



# The natESM story

## What have we done and achieved so far?

Anja Schmidt (DLR, LMU)

# The natESM story



- 2017/2018: Realization that addressing technological and HPC challenges in the years ahead requires a national community effort
  - **Vision:** establish a national Earth System Modelling capability and a support team that will help to save resources, create synergies, share insights and disseminate knowledge
- Deutsches Klima-Konsortium (DKK) got involved and steering-committee was formed (Sarah Jones, Thomas Jung, Jochem Marotzke, Michael Schulz, Ina Tegen)

# 2018/2019 first workshops

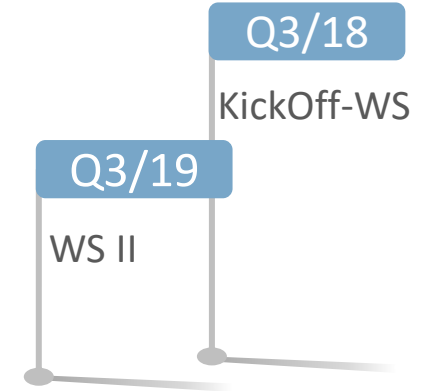


## Goals of kickoff workshop:

- Brainstorming and discussions
- Establishing working groups
  - WG 1: Core components and model configuration
  - WG 2: Technical requirements and infrastructure
  - WG 3: Governance

## Outcomes:

- Lots of ideas discussed and material collected
- Good community engagement and enthusiasm



# 2018/2019 first workshops

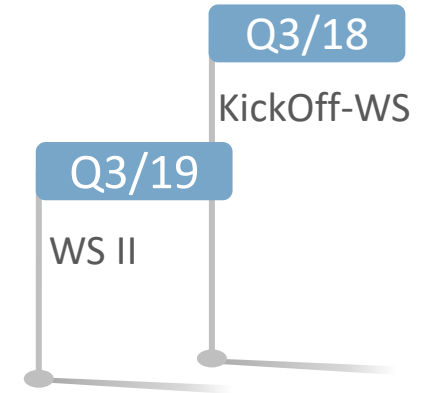


## Goals of second workshop:

- Present and discuss material prepared by working groups
- Select core model components (Atmosphere, Ocean, Land)

## Outcomes:

- No agreement on core components
- Instead, it was collectively agreed upon technical requirements or criteria that model components need to fulfill



# Criteria for an ESM system

Well – defined interfaces between Earth system components

Allows simulations from global to local

Exascale - ready

Scalable work flows

Portability

Modularity

Data assimilation capacity

Diagnostic capacity

User friendly and well documented

Traceability, reproducibility and version control

Standardization

Open - source

# 2018/2019 first workshops

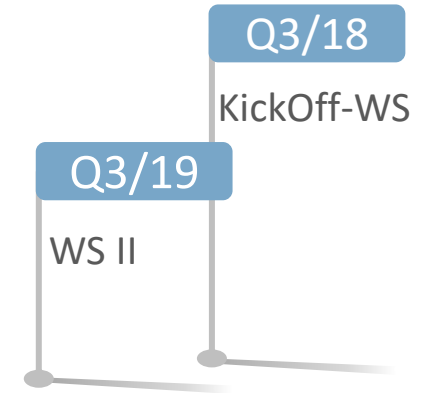


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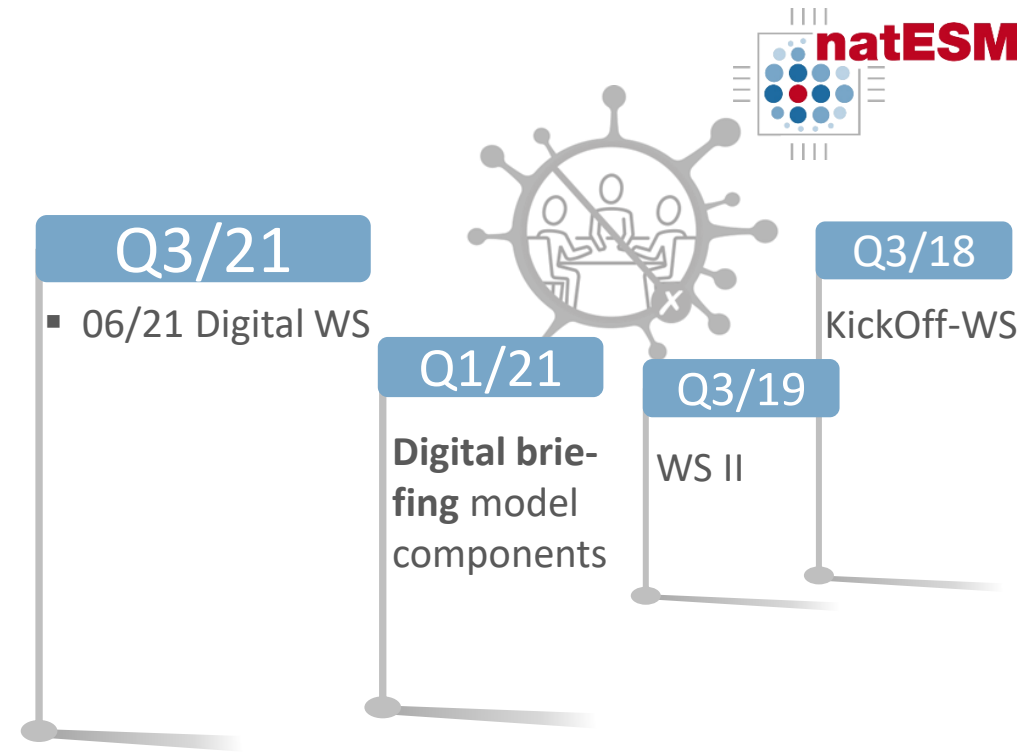
**Realization that workshops themselves are a crucial element of the strategy**

# Corona slowed things down considerably



# Several online meetings in 2021

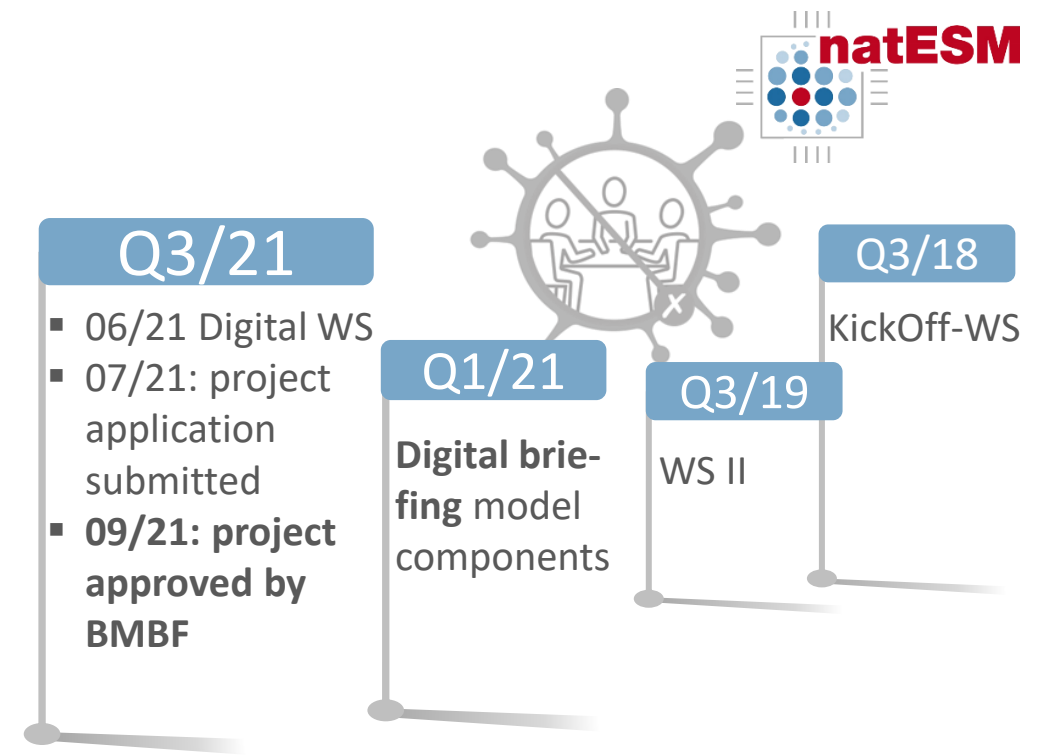
- Lots of material and information on possible components were put together
- Community briefing but no attempt to **decide** upon core components after decision to focus on technical requirements
- Online meetings not the same as in-person





# Q3/2021

- Realisation that funding is needed
- DKRZ led the writing of BMBF project proposal
- Project approved in Sep 2021
  - Sprints introduced
  - Project ends in Feb 2025



**Formation of the current steering committee including those who led the working groups**

# Members of the natESM steering committee

12 people from research institutions, universities and government agencies



**Jochem Marotzke**  
Co-Chair  
MPI-M Hamburg



**Anja Schmidt**  
Co-Chair  
DLR & LMU



**Sabine Attinger**  
UFZ Leipzig



**Hendryk Bockelmann**  
DKRZ Hamburg



**Georg Feulner**  
PIK Potsdam



**Corinna Hoose**  
KIT Karlsruhe



**Thomas Jung**  
AWI Bremerhaven



**Stefan Kollet**  
FZJ Jülich



**Roland Potthast**  
DWD Offenbach



**Kira Rehfeld**  
Universität Tübingen



**Hauke Schmidt**  
MPI-M Hamburg



**Ina Tegen**  
TROPOS Leipzig

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12 people from research institutions, universities and government agencies

## Previous members

- J. Biercamp
- M. Rapp
- S. Jones
- M. Schulz



**Jochem Marotzke**  
Co-Chair  
MPI-M Hamburg



**Anja Schmidt**  
Co-Chair  
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**Sabine Attinger**  
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TROPOS Leipzig

# The natESM story



## 11/21

### Project start

Community briefing



### Q3/21

- 06/21 Digital WS
- 07/21: project application submitted
- **09/21: project approved by BMBF**

### Q1/21

**Digital briefing** model components

### Q3/19

WS II

### Q3/18

KickOff-WS



# The natESM story

## Q1/22

### Establishing sprint activities

- 01/22 sprint applications submitted
- 02/22 Digital community WS
- 03/22 Four sprints selected for implementation

11/21

## Project start

Community briefing



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## Q1/21

Digital briefing model components

## Q3/19

WS II

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KickOff-WS



- **Sprints engaged broader part of community and are part of the strategy**
- **First four sprints were selected based on fit to technical criteria**
- **ICON-A; ICON-O and FESOM emerged as core components for atm. and ocean**

# The natESM story



11/21

Project start

Community briefing



Q1/22

Establishing sprint activities

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Q4/22

Hackathon

Goal: transfer of expert knowledge on HPC

Q3/21

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- 07/21: project application submitted
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Q1/21

Digital briefing model components

Q3/19

WS II

Q3/18

KickOff-WS

- **Iris Ehlert joined as the project as Process Coordinator**
- **3 Scientific Programmers appointed**

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Q3/18

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Q1/23

First on-site community workshop

Goal: engage the community to tackle next challenges and advance our strategy

# Day 1 agenda

Day 1 • 30.03.2023



10:30 Arrival and registration

## Introduction

11:00 Welcome and overview  
Anja Schmidt (DLR, LMU)

11:20 Presentation Sprint 1 (ICON-ART)  
Sven Werchner (KIT)

11:35 Presentation Sprint 2 (ICON-mHM)  
Sebastian Müller (UFZ)

11:50 Presentation Sprint 3 (FESOM)  
Dmitry Sidorenko (AWI)

12:05 Presentation Sprint 4 (ParFlow)  
Daniel Caviedes-Voullième (FZ Jülich)

12:20 The current natESM strategy  
Iris Ehlert (DKRZ)

12:50 **Plenary discussion on the strategy** Part I  
Jochem Marotzke (MPI-M), Anja Schmidt (DLR, LMU), Iris Ehlert (DKRZ)

13:30 L u n c h b r e a k

15:00 Welcome from BMBF  
Verena Hebbecker

15:05 **Plenary discussion on the strategy** Part II  
Jochem Marotzke (MPI-M), Anja Schmidt (DLR, LMU), Iris Ehlert (DKRZ)

Moderated by Marie-Luise Beck (DKK)



# Day 1 agenda



## 15:30 Working Groups

1. Initially selected model components –  
consequences for other components  
Hauke Schmidt (MPI-M)  
Georg Feulner (PIK) Auditorium B  
Roland Potthast (DWD)
2. Interfaces and model composition  
Sabine Attinger (UFZ)  
Ina Tegen (TROPOS) Seminarraum 3  
Hendryk Bockelmann (DKRZ)
3. Missing model components  
Stefan Kollet (FZ Jülich) Seminarraum 1  
Thomas Jung (AWI)
4. Community building and communication strategy  
→ Will be conducted via an online questionnaire.  
Iris Ehlert (DKRZ)

From  
17:30 I c e b r e a k e r

18:30 D i n n e r

From  
20:00 I n f o r m a l d i s c u s s i o n s a n d n e t w o r k i n g

# Day 2

Day 2 • 31.03.2023



**08:30** Arrival

**09:00** **Presentation of WG results**

1. Initially selected model components – consequences for other components  
Hauke Schmidt (MPI-M)
2. Interfaces and model composition  
Sabine Attinger (UFZ)
3. Missing model components  
Stefan Kollet (FZ Jülich)
4. Community building and communication strategy  
Iris Ehlert (DKRZ)

Moderated by Marie-Luise Beck (DKK)

**10:30** C o f f e e b r e a k

**11:00** **Summary and discussion**

Summary of workshop results  
Jochem Marotzke (MPI-M)

Followed by plenary discussion of workshop results

**12:00** L u n c h b r e a k

**13:00** Final discussion and outlook

**14:00** E n d o f w o r k s h o p

# Sprints



Component / Tool	Task	Start Dauer	Status
ICON-ART	Analyse des ART-Codes für GPU-Portierung	04 / 22 8 Wochen	Abgeschlossen, <a href="#">Doku</a>
ICON-mHM	Online-Kopplung mHM in ICON mittels YAC	07 / 22 6 Monate	Laufend, im Abschluss
FESOM	Portierung von FESOM 2.1 zu JUWELS booster und LEVANTE-GPU	11 / 22 6 Monate	In Arbeit
ParFlow	Portierung von ParFlow zu AMD GPUs, Inspektion von RAPID Memory Manager und Hipifikation, Performance Analyse	12 / 22 5 Monate	In Arbeit
MESSy	Optimierung des Datentransfers zwischen Host (CPU) und GPU	02 / 23 4 Monate	In Arbeit
ESMValTool	Aktualisierung verbleibender, nicht-lastiger Präprozessorfunktionen, um speichereffizient zu sein + Aktualisierung von ESMValCore	6 Monate	Wartend

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