DWD Academic ICON Course

Hamburg | July 2025 | Florian Prill, DWD

Welcome!

This is already the **11th training course** for ICON users at universities and research institutions **since 2014**.

This year there were over 70 registrations for participation. We now have 36 registered participants + 3 guest attendees from the DKRZ.

To avoid this being forgotten later in the course: We are pleased to see your interest in the ICON model! Our aim is to support new users and developers in their research projects.

Agenda

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

	Mon July 21	Tue July 22	Wed July 23	Thu July 24	Fri July 25
9:00 – 9:45		Dynamics & Transport *D. Reinert, DWD*	Physics Overview *M. Köhler, DWD*	Atmo-Ocean Runs *J. Jungclaus, MPI-M*	Coupling with YAC *M. Hanke, DKRZ*
9:45 – 10:30		Nesting & LAM *D. Reinert, DWD*	Radiation *M. Burba, DWD*	ICON-ART *A. Hoshyaripour, KIT*	ICON ComIn
10:30 – 11:00		Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00 – 11:45		Global NWP	Land, Lake & Soil *J.-P. Schulz, DWD*	Primary Aerosols *A. Hoshyaripour, KIT*	ComIn & YAC
11:45 – 12:30		Global NWP	Turbulence *M. Raschendorfer, DWD*	ART Primary Aerosols	Wrap-Up and Best Practice *F. Prill, DWD*
12:30 – 13:00	Arrival and Registration	Lunch Break	Lunch Break	Group Picture	Exercise
13:00 – 13:30	Welcome & Introduction			Lunch Break	
13:30 – 14:00	Getting Started *F. Prill, DWD*				Lecture
14:00 – 14:45		Initial and Boundary Data *D. Rieger, DWD*	Clouds & Precipitation *M. Köhler, DWD*	Chemistry *C. Keller, EMPA*	
14:45 – 15:30	ICON Jupyter Notebooks	Limited Area Runs	ComIn Plugins *M. Haghighatnasab, DWD*	ART Chemistry	
15:30 – 16:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
16:00 – 16:45	Running Idealized Tests	Limited Area Runs	Programming ICON	Secondary Aerosols *J. Bruckert, KIT*	
16:45 – 17:30	Running Idealized Tests	Limited Area Runs	ICON ComIn	ART Secondary Aerosols	
	Dinner		Dinner		

Download Agenda

SCAN ME

ICON

Agenda

Lectures

Physical, dynamical & technical aspects: *Getting Started, Dynamics,Nesting & ICON-LAM, Physics: Radiation, Soil & External Parameters, Lake & Sea Ice, Turbulent Transfer & Diffusion, Microphysics, Clouds, Convection*

Practical exercises

based on Jupyter notebooks: from idealized tests to real-data simulations, extending the code by new features

ICON-ART

dedicated lectures and exercises on Thursday.

Invited lectures

Atmo-ocean runs, coupling with the YAC coupler

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Schedule

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Today: until 6 p.m. … icebreaker in the evening in restaurant KARLSONS Grindel, Rutschbahn 15a, 20146 Hamburg

- Getting started
  - ICON Jupyter Notebooks
  - Hands-on session(s): Running Idealized Tests
  - Coffee break(s) each day at 3:30 p.m.

DKRZ DEUTSCHES KLIMARECHENZENTRUM

jupyter

Tomorrow (and the rest of the week)
… we start at 9 a.m. here until 5.30/6 p.m. each day

Wednesday evening (23 July) … also joint dinner at restaurant BEEKA

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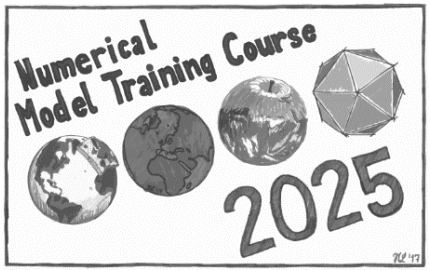
ICON and its partners



ICON and its partners

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

- **Deutscher Wetterdienst (DWD)**
  Germany's national meteorological service
- **Max Planck Institute for Meteorology (MPIM)**
  Research institution: understand Earth's changing climate
- **German Climate Computing Center (DKRZ)**
  Service center for German climate and earth system research
- **Karlsruhe Institute of Technology (KIT)**
  Atmospheric composition modeling through development of ART (Aerosol and Reactive Trace gases)
- **Center for Climate Systems Modeling (C2SM)**
  Swiss joint center: Development and application of complex models of weather, climate and the Earth system

ICON

ICON License

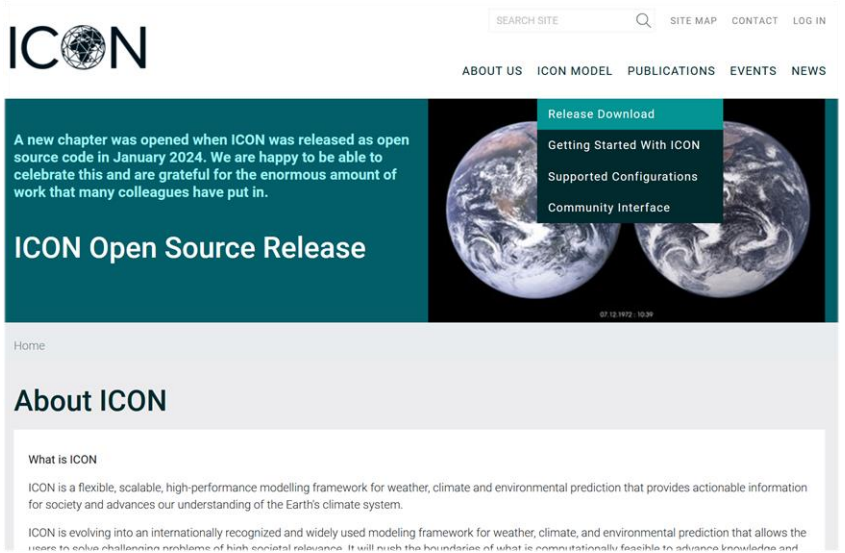
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Model License

- **Since January 2024: Open Source Release**
  BSD-3-C = "free to use, give credit"
  *Model version **icon-2025.04***
  Future releases will be open source

Support & Service License for NMHS

- **Includes…**
  … initial and boundary data transmission
  … dedicated support provided by COSMO
  icon-support@cosmo-model.org
  … additional (optional) software
- **Fee for support and service license**
  Based on gross domestic product per capita, waived below threshold



https://www.icon-model.org/

A few words about DWD

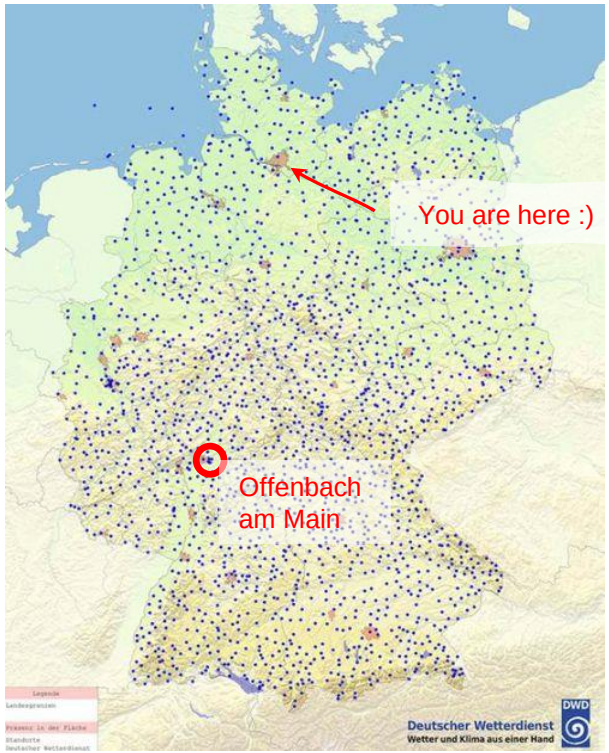
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

The German Meteorological Service DWD …

- founded in 1952
- public institution under the Federal Ministry of Transport
- DWD headquarters in Offenbach am Main, branch offices in Hamburg, Potsdam, Leipzig, Essen, Stuttgart und München
- about 2,150 posts with very different tasks and responsibilities
- scientific and technical service provider with research mission
- representation of Germany in international meteorological and climatological organizations

Source: DWD, status: 02/2024

A few words about DWD



- 181 weather measuring stations
- 48 stations monitoring atmospheric radioactivity
- 1,726 stations operated by voluntary observers
- 1,070 phenological observatories
- 18 operational weather radars
- 2 meteorological observatories
- 10 radio sonde stations (ca. 7,500 meas./yr.)
- 2 onboard meteorological stations
- 150 automatic shipboard weather stations
- 448 shipboard stations operated by voluntary observers

Source: DWD, status: 02/2024

DKRZ – Deutsches Klimarechenzentrum

- **German Climate Computing Center –
  Partner for Climate and Earth System Research in Germany**

  provide high performance computers, data archiving, management and publication of big data and technical support like code optimization and parallelization, visualization, machine learning and artificial intelligence

  Founded in 1987 as a non-profit company

  4 shareholders: Max Planck Society, City of Hamburg (University Hamburg), Alfred-Wegener Institute for Polar and Marine Research and Hereon

- **Systems at DKRZ**

  Supercomputer Levante: rank 140 on Top500 list (06/2025)

  2.892 CPU nodes with computing power of 14 PetaFLOPS

  60 GPU nodes with computing power of 2,8 PetaFLOPS

  Disk storage: 132 PetaByte, Long term data archive (tape libraries) with 225 PetaByte data stored

ICON

Source: M. Rompe, DKRZ

ICON-ART: Aerosol and Reactive Trace gases

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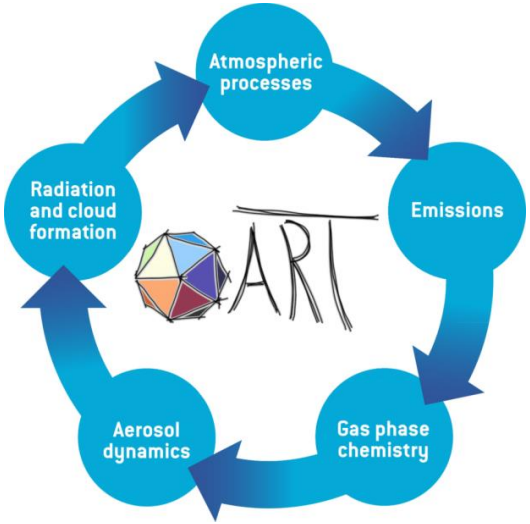
Thursday's main topics:

- Overview of ICON-ART
- Modeling primary aerosols; lecture + exercise:
  - Emission of dust, wildfire and sea salt aerosols
  - Aerosol-radiation interaction
- Modeling air quality; lecture + exercise:
  - Full chemistry with MECCA
  - Emission processing with emiproc
  - Online emission module
- Modeling secondary aerosols & chemistry; lecture + exercise:
  - Point source emission for a volcanic eruption
  - Aerosol dynamics (nucleation, condensation, coagulation)
  - Simplified OH and LINOZ chemistry



Karlsruhe Institute of Technology

Source: A. Hoshyaripour, KIT

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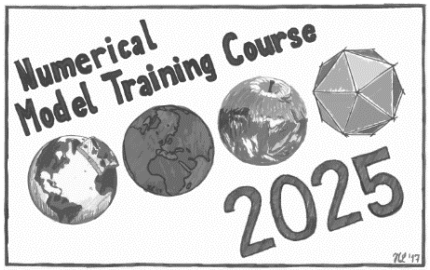
Training course

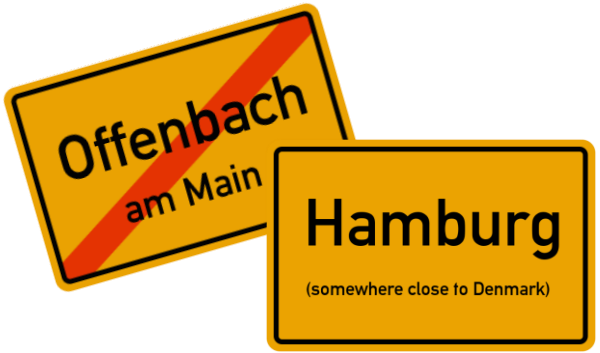


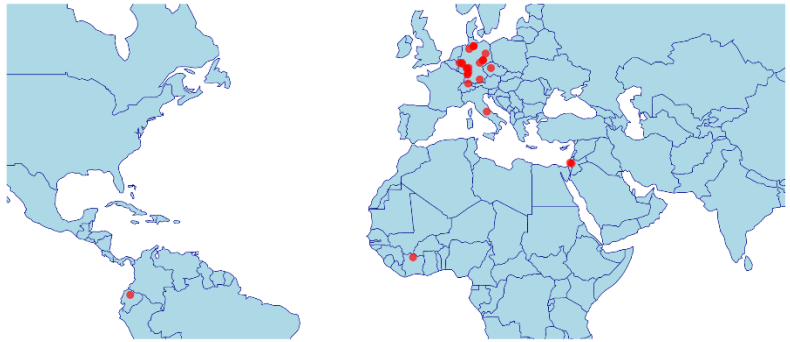
ICON

Training course

11th training course for ICON users at universities and research institutions since 2014.

For the first time not held in Offenbach.





Course participants 2025: Institutions

Numerical Model Training 2023 Participants

Course team

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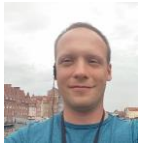
Course Lead


Daniel Reinert, DWD


Daniel Rieger, DWD


Mahnoosh Haghighatnasab, DWD


Florian Prill, DWD

Organization


Maria Rompe, DKRZ


Iris Ehlert, DKRZ


Hendryk Bockelmann, DKRZ

+ Susanne Müller, DKRZ

Other Lecturers


Martin Köhler, DWD


Mareike Burba, DWD


Johann Jungclaus, MPI-M


Moritz Hanke, DKRZ

+ Matthias Raschendorfer (DWD, remote),
  Jan-Peter Schulz (DWD, remote)

KIT Team


Ali Hoshyaripour, KIT

- Julia Bruckert
- Stefan Versick
- Corina Keller (EMPA)

Housekeeping

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- All **food** is served in front of this room – you can also eat on the terrace
- **Coffee breaks** in between are flexible (Coffee, tea, water, fruits, snacks always available)
- **Wifi** access
  - via Eduroam
  - SSID “???” with pwd “???”

>> This training/workshop is meant to be interactive.

Although the speakers prepared nice slides, feel free to ask/discuss anytime. <<

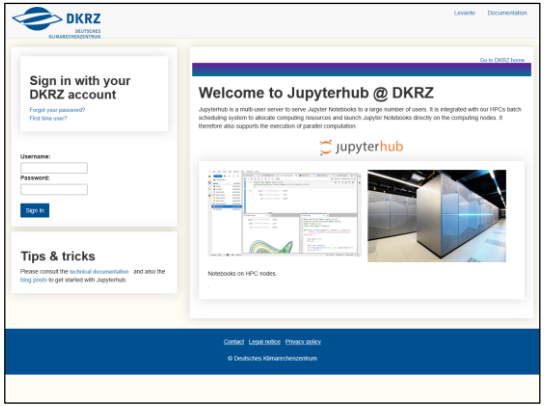
Practical exercises: Levante HPC

- For the hands-on sessions you all need access to Levante **user name**, eg. `b12345` and **account name**, eg. `mh1234`

  (if not, go find Hendryk Bockelmann)

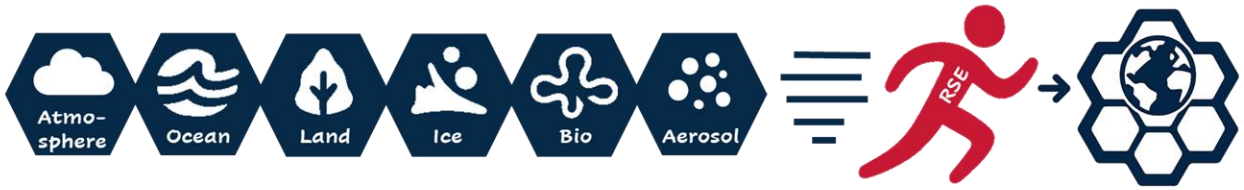
- You will need only a web browser to log into the **JupyterHub frontend**.

  We'll give you all the info you need about how to log in and where to get the course material in the afternoon.



Restaurant recommendations

natESM in a nutshell



What is natESM?

A national initiative to integrate and advance Earth system modeling in Germany

Aims to develop a modular, future-proof, and community-driven ESM system

Joint effort of research institutions, public authorities, and universities

What makes natESM unique?

Sprint-based collaboration between scientists and RSEs

Development of open, sustainable infrastructure for model coupling and simulation workflows

Strategic coordination to pool national resources and enhance international visibility

How to get involved?

Apply for a sprint – up to 6 months of technical support by RSEs

Join trainings – e.g., on Earth system components or software engineering

Register your model components & participate in workshops

More info: nat-esm.de

Source: I. Ehlert, DKRZ

Questions?

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Met. Analyse und Modellierung
Deutscher Wetterdienst

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