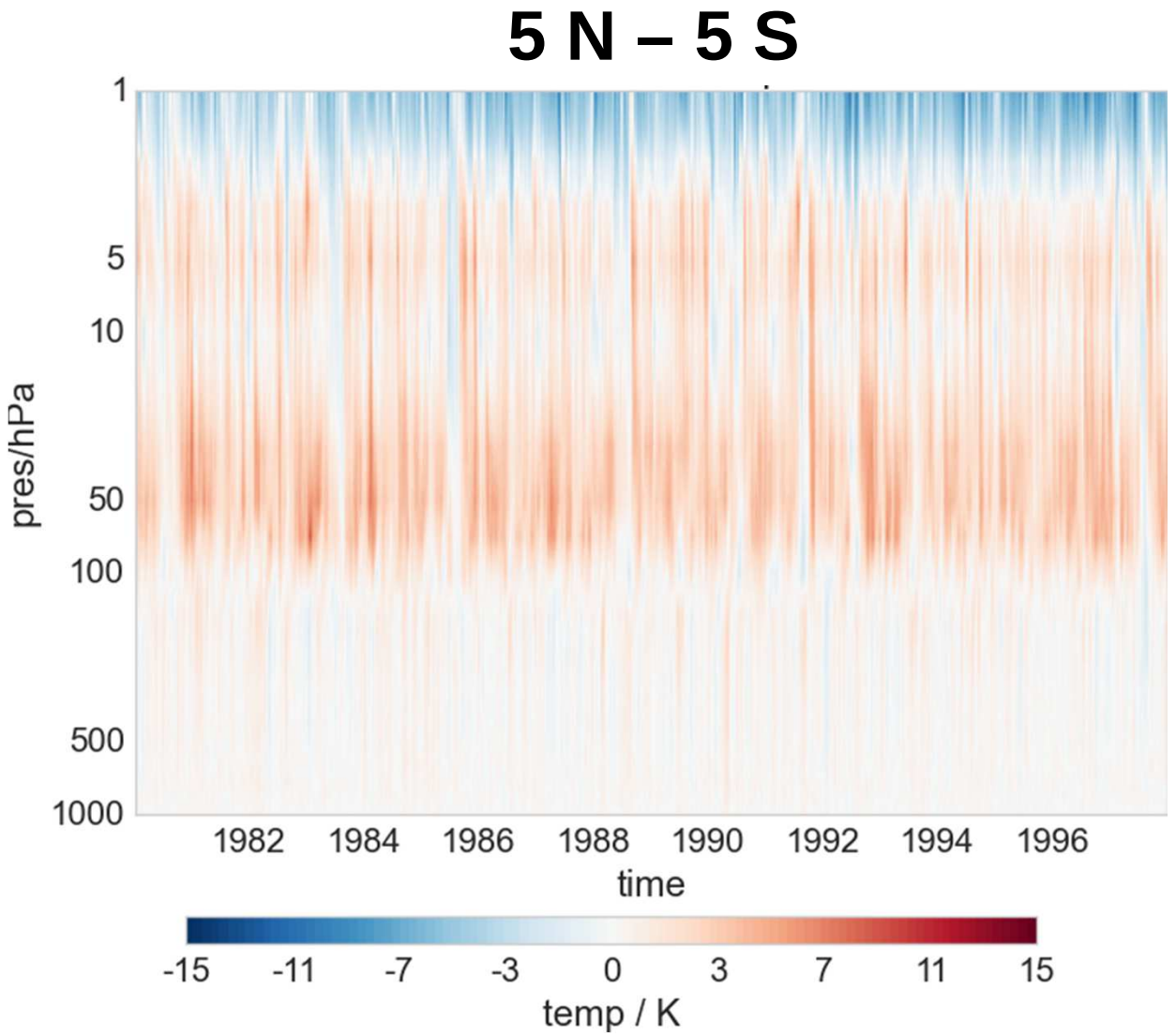


standard experiment without ozone feedback

standard experiment with ozone feedback

Jennifer Schröter - jennifer.schroeter@kit.edu

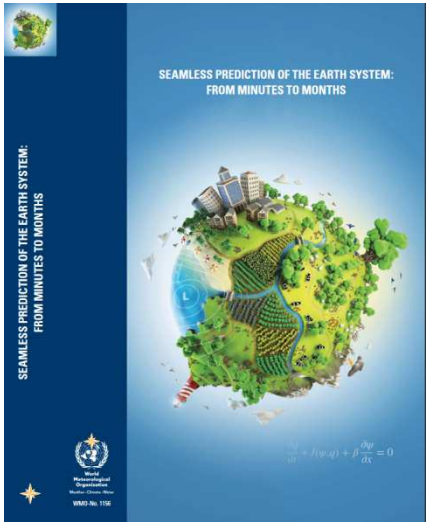
Impact of ozone feedback on monthly mean temperature



Jennifer Schröter - jennifer.schroeter@kit.edu

Conclusion

ICON-ART is on the way to become one of the very few seamless prediction models world wide.



Join us in the development or make use of it!