

Please check our [wiki](#) for help on navigating the form.

Horizon 2020

Call: H2020-LC-CLA-2018-2019-2020

(Building a low-carbon, climate resilient future: climate action in support of the Paris Agreement)

Topic: LC-CLA-18-2020

Type of action: RIA-LS

Proposal number: 101003470-1

Proposal acronym: NextGEMS

Deadline Id: H2020-LC-CLA-2020-2

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How to fill in the forms

The administrative forms must be filled in for each proposal using the templates available in the submission system. Some data fields in the administrative forms are pre-filled based on the steps in the submission wizard.

Proposal Submission Forms

Proposal ID 101003470-1

Acronym NextGEMS

1 - General information

Topic LC-CLA-18-2020

Type of Action RIA-LS

Call Identifier H2020-LC-CLA-2018-2019-2020

Deadline Id H2020-LC-CLA-2020-2

Acronym NextGEMS

Proposal title Next Generation Earth Modelling Systems

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &

Duration in months 48

Fixed keyword 1 Climatic research

Fixed keyword 2 Climatology and climate change

Fixed keyword 3 Scientific computing, simulation and modelling tools

Free keywords Monsoon, Hurricanes, Dry Spells, Carbon Cycle, Aerosol Forcing, Climate Sensitivity, Renewable Energy, Marine Nutrients

Abstract*

NextGEMS will develop and apply a new generation of global coupled Storm-Resolving Earth System Models (SR-ESMs) to the study of anthropogenic climate change. SR-ESMs are distinguished by their fine, 3 km, grid in the atmosphere and ocean. This allows a more physical representation of atmospheric and oceanic circulation systems, including their coupling to Earth-system processes such as the carbon, nutrients, water and atmospheric particulate (aerosol) cycles. NextGEMS will develop two prototypes SR-ESMs into production systems and produce multi-decadal (30 y) projections of future climate change. Improved resolution is expected to reduce biases and enhance the realism of these simulations. Ensembles of simulations will address scientific puzzles such as the impact of convective organization on climate sensitivity, the magnitude of aerosol forcing, and the changes in extremes associated with tropical air-sea interaction (including the African Monsoon and Atlantic Hurricanes) and land-surface interaction in the mid-latitudes (dry-spells and links between hydrology and carbon). By developing models that are structurally different than existing ones, NextGEMS will reshape perceptions of uncertainty and provide a basis for reassessing the risk global warming poses for society and ecology. By focusing on just two models, NextGEMS builds a European community of scientists and users around a technologically more ambitious modelling enterprise. This concentration is needed if Europe is to maintain its position at the forefront of Earth-system modelling. By representing the scales of motion and driving forces of high impact weather globally, NextGEMS links more directly to applications, thereby shortening the value chain. Knowledge co-production projects focusing on how circulation influences both solar energy production and marine nutrients will demonstrate how applications and downstream users can thus be directly integrated into the model development enterprise.

Remaining characters

4

Proposal Submission Forms

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Has this proposal (or a very similar one) been submitted in the past 2 years in response to a call for proposals under Horizon 2020 or any other EU programme(s)?

☐ Yes ☒ No

Please give the proposal reference or contract number.

XXXXXX-X

Declarations

1*) We/I declare to have the explicit consent of all participants on their participation and on the content of this proposal.	<input checked="" type="checkbox"/>
2) We/I confirm that the information contained in this proposal is correct and complete and that none of the project activities have started before the proposal was submitted.	<input checked="" type="checkbox"/>
3) We/I declare: - to be fully compliant with the eligibility criteria set out in the call - not to be subject to any exclusion grounds under the EU Financial Regulation 2018/1046 - to have the financial and operational capacity to carry out the proposed project.	<input checked="" type="checkbox"/>
4) We/acknowledge that all communication will be made through the Funding & Tenders Portal electronic exchange system and that access and use of this system is subject to the Funding & Tenders Portal Terms and Conditions .	<input checked="" type="checkbox"/>
5) We/I acknowledge and authorize the collection, use and processing of personal data for the purpose of the evaluation of the proposal and the subsequent management of the grant/prize (if any). We/I acknowledge and authorize that the data may also be used for the monitoring and evaluation of the EU funding programme, the design of future programmes and communication purposes.	<input checked="" type="checkbox"/>
6) We/I declare that subcontracts will be best value for money and free of conflict of interest.	<input checked="" type="checkbox"/>
7*) We/I declare that all beneficiaries have followed their own accounting practices for the preparation of the budget and have included therein only cost that would be eligible for an actual costs grant, excluding costs that are ineligible under H2020 rules.	<input checked="" type="checkbox"/>

The coordinator is only responsible for the correctness of the information relating to his/her own organisation. Each applicant remains responsible for the correctness of the information related to him/her and declared above. If the proposal to be retained for EU funding, the coordinator and each beneficiary will be required to present a formal declaration in this respect.

Note:

For **multi-beneficiary applications**, the coordinator vouches for its own organization and that all other participants confirmed their participation and compliance with conditions set out in the call. If the proposal is retained for funding, each participant will be required to submit a formal declaration of honour confirming this.

False statements or incorrect information may lead to administrative sanctions under the Financial Regulation 2018/1046.

Personal data will be collected, used and processed in accordance with Regulation 2018/1725 and the [Funding & Tenders Portal privacy statement](#).

Please be however aware that, to protect EU financial interests, your data may be transferred to other EU institutions and bodies and be registered in the EDES database. Data in the EDES database is also subject to Regulation 2018/1725 and the [EDES privacy statement](#).

Proposal Submission Forms

Proposal ID 101003470-1

Acronym NextGEMS

2 - Participants & contacts

#	Participant Legal Name	Country	Action
1	MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTEN EV	DE	
2	EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS	UK	
3	ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FUR POLAR- UND MEERESFORSCHUNG	DE	
4	UNIVERSITETET I BERGEN	NO	
5	KOBENHAVNS UNIVERSITET	DK	
6	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	FR	
7	STOCKHOLMS UNIVERSITET	SE	
8	UNIWERSYTET WARSZAWSKI	PL	
9	THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD	UK	
10	HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL	DE	
11	BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION	ES	
12	UNIVERSITAT POLITECNICA DE CATALUNYA	ES	
13	THE UNIVERSITY OF READING	UK	
14	WAGENINGEN UNIVERSITY	NL	
15	EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH	Switzerland	
16	UNIVERSITAET BERN	CH	
17	FCIENCIAS.ID - ASSOCIACAO PARA A INVESTIGACAO E DESENVOLVIMENTO DE CIENCIAS	PT	
18	HELSINGIN YLIOPISTO	FI	
19	UNIVERSITA DEGLI STUDI DI TRENTO	IT	
20	DEUTSCHES KLIMARECHENZENTRUM GMBH	DE	
21	UNIVERSIDAD COMPLUTENSE DE MADRID	ES	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym **NextGEMS**

22	INSTITUT DE RECHERCHE POUR LE DEVELOPPEMENT	FR	
23	IBERDROLA RENOVABLES ENERGIA SA	ES	
24	INSTITUT SENEGALAIS DE RECHERCHES AGRICOLES	SN	
25	Latest Thinking GmbH	DE	

2 - Administrative data of participating organisations

PIC

999990267

Legal name

MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTEN EV

Short name: MPG | MPI-M

Address

Street HOFGARTENSTRASSE 8

Town MUENCHEN

Postcode 80539

Country Germany

Webpage www.mpg.de

Specific Legal Statuses

Legal personyes

Public bodyno

Industry (private for profit).....no

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....05/04/2016 - no

SME self-assessment05/04/2016 - no

SME validation sme.....31/10/2008 - no

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name MPG | MPI-M

Department(s) carrying out the proposed work

Department 1

Department name

Max Planck Institute for Meteorology

☐ not applicable

☐ Same as proposing organisation's address

Street

Bundesstr. 53

Town

Hamburg

Postcode

20146

Country

Germany

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **MPG | MPI-M**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☒ Male

☐ Female

First name **Bjorn**

Last name **STEVENS**

E-Mail **bjorn.stevens@mpimet.mpg.de**

Position in org.

Director

Department

The Atmosphere in the Earth System

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Bundesstr. 53

Town

Hamburg

Post code

20146

Country

Germany

Website

https://mpimet.mpg.de/en

Phone

+49-40-41173-421

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Chenbo	Guo	chenbo.guo@mpimet.mpg.de	+49-40-41173-258
Cathy	Hohenegger	cathy.hohenegger@mpimet.mpg.de	+xxx xxxxxxxxx
Johann	Jungclaus	johann.jungclaus@mpimet.mpg.de	+xxx xxxxxxxxx
Martina	Boether	martina.boether@vw.mpimet.mpg.de	+xxx xxxxxxxxx

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name ECMWF

PIC

999916741

Legal name

EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

Short name: ECMWF

Address

Street SHINFIELD PARK

Town READING

Postcode RG2 9AX

Country United Kingdom

Webpage www.ecmwf.int

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationyes

International organisation of European interestyes

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name ECMWF

Department(s) carrying out the proposed work

Department 1

Department name

Research Department

☐ not applicable

☒ Same as proposing organisation's address

Street

SHINFIELD PARK

Town

READING

Postcode

RG2 9AX

Country

United Kingdom

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **ECMWF**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☐ Male

☒ Female

First name **Irina**

Last name **Sandu**

E-Mail **irina.sandu@ecmwf.int**

Position in org.

Senior Scientist

Department

Research Department

☐

Same as
organisation name

☒ Same as proposing organisation's address

Street

SHINFIELD PARK

Town

READING

Post code

RG2 9AX

Country

United Kingdom

Website

www.ecmwf.int

Phone

+441189499730

Phone 2

+XXX XXXXXXXXX

Fax

+XXX XXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Daniel	Thiemert	daniel.thiemert@ecmwf.int	+XXX XXXXXXXXX
Nils	Wedi	nils.wedi@ecmwf.int	+XXX XXXXXXXXX
Peter	Bauer	peter.bauer@ecmwf.int	+XXX XXXXXXXXX

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name AWI

PIC

999497507

Legal name

ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FUR POLAR- UND MEERESFORSCHUNG

Short name: AWI

Address

Street AM HANDELSHAFEN 12

Town BREMERHAVEN

Postcode 27570

Country Germany

Webpage www.awi.de

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....31/12/2015 - no

SME self-assessment17/03/1986 - no

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name AWI

Department(s) carrying out the proposed work

Department 1

Department name

Climate Dynamics

☐ not applicable

☐ Same as proposing organisation's address

Street

Bussestr. 24

Town

Bremerhaven

Postcode

27570

Country

Germany

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **AWI**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☒ Male

☐ Female

First name **Thomas**

Last name **Jung**

E-Mail **thomas.jung@awi.de**

Position in org. Professor / section head

Department Climate Dynamics

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street Bussestr. 24

Town Bremerhaven

Post code 27570

Country Germany

Website www.awi.de/en/science/climate-sciences/climate-dynamics.html

Phone +49(471)4831-1761

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Maria	Eden	maria.eden@awi.de	+49(471)4831-2412
EU	Grants	eu-grants@awi.de	+49(471)4831-2412

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UiB

PIC

999974456

Legal name

UNIVERSITETET I BERGEN

Short name: UiB

Address

Street MUSEPLASSEN 1

Town BERGEN

Postcode 5020

Country Norway

Webpage www.uib.no

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationno

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....23/05/2016 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UiB

Department(s) carrying out the proposed work

Department 1

Department name

Geophysical Institute

☐ not applicable

☐ Same as proposing organisation's address

Street

Postbox 7803

Town

Bergen

Postcode

5020

Country

Norway

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UiB**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☒ Male

☐ Female

First name **Noel**

Last name **Keenlyside**

E-Mail **noel.keenlyside@gfi.uib.no**

Position in org.

Professor

Department

Geophysical Institute

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Postbox 7803

Town

Bergen

Post code

5020

Country

Norway

Website

<https://www.uib.no/en/persons/Noel.Keenlyside>

Phone

+4755582032

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Liv-Grethe	Gudmundsen	post@fa.uib.no	+4755584965

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UCPH

PIC

999991043

Legal name

KOBENHAVNS UNIVERSITET

Short name: UCPH

Address

Street NORREGADE 10

Town KOBENHAVN

Postcode 1165

Country Denmark

Webpage www.ku.dk

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....01/01/2005 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UCPH

Department(s) carrying out the proposed work

Department 1

Department name

Niels Bohr Institute

☐ not applicable

☐ Same as proposing organisation's address

Street

Tagensvej 16

Town

Copenhagen

Postcode

1573

Country

Denmark

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UCPH**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☒ Male

☐ Female

First name **Markus**

Last name **Jochum**

E-Mail **mjochum@nbi.dk**

Position in org.

Professor

Department

Niels Bohr Institute

☐

Same as
organisation name

☒ Same as proposing organisation's address

Street

NORREGADE 10

Town

KOBENHAVN

Post code

1165

Country

Denmark

Website

<https://www.gfy.ku.dk/~nuterman/teamocean/index.html>

Phone

+45 24851562

Phone 2

+XXX XXXXXXXXX

Fax

+XXX XXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Sannie	Henriksen	henriksen@nbi.ku.dk	+XXX XXXXXXXXX

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name CNRS

PIC

999997930

Legal name

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS

Short name: CNRS

Address

Street RUE MICHEL ANGE 3

Town PARIS

Postcode 75794

Country France

Webpage www.cnrs.fr

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....18/11/2008 - no

SME self-assessment unknown

SME validation sme.....18/11/2008 - no

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name CNRS

Department(s) carrying out the proposed work

Department 1

Department name Laboratoire de météorologie dynamique (LMD)

☐ not applicable

☐ Same as proposing organisation's address

Street Route de Saclay

Town PALAISEAU

Postcode 91128

Country France

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **CNRS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☐ Male

☒ Female

First name **Sandrine**

Last name **Bony**

E-Mail **sandrine.bony@lmd.jussieu.fr**

Position in org.

Research Director

Department

Laboratoire de météorologie dynamique (LMD)

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Route de Saclay

Town

Palaiseau

Post code

91128

Country

France

Website

Phone

+33144275014

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Sylvie	Agasse	sylvie.agasse@lmd.polytechnique.fr	+xxx xxxxxxxxx
Weronika	Urbanska	dr04spv-europe@cnrs.fr	+33 1 69 82 32 45

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name MISU

PIC

999885022

Legal name

STOCKHOLMS UNIVERSITET

Short name: MISU

Address

Street UNIVERSITETSVAGEN 10

Town STOCKHOLM

Postcode 10691

Country Sweden

Webpage www.su.se

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name MISU

Department(s) carrying out the proposed work

Department 1

Department name

Department of Meteorology

☐ not applicable

☐ Same as proposing organisation's address

Street

Svante Arrhenius v. 16c

Town

Stockholm

Postcode

10691

Country

Sweden

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **MISU**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☐ Male

☒ Female

First name **Frida**

Last name **Bender**

E-Mail **frida.bender@misu.su.se**

Position in org.

Associate professor

Department

Department of Meteorology, Stockholm University

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Svante Arrhneius v. 16c

Town

Stockholm

Post code

10691

Country

Sweden

Website

Phone

+46-8-161082

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Thorsten	Mauritsen	thorsten.mauritsen@misu.su.se	+46-8-164358

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UNIWARSAW

PIC

999572294

Legal name

UNIWERSYTET WARSZAWSKI

Short name: UNIWARSAW

Address

Street KRAKOWSKIE PRZEDMIESCIE 26/28

Town WARSZAWA

Postcode 00 927

Country Poland

Webpage www.uw.edu.pl

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....15/12/1975 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UNIWARSAW

Department(s) carrying out the proposed work

Department 1

Department name

Faculty of Physics

☐ not applicable

☐ Same as proposing organisation's address

Street

Pasteura 5

Town

Warszawa

Postcode

02-093

Country

Poland

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UNIWARSAW**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☐

Male

☒

Female

First name **Hanna**

Last name **Pawlowska**

E-Mail **hanna.pawlowska@igf.fuw.edu.pl**

Position in org.

Professor

Department

Faculty of Physics

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Pasteura 5

Town

Warszawa

Post code

02-093

Country

Poland

Website

https://www.igf.fuw.edu.pl

Phone

+48 22 55 32 035

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Szymon	Malinowski	szymon.malinowski@fuw.edu.pl	+48 22 55 32 042

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UOXF**

PIC

999984350

Legal name

THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD

Short name: UOXF

Address

Street WELLINGTON SQUARE UNIVERSITY OFFICE

Town OXFORD

Postcode OX1 2JD

Country United Kingdom

Webpage www.ox.ac.uk

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....22/12/1570 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UOXF

Department(s) carrying out the proposed work

Department 1

Department name

Atmospheric, Oceanic and Planetary Physics

☐ not applicable

☐ Same as proposing organisation's address

Street

Clarendon Laboratory, Parks Road

Town

Oxford

Postcode

OX1 3PU

Country

United Kingdom

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UOXF**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☒ Male

☐ Female

First name **Philip**

Last name **Stier**

E-Mail **philip.stier@physics.ox.ac.uk**

Position in org. Professor of Atmospheric Physics

Department Atmospheric, Oceanic and Planetary Physics

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street Clarendon Laboratory, Parks Road

Town Oxford

Post code

OX1 3PU

Country United Kingdom

Website <https://www2.physics.ox.ac.uk/contacts/people/stier>

Phone +44 1865 272887

Phone 2

+XXX XXXXXXXXX

Fax

+XXX XXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Hannah	Lingard	grants@physics.ox.ac.uk	+XXX XXXXXXXXX
Gill	Wells	ecresearch@admin.ox.ac.uk	+XXX XXXXXXXXX

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **GEOMAR**

PIC 986090458 **Legal name** HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL

Short name: *GEOMAR*

Address

Street WISCHHOFSTRASSE 1-3

Town KIEL

Postcode 24148

Country Germany

Webpage www.geomar.de

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....01/01/2012 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name GEOMAR

Department(s) carrying out the proposed work

Department 1

Department name

Ocean Circulation and Climate Dynamics

☐ not applicable

☐ Same as proposing organisation's address

Street

Düsternbrooker Weg 20

Town

Kiel

Postcode

24105

Country

Germany

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **GEOMAR**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name **Marcus**

Last name **Dengler**

E-Mail **mdengler@geomar.de**

Position in org.

Scientist

Department

Ocean Circulation and Climate Dynamics / Physical Oceanography

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Düsternbrooker Weg 20

Town

Kiel

Post code

24105

Country

Germany

Website

<https://www.geomar.de/en/research/fb1/fb1-po/>

Phone

+494316004107

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Alexandra	Drossou-Berendes	adrossou-berendes@geomar.de	+494316002808

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **BSC**

PIC

999655520

Legal name

BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION

Short name: *BSC*

Address

Street Calle Jordi Girona 31

Town BARCELONA

Postcode 08034

Country Spain

Webpage www.bsc.es

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....01/03/2005 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name BSC

Department(s) carrying out the proposed work

Department 1

Department name

Earth Sciences

☐ not applicable

☐ Same as proposing organisation's address

Street

Jordi Girona, 29

Town

Barcelona

Postcode

08034

Country

Spain

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **BSC**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☐ Male

☒ Female

First name **Dragana**

Last name **Bojovic**

E-Mail **dragana.bojovic@bsc.es**

Position in org.

Social Scientist

Department

Earth Sciences

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Jordi Girona, 29

Town

Barcelona

Post code

08034

Country

Spain

Website

www.bsc.es

Phone

+34 934137937

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Dorota	Jouet	dorota.jouet@bsc.es	+34 934134082
Martina	Klose	martina.klose@bsc.es	+34 934134051
Carlos	Perez	carlos.perez@bsc.es	+xxx xxxxxxxxx

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UPC

PIC

999976202

Legal name

UNIVERSITAT POLITECNICA DE CATALUNYA

Short name: UPC

Address

Street CALLE JORDI GIRONA 31

Town BARCELONA

Postcode 08034

Country Spain

Webpage www.upc.edu

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....05/03/2014 - no

SME self-assessment05/03/2014 - no

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UPC

Department(s) carrying out the proposed work

Department 1

Department name

Department of Physics

☐ not applicable

☐ Same as proposing organisation's address

Street

Calle Jordi Girona 1-3

Town

Barcelona

Postcode

08034

Country

Spain

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UPC**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name **Juan Pedro**

Last name **Mellado**

E-Mail **juan.pedro.mellado@upc.edu**

Position in org.

Full Professor

Department

Physics

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Esteve Terrades, 5, Building C3C

Town

Castelldefels

Post code

08860

Country

Spain

Website

www.upc.edu

Phone

+34934137551

Phone 2

+34685562986

Fax

+34934017100

Other contact persons

First Name	Last Name	E-mail	Phone
Montserrat	Banegas	montserrat.banegas@upc.edu	+34934016930
Mercedes	Torrellas	cttinfo.europeus@upc.edu	+34934016930

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UREAD

PIC

999984156

Legal name

THE UNIVERSITY OF READING

Short name: UREAD

Address

Street WHITEKNIGHTS CAMPUS WHITEKNIGHTS H

Town READING

Postcode RG6 6AH

Country United Kingdom

Webpage <http://www.reading.ac.uk>

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....17/03/1926 - no

SME self-assessment unknown

SME validation sme.....17/03/1926 - no

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UREAD

Department(s) carrying out the proposed work

Department 1

Department name NCAS, Department of Meteorology

☐ not applicable

☐ Same as proposing organisation's address

Street University of Reading, Early Gate

Town Reading

Postcode RG6 6BB

Country United Kingdom

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UREAD**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☒ Male

☐ Female

First name **Pier Luigi**

Last name **Vidale**

E-Mail **p.l.vidale@reading.ac.uk**

Position in org.

Professor of Climate System Science

Department

NCAS, Department of Meteorology

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

University of Reading, Earley Gate

Town

Reading

Post code

RG6 6BB

Country

United Kingdom

Website

Phone

+XXX XXXXXXXXXX

Phone 2

+XXX XXXXXXXXXX

Fax

+XXX XXXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
EU Unit	Reading	eu-unit@reading.ac.uk	+XXX XXXXXXXXXX
Mischa	Phillips	m.phillips@reading.ac.uk	+XXX XXXXXXXXXX

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name WUR

PIC

999981634

Legal name

WAGENINGEN UNIVERSITY

Short name: WUR

Address

Street DROEVENDAALSESTEEG 4

Town WAGENINGEN

Postcode 6708 PB

Country Netherlands

Webpage <http://www.wageningenur.nl/nl.htm>

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationno

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....12/04/2016 - no

SME self-assessment12/04/2016 - no

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name WUR

Department(s) carrying out the proposed work

Department 1

Department name

Department of Environmental Sciences

☐ not applicable

☐ Same as proposing organisation's address

Street

Droevendaalsesteeg 3

Town

Wageningen

Postcode

6708 PB

Country

Netherlands

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **WUR**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name **Chiel**

Last name **van Heerwaarden**

E-Mail **chielvanheerwaarden@gmail.com**

Position in org.

Assistant Professor

Department

Chair Meteorology and Air Quality - Department of Environmental Sciences

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Droevendaalsesteeg 3

Town

Wageningen

Post code

6708 PB

Country

Netherlands

Website

http://www.wageningenur.nl/nl.htm

Phone

+31 317 485336

Phone 2

+31 317 487754

Fax

+31 317 419000

Other contact persons

First Name	Last Name	E-mail	Phone
ESG	Tender Support Unit	tendersupportunit.esg@wur.nl	+31 317 485069

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name ETH Zürich

PIC 999979015 **Legal name** EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH

Short name: ETH Zürich

Address

Street Raemistrasse 101

Town ZUERICH

Postcode 8092

Country Switzerland

Webpage www.ethz.ch

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....06/01/2009 - no

SME self-assessment unknown

SME validation sme.....06/01/2009 - no

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name ETH Zürich

Department(s) carrying out the proposed work

Department 1

Department name

Dept. of Environmental Systems Science

☐ not applicable

☐ Same as proposing organisation's address

Street

Universitaetstrasse 16

Town

Zurich

Postcode

8092

Country

Switzerland

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name ETH Zürich

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name Erich

Last name Fischer

E-Mail erich.fischer@env.ethz.ch

Position in org.

Senior Scientist

Department

Dept. of Environmental Systems Science

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Universitaetstrasse 16

Town

Zurich

Post code

8092

Country

Switzerland

Website

https://iac.ethz.ch/people-iac/person-detail.MTE5NTkw.TGlzdC82Mzc

Phone

+41 44 632 8241

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Barbara	Wittneben	barbara.wittneben@env.ethz.ch	+41446328279
Agatha	Keller	grants@sl.ethz.ch	+41 44 634 5350

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UBERN

PIC

999976493

Legal name

UNIVERSITAET BERN

Short name: UBERN

Address

Street HOCHSCHULSTRASSE 6

Town BERN

Postcode 3012

Country Switzerland

Webpage <http://www.unibe.ch>

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UBERN

Department(s) carrying out the proposed work

Department 1

Department name

Institute of Geography

☐ not applicable

☐ Same as proposing organisation's address

Street

Hallerstrasse 12

Town

Bern

Postcode

3012

Country

Switzerland

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UBERN**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☐

Male

☒

Female

First name **Olivia**

Last name **Martius**

E-Mail **olivia.martius@giub.unibe.ch**

Position in org.

Professor

Department

Institute of Geography

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Hallerstrasse 12

Town

Bern

Post code

3012

Country

Switzerland

Website

Phone

+41316313337

Phone 2

+41795872431

Fax

+XXX XXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Simone	Rufener	simone.rufener@research.unibe.ch	+XXX XXXXXXXXX

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name FC.ID

PIC

915056194

Legal name

FCIENCIAS.ID - ASSOCIACAO PARA A INVESTIGACAO E DESENVOLVIMENTO DE CIENCIAS

Short name: FC.ID

Address

Street CAMPO GRANDE, EDIFICIO C1, PISO 3

Town LISBON

Postcode 1749 016

Country Portugal

Webpage <http://www.fcencias-id.pt>

Specific Legal Statuses

Legal personyes

Public bodyno

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....10/01/2017 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name FC.ID

Department(s) carrying out the proposed work

Department 1

Department name

Instituto Dom Luiz

☐ not applicable

☐ Same as proposing organisation's address

Street

FCUL, Campo Grande Building C1, Floor 1,

Town

Lisbon

Postcode

1749-016

Country

Portugal

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **FC.ID**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name **Emanuel**

Last name **Dutra**

E-Mail **endutra@fc.ul.pt**

Position in org.

Researcher

Department

Instituto Dom Luiz

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

FCUL, Campo Grande Building C1, Floor 1,

Town

Lisbon

Post code

1749-016

Country

Portugal

Website

http://idl.campus.ciencias.ulisboa.pt/

Phone

+351 217 500 357

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Carla	Marques	ccmarques@fciencias-id.pt	+351 217500032

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UH

PIC

999994535

Legal name

HELSINGIN YLIOPISTO

Short name: UH

Address

Street YLIOPISTONKATU 3

Town HELSINGIN YLIOPISTO

Postcode 00014

Country Finland

Webpage www.helsinki.fi

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....31/12/2018 - no

SME self-assessment31/12/2018 - no

SME validation sme.....09/02/2009 - no

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UH

Department(s) carrying out the proposed work

Department 1

Department name

Faculty of Science / Institute for Atmospheric and Earth System R

☐ not applicable

☐ Same as proposing organisation's address

Street

Gustaf Hållströmin katu 2

Town

University of Helsinki

Postcode

00014

Country

Finland

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UH

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex

☒ Male ☐ Female

First name Heikki

Last name Jarvinen

E-Mail heikki.j.jarvinen@helsinki.fi

Position in org. Professor

Department Institute for Atmospheric and Earth System Research

☐

Same as organisation name

☐ Same as proposing organisation's address

Street Gustaf Hällströmin katu 2

Town University of Helsinki

Post code 00014

Country Finland

Website https://www.helsinki.fi/en/inar-institute-for-atmospheric-and-ear

Phone +358294140022

Phone 2 +xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Ulrika	Backman	ulrika.backman@helsinki.fi	+358294121664

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UNITN

PIC

999841954

Legal name

UNIVERSITA DEGLI STUDI DI TRENTO

Short name: UNITN

Address

Street VIA CALEPINA 14

Town TRENTO

Postcode 38122

Country Italy

Webpage www.unitn.it

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....14/08/1982 - no

SME self-assessment14/08/1982 - no

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UNITN

Department(s) carrying out the proposed work

Department 1

Department name

Department of Civil, Environmental and Mechanical Engineering

☐ not applicable

☐ Same as proposing organisation's address

Street

Via Mesiano 77

Town

Trento

Postcode

38123

Country

Italy

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UNITN**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Prof.

Sex

☐

Male

☒

Female

First name **Simona**

Last name **Bordoni**

E-Mail **simona.bordoni@unitn.it**

Position in org. Full Professor

Department Department of Civil, Environmental and Mechanical Engineering

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street Via Mesiano 77

Town Trento

Post code 38123

Country Italy

Website <http://web.unitn.it/en/dicam>

Phone +390461282606

Phone 2 +390461281904

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Laura	Paternoster	laura.paternoster@unitn.it	+390461283230

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **DKRZ**

PIC

998692310

Legal name

DEUTSCHES KLIMARECHENZENTRUM GMBH

Short name: *DKRZ*

Address

Street BUNDESSTRASSE 45A

Town HAMBURG

Postcode 20146

Country Germany

Webpage <http://www.dkrz.de>

Specific Legal Statuses

Legal personyes

Public bodyno

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....03/11/2008 - no

SME self-assessment unknown

SME validation sme.....03/11/2008 - no

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name DKRZ

Department(s) carrying out the proposed work

Department 1

Department name

Application support

☐ not applicable

☒ Same as proposing organisation's address

Street

BUNDESSTRASSE 45A

Town

HAMBURG

Postcode

20146

Country

Germany

Dependencies with other proposal participants

Character of dependence	Participant	
Is controlled by	MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTEN E	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **DKRZ**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name **Joachim**

Last name **Biercamp**

E-Mail **biercamp@dkrz.de**

Position in org.

Department head

Department

Application support

☐

Same as
organisation name

☒ Same as proposing organisation's address

Street

BUNDESSTRASSE 45A

Town

HAMBURG

Post code

20146

Country

Germany

Website

https://www.dkrz.de

Phone

+49 40 460094-314

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UCM

PIC

999874546

Legal name

UNIVERSIDAD COMPLUTENSE DE MADRID

Short name: UCM

Address

Street AVENIDA DE SENECA 2

Town MADRID

Postcode 28040

Country Spain

Webpage <http://www.ucm.es>

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentyes

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....01/01/1900 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name UCM

Department(s) carrying out the proposed work

Department 1

Department name

Physics of the Earth and Astrophysics

☐ not applicable

☐ Same as proposing organisation's address

Street

Ciudad Universitaria Plaza de Ciencias 1

Town

Madrid

Postcode

28040

Country

Spain

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **UCM**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☐ Male

☒ Female

First name **Elsa**

Last name **Mohino**

E-Mail **emohino@ucm.es**

Position in org.

Researcher

Department

Physics of the Earth and Astrophysics

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Ciudad Universitaria Plaza de Ciencias 1

Town

Madrid

Post code

28040

Country

Spain

Website

Phone

+34 913944390

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Maria	Belen Rodriguez-Fonsec	brfonsec@ucm.es	+34 91394 4513
Ignacio	Gómez Cuesta	ignacio.gomez@rect.ucm.es	+34 91 394 6472
Leticia	Riaza Gambero	l.riaza@ucm.es	+34 91 394 6384

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name IRD

PIC 999513803 **Legal name** INSTITUT DE RECHERCHE POUR LE DEVELOPPEMENT

Short name: IRD

Address

Street BOULEVARD DE DUNKERQUE 44 CS 90009

Town MARSEILLE

Postcode 13572

Country France

Webpage www.ird.fr

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....21/11/2008 - no

SME self-assessment unknown

SME validation sme.....21/11/2008 - no

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name IRD

Department(s) carrying out the proposed work

Department 1

Department name

Marine Environmental Sciences Laboratory (LEMAR)

☐ not applicable

☐ Same as proposing organisation's address

Street

Rue Dumont D'urville

Town

Plouzané

Postcode

29280

Country

France

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name IRD

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name **Patrice**

Last name **Brehmer**

E-Mail **patrice.brehmer@ird.fr**

Position in org.

Senior Researcher

Department

Marine Environmental Sciences Laboratory (LEMAR)

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Rue Dumont D'urville

Town

Plouzané

Post code

29280

Country

France

Website

www.ird.fr

Phone

+33 (0)2 98 22 42 88

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Emmanuel	Stein	europe@ird.fr	+xxx xxxxxxxxx

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name IBERDROLA

PIC

953093774

Legal name

IBERDROLA RENOVABLES ENERGIA SA

Short name: IBERDROLA

Address

Street CALLE MENORCA 19/13

Town VALENCIA

Postcode 46023

Country Spain

Webpage www.iberdrola.es

Specific Legal Statuses

Legal personyes

Public bodyno

Non-profitno

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationno

Industry (private for profit).....yes

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....26/03/1996 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name IBERDROLA

Department(s) carrying out the proposed work

Department 1

Department name

Physics of the Earth and Astrophysics

☐ not applicable

☐ Same as proposing organisation's address

Street

Ciudad Universitaria Plaza de Ciencias 1

Town

Madrid

Postcode

28040

Country

Spain

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name IBERDROLA

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name Daniel

Last name Paredes

E-Mail dparedes@iberdrola.es

Position in org.

Senior Researcher

Department

Physics of the Earth and Astrophysics

☐

Same as organisation name

☐ Same as proposing organisation's address

Street

Ciudad Universitaria Plaza de Ciencias 1

Town

Madrid

Post code

28040

Country

Spain

Website

https://www.iberdrolarenovablesenergia.es/home

Phone

+XXX XXXXXXXXX

Phone 2

+XXX XXXXXXXXX

Fax

+XXX XXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Luis	Malumbres	Imm@iberdrola.es	+XXX XXXXXXXXX

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name ISRA

PIC 999791805 **Legal name** INSTITUT SENEGALAIS DE RECHERCHES AGRICOLES

Short name: ISRA

Address

Street Route des Hydrocarbures

Town DAKAR

Postcode 3120

Country Senegal

Webpage www.isra.sn

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationunknown

International organisation of European interestunknown

Secondary or Higher education establishmentunknown

Research organisationyes

Industry (private for profit).....no

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name ISRA

Department(s) carrying out the proposed work

Department 1

Department name

Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT)

☐ not applicable

☐ Same as proposing organisation's address

Street

Pole de Recherches de Hann

Town

Dakar

Postcode

BP 2241

Country

Senegal

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **ISRA**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male

☐ Female

First name **Abdoulaye**

Last name **Sarre**

E-Mail **ablaysarrey@yahoo.fr**

Position in org.

Responsible of Pelagic Resources Assessment

Department

Gestion durable des écosystèmes et des ressources (GEDER)

☐

Same as
organisation name

☐ Same as proposing organisation's address

Street

Pole de Recherches de Hann

Town

Dakar

Post code

BP 2241

Country

Senegal

Website

Phone

+221 77 632 05 32

Phone 2

+221 70 797 11 32

Fax

+XXX XXXXXXXXXX

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name Latest Thinking

PIC

920342306

Legal name

Latest Thinking GmbH

Short name: Latest Thinking

Address

Street Am Feenteich 4

Town Hamburg

Postcode 22085

Country Germany

Webpage www.lt.org

Specific Legal Statuses

Legal personyes

Public bodyno

Non-profitno

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationno

Industry (private for profit).....yes

Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....31/12/2017 - yes

SME self-assessment31/12/2017 - yes

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003470-1

Acronym

NextGEMS

Short name Latest Thinking

Department(s) carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID **101003470-1**

Acronym

NextGEMS

Short name **Latest Thinking**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Mr.

Sex

☒ Male

☐ Female

First name **Pajam**

Last name **Sobhani**

E-Mail **pajam.sobhani@lt.org**

Position in org.

Founder & CEO

Department

Latest Thinking GmbH



Same as
organisation name

☒ Same as proposing organisation's address

Street

Am Feenteich 4

Town

Hamburg

Post code

22085

Country

Germany

Website

https://lt.org/

Phone

+49 40 537978280

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

3 - Budget

Total requested EU contribution for the proposal/ €	11 151 155
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NextGEMS: Next Generation Earth Modelling Systems

1 Excellence

1.1 Objectives

NextGEMS aims to develop and apply global Storm-Resolving Earth System Models (SR-ESMs) to the study of anthropogenic climate change. SR-ESMs differ qualitatively from ‘high-resolution’ versions of traditional ESMs in that the fineness, $\mathcal{O}(3\text{ km})$, of their oceanic and atmospheric grids allows them to explicitly, and thereby physically, represent essential climate processes – precipitating deep convection, ocean mesoscale eddies, mesoscale land surface heterogeneity and orographic influences on large-scale circulations and ocean water-mass formation. Presently SR-ESMs only exist as prototypes. By developing two existing prototypes into production systems, and by applying them to a few select but important problems, NextGEMS will re-imagine the scientific, technical, and to some extent cultural, foundations of Earth system modelling in Europe.

NextGEMS’ specific objectives (hereinafter referred to as **O1**, **O2** and **O3**) are:

- O1:** demonstrate the capacity of SR-ESMs to realistically represent the coupled (land-ocean-atmosphere) climate system; use these to perform the first global multi-decadal (30 y) SR-ESM based climate projections; and use the simulations from this new type of model to test for out-of-sample climate trajectories, i.e., surprises.
- O2:** use SR-ESMs to test emerging and long-standing hypotheses underpinning our understanding of climate change: (i) that convective organization determines Earth’s energy budget and the strength of cloud feedbacks; (ii) that a more explicit representation of cloud-aerosol interactions mutes aerosol-radiative forcing; (iii) that storm-scale circulations are of leading order importance for air-sea fluxes in the tropics, thereby influencing tropical and mid-latitude variability, including extremes; and (iv) that storm-scale variability in weather systems and of the land surface strongly influence extra-tropical climate and extremes, for instance by conditioning circulation regimes, like blocking.
- O3:** exploit the ability of SR-ESMs to simulate scales commensurate to those that are observed and are also associated with large impacts to respectively: (i) better constrain otherwise unconstrained degrees of freedom (e.g., from cloud microphysics); and (ii) more effectively involve application and impact communities as part of the model development.

1.2 Relation to the work programme

NextGEMS enabling idea is that advances in computing are allowing global simulations that finally breakthrough to scales of motion where critical climate processes and interactions can be explicitly resolved, rather than parameterized, and hence be represented more physically. In pioneering the development and application of SR-ESMs for this purpose, NextGEMS naturally aligns with the scope of the call for “developing next generation Earth System Models” (LC-CLA-18-2020). By using the highest possible resolution to represent key climate processes explicitly, and boundary conditions more realistically, NextGEMS addresses the desire (here quoted) for “realism”, “bias reduction” and “improved resolution”. NextGEMS “resolves uncertainty” by virtue of applying qualitatively, or structurally, different types of models to climate problems, which tests for out-of-sample trajectories.

The benefits of improved resolution, reduced biases, and greater realism will allow NextGEMS to explore anew scientific questions at the center of climate science. Relevant for climate sensitivity is how the organization of deep convection influences the tropical energy budget, cloud feedbacks, and patterns of ocean warming, how atmospheric-ocean coupling in the tropics affects tropical cyclones and monsoons and their potential changes with warming, and affects phenomena such as drought, through teleconnections. Likewise, NextGEMS enables new approaches for understanding how surface heterogeneity (and more realistic surface orography) and land atmosphere coupling influence the hydrological cycle and the development of extremes.

It is often surmised that computationally demanding approaches (see NextGEMS in a Nutshell), are less well adapted to other aspects of the call (i.e., ensembles, links to slow – carbon, composition – processes, or to applications and assessment activities), some of which are more specifically associated with the idea of the ‘Earth system’. Here, and in Table 1, we explain how NextGEMS introduces novel ways to also address these challenges, and thus aligns with the full scope of the call:

NextGEMS in a Nutshell



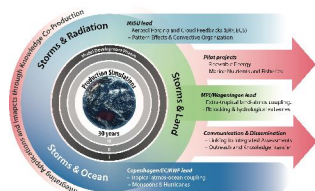
ECMWF and MPI-M are already performing global simulations at 2.5 km (atmosphere) and AWI and MPI-M are pioneering a new generation of ocean models. The first month-long coupled simulations have been performed at 5 km resolution, demonstrating that multi-decadal simulations by SR-ESMs are feasible today. NextGEMS will accelerate this development and give it an Earth System emphasis, with multiple multi-decadal simulations in the third year and a close integration of application and impact communities.



“One cannot learn anything about the Earth System from such short simulations with limited realizations” Most of what we call robust understanding of climate change hasn’t required century-long simulations, or very large ensembles; many important biases are well known to emerge in days (atmosphere) to months (ocean), and even one out-of-sample climate trajectory from a new type of model will reshape perceptions about uncertainty. At this stage in climate science new modelling approaches are needed.



“But we already have km-scale regional models to look at small scale effects” Indeed, such models have paved the way in showing the benefits of high resolution. NextGEMS, however, is based on the hypothesis that in addition to influencing the atmosphere and ocean general circulation, scales of motion resolved by SR-ESMs also condition other components of the Earth system, e.g., carbon, aerosols and marine nutrients. In this way fine-scale circulations may additionally influence climate trajectories.



With an eye toward a more coordinated and inclusive use of the most ambitious types of Earth system modelling, NextGEMS will develop new approaches to incorporating applications as part of the model development. Knowledge Co-production pilot projects will use ‘Hackathons’ to evolve online methods for quantifying the impact of resolving circulation on risk assessment, near surface renewable energy production, and coastal marine ecosystems and fisheries.

- (1) The poor, or often absent, representation of mesoscale (2 km to 200 km) circulations in present climate models limits the ability to explore important Earth system questions with any fidelity. For example, the intensity distribution of rainfall and the duration distribution of dry spells have a large impact on the terrestrial biosphere, and extremes. Likewise the pattern and distribution of rainfall strongly influences the burden and distribution of the aerosol. Ocean mesoscale eddies influence, among other things, nutrient transport in boundary current regions, with implication for ecology. By resolving the circulation systems that are decisive for these ‘Earth system’ processes, NextGEMS will study their impacts in new ways, even with relatively short (decadal to multi-decadal) simulations.
- (2) SR-ESMs avoid most parameterizations that have an ambiguous dependence on scale. Whereas the aim of a conventional Earth system model is for its large-scale climate to be independent of the grid scale, SR-ESMs allow one to look at how the large scale changes as finer scales become better resolved. Hence the trajectory of the climate, as the grid is refined, becomes informative in ways that are purposefully avoided in conventional approaches¹. This makes reduced resolution simulations, for instance using twice the grid spacing, informative. Given that a factor of two in resolution implies roughly a factor of ten in throughput, this will enable NextGEMS to use ensembles of simulations at coarser resolution,

¹Bjorn Stevens and Donald H Lenschow. “Observations, experiments, and Large Eddy Simulation”. In: *Bull. Amer. Meteorol. Soc* 82.2 (2001), pp. 283–294, Cathy Hohenegger et al. “Climate Statistics in Global Simulations of the Atmosphere, from 80 to 2.5 km Grid Spacing”. In: *Journal of the Meteorological Society of Japan. Ser. II* (2020), pp. 2020–005.

also combined with data assimilation approaches, to inform and assess the development of its finest resolution, most computationally intensive, simulations.

- (3) Today, risks are assessed through a patchwork of downscaling approaches. Doing so often artificially separates the users from the creators of climate information (through what is sometimes called the value chain). By providing information in terms and on scales which application communities already understand, SR-ESMs allow a more integrated approach to the provision of climate information. Moreover, risk depends upon hazard probability, which is influenced by small-scale atmospheric phenomena, and vulnerability and exposure, which are strongly heterogeneous on scales not represented by traditional ESMs. NextGEMS will exploit the advantages of resolving those scales which are of greatest interest to application and impact communities through the use of *Knowledge-coproduction Hackathons*, to show how applications can be directly integrated into this next generation of models. For this purpose we have chosen two pilot applications: near surface renewable energy and marine nutrients.

1.3 Concept and methodology

a) Concept

Present day ESMs rest on theoretical foundations developed fifty years ago. A great deal has been learned from such models as they have steadily expanded upon and improved their representation of the Earth system. Nonetheless, large and systematic biases have proven recalcitrant², calling into question some of the basic assumptions of the models. These assumptions – which provide the underpinnings for the parameterizations that NextGEMS circumvents – have become so ingrained, that in many cases they are no longer acknowledged, let alone questioned. Advances in computing make it possible to now approach the problem in a novel way, a fact NextGEMS endeavors to exploit.

Until recently global atmospheric models running on meshes with grid spacings less than 5 km were largely the apanage of the Japanese group developing and using NICAM. This is no longer the case, as evidenced by DYAMOND, the first ever inter-comparison of global storm-resolving models. Nine groups participated in DYAMOND, including four from Europe, and demonstrated an ability to run atmospheric models on fine (2.5 km to 4 km) quasi-uniform global meshes for forty days during summer³. Based on DYAMOND, longer runs are being performed, and a follow up initiative (DYAMOND-Winter), has been organized to compare global models that resolve the coupled evolution of both the atmosphere and ocean on these same scales. NextGEMS proposes to further develop the two European models (ICON from MPI-M and IFS/FESOM from ECMWF/AWI) participating in DYAMOND-Winter, and thus builds on institutional commitments to make the leap to coupled models that can be run at kilometer scales globally. These developments are still a far cry from being able to model the climate system on kilometer scales, but they have demonstrated that the computational efficiency of the models, combined with ongoing and continuing investments in high-performance computing (which builds on a rich legacy of European projects) makes it possible to conceive multi-decadal atmosphere-ocean coupled global simulations on grid meshes as fine as 2.5 km in the next few years, and without fundamental changes in technology⁴. This situation has given impetus to NextGEMS as a project to accelerate this development, to apply SR-ESMs to important Earth system questions, and to exploit their capabilities for linking to important application sectors.

NextGEMS will do this by building on the DYAMOND initiative to bring together a new community of scientists and stake-holders with both the interest and expertise in contributing to the development of this new generation of Earth system models. Adopting the word *storms* as short hand for the intermediate (2 km to 200 km) scale circulation systems that SR-ESMs endeavor to explicitly represent, NextGEMS stands on three legs. One focuses on the coupling of storms & radiation (S&R), another on storms & land (S&L), and the third, on storms & ocean (S&O), Fig. 1. These three themes have been constructed to show how SR-ESMs can be used

²C Reynolds, K D Williams, and Ayrton Zadra. *WGNE Systematic Error Survey Results Summary*. Tech. rep. WCRP, Aureole Voltaire et al. “Role of wind stress in driving SST biases in the Tropical Atlantic”. In: *Climate Dynamics* 53.5-6 (Mar. 2019), pp. 3481–3504.

³Masaki Satoh et al. “Global Cloud-Resolving Models”. In: *Curr Clim Change Rep* 5.3 (May 2019), pp. 172–184, Bjorn Stevens et al. “DYAMOND: the DYnamics of the Atmospheric general circulation Modeled On Non-hydrostatic Domains”. In: *Prog. in Earth and Planet. Sci.* 6.1 (Sept. 2019), pp. 1–17.

⁴Oliver Fuhrer et al. “Near-global climate simulation at 1 km resolution: establishing a performance baseline on 4888 GPUs with COSMO 5.0”. In: *Geosci. Model Dev.* 11.4 (2018), pp. 1665–1681, Philipp Neumann et al. “Assessing the scales in numerical weather and climate predictions: will exascale be the rescue?”. In: *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 377.2142 (Apr. 2019), pp. 20180148–17.

Table 1. Relation to ‘Challenges’ and ‘Scope’ of the Call (LC-CLA-18-2020).

Challenge	NextGEMS
The call outlines three challenges: (i) ‘Improvement around predicting capability’; (ii) ‘Improvement around process realism, capacity of resolving epistemic uncertainty’ and (iii) ‘Needs of parametrisation and reduction in systematic biases, time and resolution’	By breaking through to scales where crucial climate processes and interactions can be explicitly represented, rather than parameterized, NextGEMS greatly strengthens the foundations of Earth system modelling. It opens a new window on prediction and new ways to think about the coupling of essential Earth system components. By sampling for out-of-sample climate trajectories the use and analysis of SR-ESM’s expands the frontiers of uncertainty quantification.
Scope	NextGEMS
‘To address in a novel way one or more of the competing demands that surround the advancement of ESMs, (e.g., improved process realism, large ensemble of predictions, improved model resolution, etc.)’	By resolving circulation systems on 2 km to 200 km scales SR-ESMs improve process realism, precisely for those elements whose poor representation limits conventional models. By expanding the computing horizon, NextGEMS also exploits the use of ensembles at reduced resolution to assess climate variability.
‘To develop innovative and effective approaches that add to or better represent Earth system processes linked to climate change’.	NextGEMS will replace some of the most stubbornly difficult, but climate-change critical, process representations – of deep precipitating convection, orographic drag, and ocean mesoscale eddies – by an explicit physically based representation of these processes.
‘Further explore novel ways of coupling existing models (e.g., ice-sheet dynamics) with ESMs and where appropriate, improve synergies with reduced complexity carbon-cycle, atmospheric composition and climate models.’	By resolving convective storms, mesoscale heterogeneities and their associated circulation systems NextGEMS reconceptualizes the coupling to the terrestrial carbon cycle and the aerosol, as both are strongly coupled to the intensity distribution of rainfall; resolving mesoscale ocean eddies does the same for linkages to ice sheets, the marine biosphere (specifically small pelagic fish dynamics as well as macro-zooplanktonic abundance), and ocean heat and carbon uptake.
‘To explore linkages with relevant integrated assessment models.’	Knowledge-coproduction pilot projects on risk, renewable energy, and coastal marine ecosystems and fisheries will explicitly integrate the assessment community as part of the model development (Table 2)
‘Actions may also devise new data assimilation methods that will demonstrably improve ESMs.’	Data assimilation methods from numerical weather prediction will be used to explore and refine methods of parameter estimation and model fine-tuning.

to address important scientific questions as articulated by **O2**. An Earth system model that explicitly represents deep convective systems and the processes that organize them, as well as the mesoscale variability of the Earth’s surface, is likely to be more informative as to how these dynamics influence Earth’s energy budget. Allowing these to couple to ocean circulations on similar scales is also hypothesized to be essential to understand tropical air-sea interaction, interactions that are sensitive to small perturbations and through teleconnections, have global manifestations⁵.

⁵Joseph J Barsugli and Prashant D Sardeshmukh. “Global Atmospheric Sensitivity to Tropical SST Anomalies throughout the Indo-Pacific Basin”. In: *Journal of Climate* 15.23 (2002), pp. 3427–3442, Nour-Eddine Omrani et al. “Key Role of the Ocean Western Boundary currents in shaping the Northern Hemisphere climate”. In: *Sci Rep* 9.1 (Feb. 2019), pp. 318–12, Paulo Ceppi and Jonathan M Gregory. “Relationship of tropospheric stability to climate sensitivity and Earth’s observed radiation budget.” In: *PNAS* 114.50 (Dec.

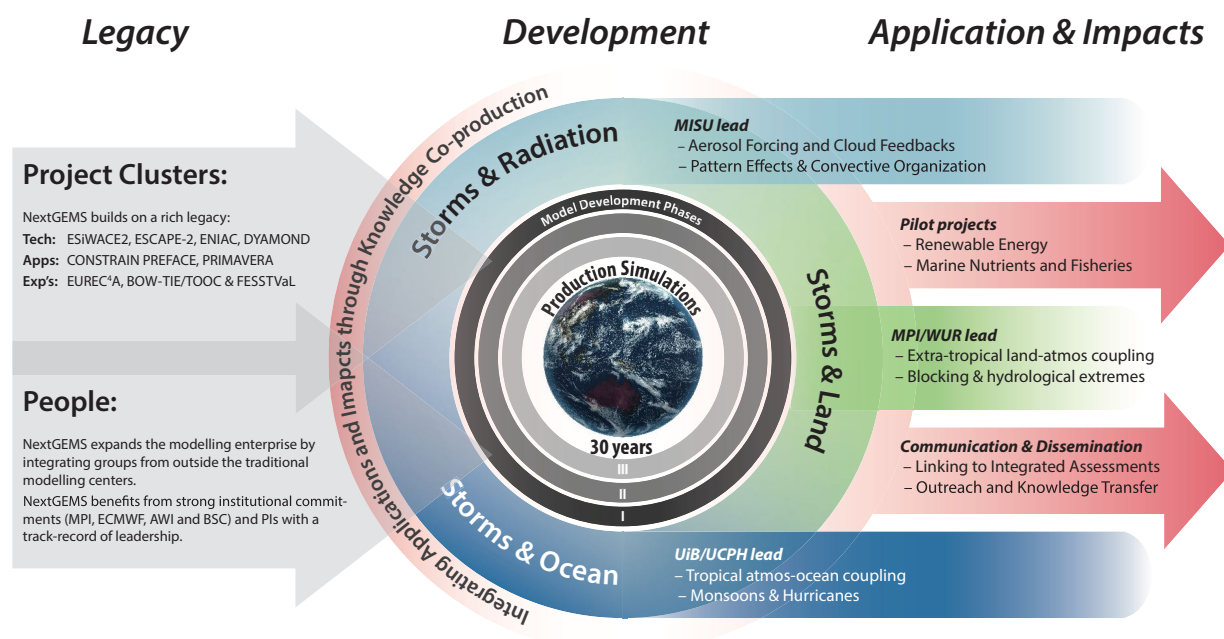


Figure 1. Basic structure of NextGEMS

NextGEMS aims to short-circuit the value chain that connects modelers to users. Rather than considering application and impact communities as a downstream activity, and model development as an upstream activity, both are integrated into each of the three themes through a sub-division of activities (but not investigators) among two classes of questions: **Model Development Questions (MDQs)**, which pertain to **O1**, and **Application and Impact Questions (AIQs)**, which pertain to **O2** and **O3**.

Contributions from the different themes to MDQs will prepare the SR-ESMs for production simulations, and will be coordinated and facilitated by two full-time-equivalent positions supporting team members working in close cooperation with the core model development teams at MPI-M and ECMWF/AWI. Science applications link to **O2** and will be coordinated by the theme leads, whereas Knowledge-coproduction, communication and outreach contribute to **O3** through the AIQs and will be coordinated by BSC. As schematically illustrated in Fig. 2, MDQs are designed to advance the models through three development cycles in the first two years with frequent information exchange via Development Hackathons (essentially group workshops set up to co-analyze – or ‘Hack’ – the simulations), and into production thereafter. Science-related AIQs gain emphasis in the second half of the project, whereas applications and impacts are integrated at the outset. Through this approach, and by exploring new ways for shared analysis (Hackathons, server-side analysis) and communication and visualization (high-impact video), NextGEMS will open up the development and exploitation of SR-ESMs to the broader community, and aspire to change the culture of model development and application. If successful it will give proof of concept to elements of ideas first developed for the ExtremeEarth flagship project, and in so doing help nudge Europe toward a more unified, coordinated and efficient capacity for Earth system modelling.

Storms and Radiation (MISU lead): This theme will study aerosol forcing, convective organization, cloud feedbacks, and processes influencing how the hydrological cycle in the tropics responds to warming.

MDQs: will focus on the ability of the SR-ESMs to realistically represent the energy budget at the top of the atmosphere. Ensembles of short simulations at coarse resolution combined with data assimilation techniques and observations from satellites and two field campaigns (EUREC4A⁶ & BOW-TIE/TOOC) will be used to optimize parameter values for production runs, for instance by addressing expected cloud biases. Structural deficiencies in the representation of unresolved processes, such as cloud-microphysics and turbulent mixing, will be assessed and used to guide the development of new

2017), pp. 13126–13131, Caroline C Ummenhofer et al. “Indian and Pacific Ocean Influences on Southeast Australian Drought and Soil Moisture”. In: *Journal of Climate* 24.5 (Mar. 2011), pp. 1313–1336.

⁶Sandrine Bony et al. “EUREC4A: A field campaign to Elucidate the Couplings between Clouds, Convection and Circulation”. In: *Surv Geophys* 36.1 (Sept. 2017), pp. 1529–1568.

parameterizations. A simplified aerosol scheme designed to exploit the ability of SR-ESMs to better represent physical source and sink processes will be developed and implemented.

AIQs: will exploit the ability of SR-ESMs to resolve precipitating deep convection, mesoscale systems of shallow and deep clouds, and aerosol source-sink processes, to reassess cloud feedbacks and aerosol forcing. Data from EUREC⁴A will inform analysis of cloud feedbacks and symmetries (land-sea, hemispheric, volcanoes, ship-tracks) will be used to assess aerosol forcing, thereby addressing items (i) and (ii) of **O2**. This theme's knowledge-coproduction focus will be on how changes in clouds and aerosols accompanying circulation changes affects the potential of solar energy production globally.

Storms and Land (MPI-M and WUR lead): This theme will study controls on the surface energy budget and the hydrological cycle over extratropical land surfaces.

MDQs: will focus on the ability of SR-ESMs to realistically represent the surface energy budget over land, including temporal (i.e., diurnal) variability, its coupling to the atmosphere and will develop strategies for configuring and initializing the land models. For this purpose land observational networks, including tall tower and flux-net measurements, and a field study (FESSTVaL in the summer of 2020) targeted to observe variability in the planetary boundary layer on scales 2-20 km (over Germany) will be exploited.

AIQs: will focus on how (i) resolving the mesoscale heterogeneity of the land-surface (also in terms of orography) influences the large-scale dynamics of the extra-tropics, particularly blocking, moisture recycling, and dry spells; and (ii) how resolving storm systems, and their interaction with orography and soil-moisture impacts the terrestrial carbon cycle, by influencing the intensity and distribution of precipitation, fire weather, and the effects of winds on tree mortality. Doing so addresses item iv of **O2**. Its knowledge-coproduction focus will be on how a more realistic representation of circulation, through its effects on cloudiness, impacts the potential of renewable energy globally.

Storms and Ocean (UiB and UCPH lead): This theme will study processes influencing the coupling of the lower atmosphere with the upper ocean in the tropics and the importance of this coupling for convective phenomena such as monsoons, tropical cyclones, as well as SST variability.

MDQs: will focus on the ability of the SR-ESMs to realistically represent the surface energy budget over the tropical ocean, as well as atmosphere-ocean coupling. It will do so by studying the role of high-frequency coupling, the effects of surface waves on mixing, and assumptions related to ocean discretization and vertical mixing, so as to optimize their representation. Extensive use will be made of data from two field studies, EUREC⁴A in the trade-winds, and BOW-TIE/TOOC, buoy measurements in the tropical Atlantic, 10-year of data collected to observe upper ocean mixing⁷ and satellite observations. Links to the extra-tropical and high-latitude oceans, and hence sea-ice, will build on legacy links to the APPLICATE project.

AIQs: will explore how resolving convective storms and ocean mesoscale eddies influences the development of SST anomalies and how this influences variability (diurnal, seasonal and inter-annual) and extremes. This will be accomplished through a specific focus on the tropical Atlantic, its effects on the North African Monsoon, and the intensity, number and spatial distribution of Atlantic Hurricanes, also as a function of warming, thereby addressing item (iii) of **O2**. Knowledge-coproduction will assess how the ability to resolve mesoscale circulations in the atmosphere and ocean affects nutrient transport and fisheries, and their changes with warming, also through a particular focus on West Africa.

Scientific questions addressed by the three themes target all four of the Cloud and Circulation Grand Science Challenge Questions of the World Climate Research Programme⁸. Even so, NextGEMS can only scratch the surface of what is possible with the simulations it performs. To mitigate against this limitation, methodologies are being developed within NextGEMS (see below) to allow and exploit a broader community participation in the project.

b) Methodology

Running SR-ESMs is computationally demanding. However, based on experiences from DYAMOND, the MPI-M estimates it can already perform coupled 5 km mesh simulations with a throughput at 0.5 SYPD (simulated years per day) were it to run on its existing (ca 2016) machine called Mistral. For this reason we see our

⁷Lucas Merckelbach et al. "A Dynamic Flight Model for Slocum Gliders and Implications for Turbulence Microstructure Measurements". In: *J. Atmos. Oceanic Technol.* 36.2 (Feb. 2019), pp. 281–296.

⁸Sandrine Bony et al. "Clouds, circulation and climate sensitivity". In: *Nature Geoscience* 8.4 (Mar. 2015), pp. 261–268.

Table 2. Knowledge Co-Production activities to involve scientists, engineers, application and/or communication specialists at an early stage. Hackathons target specific applications for integration into the model development, and on which to focus communication strategies.

Area	Approach
Renewable Energy	NextGEMS will work with IBERDOLA a multi-national Spanish utility company to develop methods of assessing renewable energy production – with an initial focus on cloud and aerosol effects on solar energy – directly from SR-ESM simulations.
Fisheries	Building on partnerships developed with PREFACE, AWA, and TRIATLAS, NextGEMS will assess how mesoscale ocean variability affects the small pelagic fish dynamics as well as macro-zooplanktonic abundance in the Senegalo-Mauritanian upwelling area (North West Africa).
Dissemination	Working with <i>Latest Thinking</i> , an SME specialized in science communication, and with BSC building on projects developed within PRIMAVERA, NextGEMS will develop short videos to disseminate advances in understanding relevant for application and impact communities.

aim (O1) to run multiple 30 year projections as a demonstrator of a new generation of ESMs as challenging, but feasible

Analyzing SR-ESMs is at least as challenging. NextGEMS will adopt techniques developed in the analysis of the DYAMOND data, e.g. homogenization of data to coarser and more uniform grids (which is sufficient for answering many questions, i.e., energy budgets); the use of server side processing; and extensive project support in the development and application of parallel post-processing tools such as the climate data operators (CDOs) and Python. Expertise will also be shared to enable project members to experiment with coarser resolution variants of the coupled model on their own, and with off-line simulations using individual components, i.e., for land or ocean spin-up or to explore the response of the SR-ESM to warming using experiments with fixed-SSTs.

To involve the broader science community in helping address the MDQs and AIQs, development Hackathons will be held at roughly six-month intervals. These three to five day events will typically involve up to fifty participants. One Hackathon per year – and at least one knowledge-coproduction Hackathon – will be incorporated into the NextGEMS General Assembly. Hackathons will be open to the broader scientific and application communities, with NextGEMS providing funding to support external participants. The Hackathons will often be organized as side events at larger and relevant events (such as scientific and stakeholder oriented conferences) to maximize participation and minimize traveling costs. Our experience based on the DYAMOND project is that there is considerable interest in exploring the properties of these new types of models. By funding external Hackathon participants, providing them ongoing access to the data and server-side processing capabilities, NextGEMS will go well beyond traditional methods of sharing data, and help engage a much broader community in the assessment and exploitation of its simulations.

A large part of what makes NextGEMS conceivable is its ability to harvest past, and leverage ongoing activities – specifically:

- (1) A strong link of the model development to three major field programmes (led by NextGEMS PIs): EUREC⁴A (2020) and BOW-TIE/TOOC (2022), both with a strong focus on tropical air-sea interaction, clouds and convective organization over tropical oceans, and FESSTVaL (2020) with a focus on mesoscale variability in the extra-tropics.
- (2) Clustering with internal and external HPC initiatives, e.g., the H2020 ESiWACE and ESCAPE-2 projects, and projects, such as ENIAC (Swiss), the ECMWF-led Scalability Project (International) and the BMBF (German) funded HD(CP)² and MONSOON2.0 projects.
- (3) Leveraging institutional priorities and associated past developments of the ECMWF/AWI and the MPI-M; MPI-M in developing SR-ESMs as a new type of ESM, ECMWF and AWI in exploring the benefits of kilometer-scale coupled global models for enhancing predictability.
- (4) Experience in managing large projects (i.e., HD(CP)², APPLICATE, PRIMAVERA, ESiWACE, DYAMOND, Scalability) designed to integrate a broad community of researchers into the coordinated development and application of storm-resolving models;

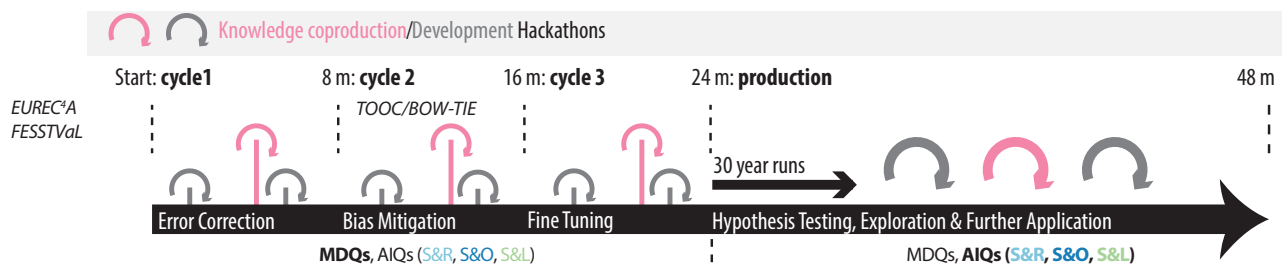


Figure 2. Project activities occur within project themes, and are sorted into *Model Development Questions* (MDQs) addressing **O1** and *Application Impact Questions* (AIQs), addressing **O2** and **O3**. Work Packages (bold) associated with MDQs are denoted by cycles, incorporate AIQs (i.e., through knowledge co-production hackathons), and are cross-cutting with respect to themes. WPs associated with AIQs form additional workpackages, usually within a theme and gain emphasis later in the project. Associated field studies are italicized.

- (5) An established track-record (i.e., BSC's Earth System Services Group, as well as within APPLICATE, PREFACE, TRIATLAS, EUCP and PRIMAVERA) of successfully working with application communities, both in knowledge-coproduction and in the development of effective outreach activities.

NextGEMS focuses its development on just two SR-ESMs, one (ICON) developed at the MPI-M the second (IFS/FESOM) through a cooperation between ECMWF and AWI. This focus makes it easier to involve groups outside of traditional modelling centers and explains the strong involvement of groups from southern and eastern EU countries, a healthy mix of early career and seasoned researchers, a large number of university groups and associated partners from Africa. This structure helps accomplish our third objective (**O3**).

To aid in project management, NextGEMS has been designed around three themes. Work packages mix activities and actions cutting across themes, as well as activities encapsulated entirely within a single theme. Each workpackage comprises transparent and clear objectives that can be realized over time-windows of roughly six (for tasks) to eighteen (for studies) months so as to make them most manageable under the Lump Sum funding pilot scheme.

1.4 Ambition

Considering that global coupled atmosphere-land-ocean simulations have never been performed at scales capable of resolving convective storms, land-surface heterogeneity, mesoscale ocean eddies and coastal current systems, NextGEMS is exceptionally ambitious. Were it not for an ability to align the priorities of participating institutions, to benefit from clusters of existing technology projects, and to leverage the leadership experience of its principle investigators (PIs), one might worry that it is too ambitious. Even so, the challenges are formidable and not all problems will be solved by resolving the atmosphere and ocean at kilometer scales. That is why NextGEMS will also nurture the development of new ideas to address some of these remaining problems (related to turbulent mixing and cloud microphysical processes). It is also why an open data and analysis framework is being implemented, so as to bring in expertise from the broader scientific community. To help better appreciate the innovative aspects of NextGEMS, the latter are summarized and presented in Table 3 also with the project impacts (§2 below) in mind.

2 Impacts

2.1 Expected Impacts

The expected impacts from NextGEMS are articulated below following the text from the call. These impacts are further addressed through specific and measurable targets as outlined in Table 3.

a) Improved models for the provision of climate services

NextGEMS advances the development and application of a new generation of Earth system models, one that uses approaches that have been shown to much better represent every aspect of precipitation and are able to represent mesoscale circulations as well as the effects of mesoscale variations in the land surface (including orography) on the atmosphere⁹. SR-ESMs provide information on scales that are similar to in-situ observations,

⁹Andreas F Prein et al. "A review on regional convection-permitting climate modeling: Demonstrations, prospects, and challenges". In: *Rev. Geophys.* 53.2 (May 2015), pp. 323–361, Christoph Schär et al. "Kilometer-scale climate models: Prospects and challenges".

Table 3. Ambitious objectives or innovative methodologies adopted by NextGEMS, and their link to the desired impacts (Section 2).

Innovation	Implication	Impact
Projections	Global coupled simulations at storm and ocean eddy (km) scale have never been performed. NextGEMS will perform at least two such simulations each for 30 y.	a,b,c,e
Applications	Through knowledge-coproduction Hackathons NextGEMS short-circuits the value chain. Renewable energy and marine nutrients will be used as pilot studies (Table 2) that aim to integrate applications into the development of SR-ESMs from the outset.	a,c
Open Analysis	NextGEMS will follow analysis paradigms developed in the (H2020) ESiWACE project based on open data and server side processing, including data analytics through AI-methodologies. Frequent Hackathons focussing on model development and application-impact questions will help open the process to participation from outside.	c, d
Participation	NextGEMS allocates funding to support external applicants in its development and Knowledge-coproduction Hackathons. This funding will target those from groups or nations that have less of a tradition of, or access to, state-of-the-art climate modelling. In addition, one Hackathon will address a topic proposed by the outside community.	a,d
Integration	NextGEMS is structured to nurture a cooperative and collective approach to analyzing, developing and using the most advanced climate models. These methods are seen as possible forerunners to a more coordinated modelling approach which could be the basis for a future European climate modelling center.	a,c
Leverage	Through funded links to other projects (i.e., CONSTRAIN) and Knowledge-coproduction Hackathons NextGEMS will provide input to the integrated assessment community. Through links to past field experiments and through the use of resolutions commensurate to the scales resolved by modern observing systems, NextGEMS will inform the design of future field experiments (e.g. BOW-TIE/TOOC) and of the observing system in general.	a,d, e

facilitating the comparison between models and observations and hence accelerating model improvement. SR-ESMs also provide information on scales familiar to users, thereby greatly short circuiting the value chain whereby traditional climate models must be processed by layers of experts before their information content can be exposed to end users. Similar approaches have been successfully adopted to provide weather predictions, to study regional climate, and to advance basic scientific understanding. A similar revolution is ongoing in oceanographic research. Moreover given most decision horizons, NextGEMS focus on multi-decadal (30 y) projections is well attuned to the users of climate information.

b) Increased confidence in climate projections

Substantial uncertainty in climate projections arises from looking at climate change through the lens of a class of models that are, structurally speaking, very similar. Given that the models are more similar to one another than any of them is to the real world, out-of-sample behavior (i.e., surprises) should be expected. For example, understanding of the tropics and its potential to change with warming is based on a class of climate models that parameterize deep precipitating convection in ways whose deficiencies are well documented. The convective heating from these parameterizations skews the entire tropical circulation, which influences global weather patterns. Similar statements could be made about the representation of orographic drag or aerosol effects in

In: *Bull. Amer. Meteor. Soc.* (Oct. 2019), BAMS-D-18-0167.1-58, Bjorn Stevens et al. "Large-eddy and Storm Resolving Models for Climate Prediction – The Added Value for Clouds and Precipitation". In: *Journal of the Meteorological Society of Japan. Ser. II* (2019), pp. 1-115.

models, or for studies of how deep convection conditions cloud feedbacks and estimates of climate sensitivity, or precipitation changes with warming and their effect on the terrestrial biosphere, or the role of boundary current systems on the climate system, or of ocean mesoscale eddies on the stratification of the southern ocean. By treating these known deficiencies by resolving more of their known physics NextGEMS will help us understand to what extent our projections of aerosol forcing and cloud feedbacks on the pace of future warming, as well as its implication for circulations and ecosystems, have been skewed by structural deficiencies, or too narrowly assessed as a result of discounting structural similarities in existing models. It is hard to think of a better way to gain confidence in climate projections.

c) Sustaining European leadership in climate science and Earth System Modelling

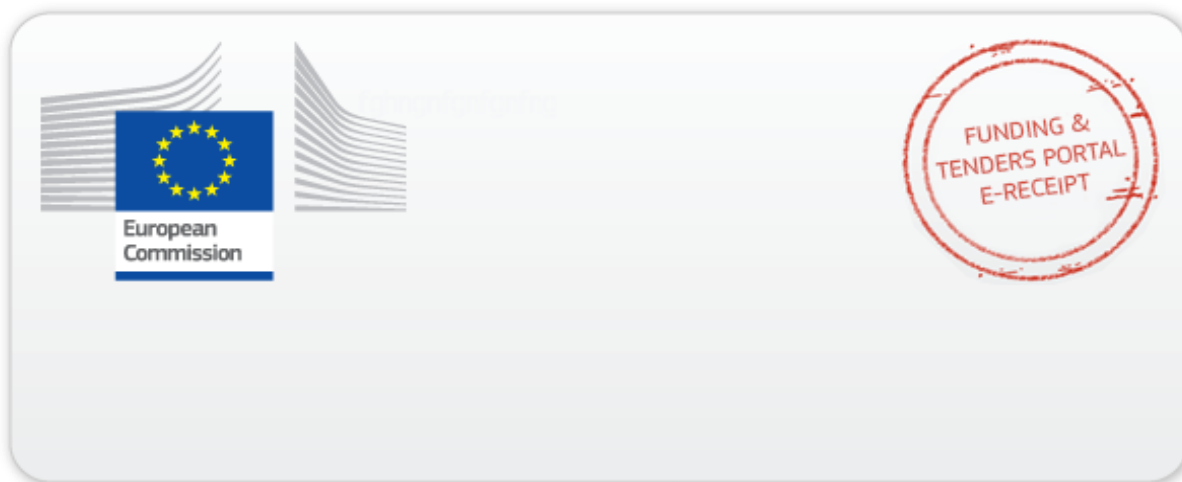
Europe has long been a leader in developing climate and weather models. Recently, through the DYAMOND project, and the development of two ocean models (ICON-O and FESOM), which are among the first to use unstructured grids, it has established itself at the forefront of the efforts to fully realize the potential for high-performance computing to resolving long-standing ESM biases. To remain at the forefront requires investment and coordination, but also a sense of purpose. NextGEMS addresses this by developing pilot projects designed to bring a community of scientists, open data and analysis methods, and new application communities together around a more coordinated and centralized modelling enterprise. As was argued by the ExtremeEarth initiative, this will be necessary if the modelling is to keep pace with technological developments. The open approach adopted by NextGEMS follows that of the HD(CP)² project, where it proved itself able to accelerate research and its uptake, by a much broader community. Hence NextGEMS, not only advances European leadership in climate science, but by contributing to the uptake of its output across Europe and beyond, greatly broadens its impact and benefits. It also prepare Europe for the next big leap, the use of short-integration hecto-meter-scale grids on global domain which might be needed to even further reduce uncertainty in climate sensitivity.

d) Supporting the operationalisation of the Paris Agreement

By addressing specific weaknesses in the present assessment of climate sensitivity, aerosol forcing, and indirectly through better understanding of factors influencing the productivity of the biosphere, NextGEMS will inform estimates of allowable emissions, thereby supporting the operationalisation of art. 2.1a,b of the Paris Agreement. Better understanding and quantification of regional changes, albeit globally, is central for management of forests and enhancement of forest carbon stocks, i.e., art. 5.2. Through its ability to better assess changes in regional circulation the models developed by NextGEMS are particularly well poised to inform adaptation efforts, while its transdisciplinary approach will strengthen the knowledge base, which are major objectives of art. 7, as well as assessing the danger of climate hazards (art. 8). The open data and open analysis frameworks being used in NextGEMS will support capacity building (art. 11) and the outreach and communication activities will specifically target art. 12. Finally the development of models with a much more physically based circulation is anticipated to underpin the use of inverse modelling — to assess emissions — which may be crucial for the global stocktake (art. 14).

e) Informing major international scientific assessment reports (e.g. IPCC)

Two of the PI's initiated a new programme of assessments under the auspices of the World Climate Research Programme (on Climate Sensitivity and Aerosol Forcing). NextGEMS PI's led the development of CMIP6 and have collectively contributed as lead authors of three rounds of IPCC assessments. PIs in NextGEMS are also strongly linked to the integrated assessment community, both through ongoing H2020 projects, i.e., CONSTRAIN, and within their local institutions (Hamburg Climate Futures). This combined with the specific research topics being addressed by NextGEMS will contribute greatly to its impact on international assessments. NextGEMS will also provide critical input to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Results on how SR-ESM can alter the understanding of climate change impacts on marine ecosystems in upwelling regions will be a key contribution to IPBES reports and inform sub-regional fisheries commissions and policy makers in Europe. As this project will start shortly after the AR6 will be completed, and before plans for further coordinated modeling activities (in support of possible future assessments) are developed, the moment is right for bringing into being a new generation of climate models, and to demonstrate their readiness to address the scientific questions of forthcoming assessments. As the climate science community takes a breath after the activity surrounding the AR6, NextGEMS will be creating the tool base for either fine-tuning targets, or dealing with the possible implications of a world continuing to warm, and carbon emissions continuing to rise, despite the best intentions of the Paris Agreement.



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