

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: 101003463-1

Proposal acronym: SOMMAR

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.

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	SOMMAR
Proposal title	Simulating the Ocean Mesoscale in the Earth system to support Mitigation and Adaptation and reduce Risks for the society <i>Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &</i>
Duration in months	60
Fixed keyword 1	Oceanography
Fixed keyword 2	Scientific computing, simulation and modelling tools
Fixed keyword 3	Climatology and climate change
Fixed keyword 4	Earth and related environmental sciences
Fixed keyword 5	Meteorology and atmospheric sciences
Fixed keyword 6	Climatic research
Free keywords	<i>high resolution Earth System Models; ocean mesoscale; low-frequency climate variability; climate predictability; future projections; Earth system processes</i>

Proposal Submission Forms

Proposal ID 101003463-1

Acronym **SOMMAR**

Abstract*

Resolving small scale oceanic processes in Earth System Models (ESM) is key to reducing long-standing biases, credibly simulating low-frequency climate variability, and increasing prediction capability across all time scales. The main goal of SOMMAR is thus to progress the state-of-the-art in simulation to a new paradigm space, applicable for both predictions and projections, with unprecedented resolution (10 km and beyond in the ocean) and fidelity, by 2026.

The simulation of many Earth system processes critically depends on a realistic representation of the physical climate system and of its variability. Therefore, SOMMAR will implement Earth system modules, such as ocean-biogeochemistry, Greenland and Antarctica ice sheets, terrestrial carbon, runoff models for river routing and leaching of nutrients from land to ocean, in six different European high resolution ESMs.

SOMMAR will address the technical challenges of high resolution modeling by implementing new technological breakthroughs to speed up models, developing methods for faster tuning and spin-up as well as the complementary approaches of online diagnostics and output coarsening tools, to increase information content, while reducing storage requirements.

SOMMAR will perform multi-model ensembles of seasonal predictions and historical and future scenario simulations with this new generation of ESMs. Thorough assessment of the simulations will use the latest observational and reanalysis datasets. The benefits for our prediction capability, the fidelity in the representation of variability, extremes and high impact weather events affecting Europe will be demonstrated. Benefits will also be demonstrated by links to the Integrated Assessment Modelling and climate services communities.

SOMMAR developments are expected to result in a sharply increased ability to answer the most pressing questions in climate science and decision making, largely due to the credibility of key processes related to oceanic resolution.

Remaining characters

0

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

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Acronym **SOMMAR**

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](#).

2 - Participants & contacts

#	Participant Legal Name	Country	Action
1	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	Sweden	
2	ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FUR POLAR- UND MEERESFORSCHUNG	DE	
3	BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION	Spain	
4	FONDAZIONE CENTRO EURO-MEDITERRANEOSUI CAMBIAMENTI CLIMATICI	IT	
5	CONSIGLIO NAZIONALE DELLE RICERCHE	IT	
6	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	FR	
7	DANMARKS METEOROLOGISKE INSTITUT	DK	
8	EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS	UK	
9	ILMATIETEEN LAITOS	FI	
10	KONINKLIJK NEDERLANDS METEOROLOGISCH INSTITUUT-KNMI	NL	
11	MET OFFICE	UK	
12	STIFTELSEN NANSEN SENTER FOR MILJOOG FJERNMALING	NO	
13	NATIONAL OCEANOGRAPHY CENTRE	UK	
14	NORCE NORWEGIAN RESEARCH CENTRE AS	NO	
15	OCEAN NEXT	FR	
16	UNITED KINGDOM RESEARCH AND INNOVATION	UK	
17	FACULTY OF SCIENCE UNIVERSITY OF ZAGREB	HR	
18	THE UNIVERSITY OF READING	UK	
19	NATIONAL UNIVERSITY CORPORATION THEUNIVERSITY OF TOKYO	JP	
20	UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH NONPROFIT CORPORATION	US	
21	Japan Agency for Marine-Earth Science and Technology	Japan	

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **SMHI**

2 - Administrative data of participating organisations

PIC	Legal name
999507983	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT

Short name: SMHI

Address

Street Folkborgsvaegen 1
 Town NORRKOEPING
 Postcode 601 76
 Country Sweden
 Webpage www.smhi.se

Specific Legal Statuses

Legal personyes
 Public bodyyes
 Non-profityes
 International organisationno
 International organisation of European interestno
 Secondary or Higher education establishmentno
 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..... unknown
 SME self-assessment unknown
 SME validation sme..... unknown

Proposal Submission Forms

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Acronym

SOMMAR

Short name **SMHI**

Department(s) carrying out the proposed work

Department 1

Department name not applicable

Same as proposing organisation's address

Street

Town

Postcode

Country

Dependencies with other proposal participants

Character of dependence	Participant	
<input type="text"/>	<input type="text"/>	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name SMHI

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 **Torben**

Last name **Koenigk**

E-Mail **torben.koenigk@smhi.se**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Monica	WALLGREN	monica.wallgren@smhi.se	+46114958104

Proposal Submission Forms

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Acronym

SOMMAR

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

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Acronym

SOMMAR

Short name **AWI**

Department(s) carrying out the proposed work

Department 1

Department name

Paleoclimate Dynamics

not applicable

Same as proposing organisation's address

Street

AM HANDELSHAFEN 12

Town

BREMERHAVEN

Postcode

27570

Country

Germany

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

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

Dr.

Sex

Male

Female

First name **Christian**

Last name **Rodehacke**

E-Mail **christian.rodehacke@awi.de**

Position in org. Researcher

Department Paleoclimate Dynamics

Same as organisation name

Same as proposing organisation's address

Street AM HANDELSHAFEN 12

Town BREMERHAVEN

Post code 27570

Country Germany

Website <https://www.awi.de/nc/en/about-us/organisation/staff/christian-ro>

Phone +4947148311520

Phone 2 +xxx xxxxxxxxx

Fax

+4647148311149

Other contact persons

First Name	Last Name	E-mail	Phone
Maria	Eden	maria.eden@awi.de	+4947148312412
EU	Grants	eu-grants@awi.de	+xxx xxxxxxxxx

Proposal Submission Forms

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Acronym

SOMMAR

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

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Acronym

SOMMAR

Short name **BSC**

Department(s) carrying out the proposed work

Department 1

Department name

Earth Science Department

not applicable

Same as proposing organisation's address

Street

Nexus II building, Jordi Girona 29

Town

Barcelona

Postcode

08034

Country

Spain

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

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 **Louis Philippe**

Last name **Caron**

E-Mail **louis-philippe.caron@bsc.es**

Position in org. Research Scientist

Department Earth Science Department

Same as organisation name

Same as proposing organisation's address

Street Nexus II building, Jordi Girona 29

Town Barcelona

Post code 08034

Country Spain

Website www.bsc.es

Phone +34934054290

Phone 2 +xxx xxxxxxxxxx

Fax

+xxx xxxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Mar	Rodríguez	mar.rodriguez@bsc.es	+34934137566

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name FONDAZIONE CMCC

PIC

999419422

Legal name

FONDAZIONE CENTRO EURO-MEDITERRANEOSUI CAMBIAMENTI CLIMATICI

Short name: FONDAZIONE CMCC

Address

Street VIA A IMPERATORE 16

Town LECCE

Postcode 73100

Country Italy

Webpage www.cmcc.it

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.....11/05/2005 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

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Acronym

SOMMAR

Short name **FONDAZIONE CMCC**

Department(s) carrying out the proposed work

Department 1

Department name not applicable

Same as proposing organisation's address

Street

Town

Postcode

Country

Dependencies with other proposal participants

Character of dependence	Participant	
<input type="text"/>	<input type="text"/>	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name FONDAZIONE CMCC

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 **Belluci**

Last name **Alessio**

E-Mail **alessio.bellucci@cmcc.it**

Position in org.

Scientist

Department CSP - Climate Simulations and Predictions

Same as organisation name

Same as proposing organisation's address

Street via Carlo Berti Pichat 6/2

Town Bologna

Post code 40127

Country Italy

Website <https://www.cmcc.it/people/bellucci-alessio>

Phone +39510301616

Phone 2 +xxx xxxxxxxxxx

Fax +xxx xxxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Giulia	Galluccio	giulia.galluccio@cmcc.it	+39283623433
Silvio	Gualdi	silvio.gualdi@cmcc.it	+390510301605
Simona	Masina	simona.masina@cmcc.it	+390510301608

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **CNR**

PIC

999979500

Legal name

CONSIGLIO NAZIONALE DELLE RICERCHE

Short name: CNR

Address

Street PIAZZALE ALDO MORO 7

Town ROMA

Postcode 00185

Country Italy

Webpage www.cnr.it

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.....18/05/2016 - no

SME self-assessment unknown

SME validation sme.....05/12/2008 - no

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **CNR**

Department(s) carrying out the proposed work

Department 1

Department name not applicable

Same as proposing organisation's address

Street

Town

Postcode

Country

Dependencies with other proposal participants

Character of dependence	Participant	
<input type="text"/>	<input type="text"/>	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **CNR**

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

Sex Male Female

First name **Jost**

Last name **von Hardenberg**

E-Mail **j.vonhardenberg@isac.cnr.it**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Jennifer	Urbinati	contratti_sede@isac.cnr.it	+39516399623

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

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

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Acronym

SOMMAR

Short name **CNRS**

Department(s) carrying out the proposed work

Department 1

Department name

Institut des Géosciences de l'Environnement, IGE

not applicable

Same as proposing organisation's address

Street

UGA - CS 40700

Town

Grenoble cedex 9

Postcode

38058

Country

France

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

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 **Thierry**

Last name **Penduff**

E-Mail **thierry.penduff@cnrs.fr**

Position in org. Senior Research Scientist

Department Institut des Géosciences de l'Environnement, IGE

Same as organisation name

Same as proposing organisation's address

Street UGA - CS 40700

Town Grenoble cedex 9

Post code 38058

Country France

Website <http://pp.ige-grenoble.fr/pageperso/pendufft/index.html>

Phone +33456528654

Phone 2 +xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Céline	Fontant	a.spv-europe@dr11.cnrs.fr	+33476881005

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name DANMARKS METEOROLOGISKE INSTITUT

PIC

999509438

Legal name

DANMARKS METEOROLOGISKE INSTITUT

Short name: DANMARKS METEOROLOGISKE INSTITUT

Address

Street LYNGBYVEJ 100

Town KOBENHAVN

Postcode 2100

Country Denmark

Webpage www.dmi.dk

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **DANMARKS METEOROLOGISKE INSTITUT**

Department(s) carrying out the proposed work

Department 1

Department name

Research and Development

not applicable

Same as proposing organisation's address

Street

LYNGBYVEJ 100

Town

KOBENHAVN

Postcode

2100

Country

Denmark

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

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Acronym

SOMMAR

Short name DANMARKS METEOROLOGISKE INSTITUT

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 **Shuting**

Last name **Yang**

E-Mail **shuting@dmi.dk**

Position in org. Senior Scientist

Department Research and Development

Same as organisation name

Same as proposing organisation's address

Street LYNGBYVEJ 100

Town KOBENHAVN

Post code 2100

Country Denmark

Website <http://research.dmi.dk/staff/all-staff/shuting/>

Phone +4539157463

Phone 2 +xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Christian	Kjaergaard	ck@dmi.dk	+4539157515

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

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 101003463-1

Acronym

SOMMAR

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

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Acronym

SOMMAR

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 **Magdalena**

Last name **Alonso Balmaseda**

E-Mail **magdalena.balmaseda@ecmwf.int**

Position in org. Head of Earth Predictability Section

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 +441189499112

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Daniel	Thiemert	daniel.thiemert@ecmwf.int	+441189499024

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **FMI**

PIC

999591306

Legal name

ILMATIETEEN LAITOS

Short name: *FMI*

Address

Street Erik Palmenin aukio 1

Town HELSINKI

Postcode 00560

Country Finland

Webpage www.fmi.fi

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

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Acronym

SOMMAR

Short name **FMI**

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 101003463-1

Acronym

SOMMAR

Short name **FMI**

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

Sex

Male Female

First name **Risto**

Last name **Makkonen**

E-Mail **risto.makkonen@fmi.fi**

Position in org.

Department



Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Julia	Sorvari	julia.sorvari@fmi.fi	+358504002071

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **KNMI**

PIC

999518944

Legal name

KONINKLIJK NEDERLANDS METEOROLOGISCH INSTITUUT-KNMI

Short name: *KNMI*

Address

Street UTRECHTSEWEG 297

Town DE BILT

Postcode 3731 GA

Country Netherlands

Webpage www.knmi.nl

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.....15/05/2008 - no

SME self-assessment unknown

SME validation sme.....15/05/2008 - no

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **KNMI**

Department(s) carrying out the proposed work

Department 1

Department name

RDWK, Research and Development for Weather and Climate

not applicable

Same as proposing organisation's address

Street

UTRECHTSEWEG 297

Town

DE BILT

Postcode

3731 GA

Country

Netherlands

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **KNMI**

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

Sex

Male Female

First name **Sybre**

Last name **Drijfhout**

E-Mail **sybre.drijfhout@knmi.nl**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Priscilla	Wittenberg	priscilla.wittenberg@knmi.nl	+31611957228

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name MET OFFICE

PIC

999892685

Legal name

MET OFFICE

Short name: MET OFFICE

Address

Street FITZROY ROAD

Town EXETER

Postcode EX1 3PB

Country United Kingdom

Webpage www.metoffice.gov.uk

Specific Legal Statuses

Legal personyes

Public bodyyes

Non-profityes

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **MET OFFICE**

Department(s) carrying out the proposed work

Department 1

Department name

Climate Science

not applicable

Same as proposing organisation's address

Street

FITZROY ROAD

Town

EXETER

Postcode

EX1 3PB

Country

United Kingdom

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **MET OFFICE**

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 **Malcolm**

Last name **Roberts**

E-Mail **malcolm.roberts@metoffice.gov.uk**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Emma	Edwards	emma.edwards@metoffice.gov.uk	+443301350791

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **NERSC**

PIC

999477913

Legal name

STIFTELSEN NANSEN SENTER FOR MILJOOG FJERNMALING

Short name: *NERSC*

Address

Street THORMOHLLENSGATE 47

Town BERGEN

Postcode 5006

Country Norway

Webpage www.nersc.no

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.....23/02/2009 - yes

SME self-assessment unknown

SME validation sme.....23/02/2009 - no

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name NERSC

Department(s) carrying out the proposed work

Department 1

Department name

Climate dynamics and prediction group

not applicable

Same as proposing organisation's address

Street

THORMOHLLENSGATE 47

Town

BERGEN

Postcode

5006

Country

Norway

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name NERSC

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 **Richard**

Last name **Davy**

E-Mail **richard.davy@nersc.no**

Position in org. Researcher II

Department Climate dynamics and prediction group

Same as organisation name

Same as proposing organisation's address

Street THORMOHLLENSGATE 47

Town BERGEN

Post code 5006

Country Norway

Website www.nersc.no

Phone +4740643028

Phone 2 +xxx xxxxxxxxxx

Fax +xxx xxxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Knut	Holba	knut.holba@nersc.no	+4790734815

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **NATIONAL OCEANOGRAPHY CENTRE**

PIC

898797054

Legal name

NATIONAL OCEANOGRAPHY CENTRE

Short name: NATIONAL OCEANOGRAPHY CENTRE

Address

Street EUROPEAN WAY

Town SOUTHAMPTON

Postcode SO14 3ZH

Country United Kingdom

Webpage www.noc.ac.uk

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **NATIONAL OCEANOGRAPHY CENTRE**

Department(s) carrying out the proposed work

Department 1

Department name

Department of Science and Technology, Marine Systems Modelling

not applicable

Same as proposing organisation's address

Street

Empress Dock

Town

Southampton

Postcode

SO143ZH

Country

United Kingdom

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name NATIONAL OCEANOGRAPHY CENTRE

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

Sex

Male Female

First name **Adrian**

Last name **New**

E-Mail **a.new@noc.ac.uk**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Holly	Pelling	hpell@noc.ac.uk	+441517954800

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **NORCE**

PIC

905860788

Legal name

NORCE NORWEGIAN RESEARCH CENTRE AS

Short name: NORCE

Address

Street NYGARDSGATEN 112

Town BERGEN

Postcode 5838

Country Norway

Webpage www.norceresearch.no

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **NORCE**

Department(s) carrying out the proposed work

Department 1

Department name

NORCE Climate

not applicable

Same as proposing organisation's address

Street

NYGARDSGATEN 112

Town

BERGEN

Postcode

5838

Country

Norway

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name NORCE

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 **Jerry**

Last name **Tjiputra**

E-Mail **jerry.tjiputra@norceresearch.no**

Position in org. Principal Researcher

Department NORCE Climate

Same as organisation name

Same as proposing organisation's address

Street Jahnebakken 5

Town Bergen

Post code 5007

Country Norway

Website <https://www.norceresearch.no/personer/jerry-tjiputra>

Phone +4756107559

Phone 2 +xxx xxxxxxxxx

Fax +xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Erik	Sandquist	erik.sandquist@norceresearch.no	+4756107549
Lars	Fagerli	lars.fagerli@norceresearch.no	+4793002873
Aleksi	Nummelin	alnu@norceresearch.no	+xxx xxxxxxxxx

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **OCEAN NEXT**

PIC

908203047

Legal name

OCEAN NEXT

Short name: OCEAN NEXT

Address

Street 90 CHEMIN DU MOULIN

Town LA TERASSE

Postcode 38660

Country France

Webpage www.ocean-next.fr

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **OCEAN NEXT**

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 101003463-1

Acronym

SOMMAR

Short name **OCEAN NEXT**

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 **Stephanie**

Last name **Leroux**

E-Mail **stephanie.leroux@ocean-next.fr**

Position in org.

Research Scientist

Department

OCEAN NEXT

Same as organisation name

Same as proposing organisation's address

Street

90 CHEMIN DU MOULIN

Town

LA TERASSE

Post code

38660

Country

France

Website

www.ocean-next.fr

Phone

+33476827076

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **UKRI**

PIC

906446474

Legal name

UNITED KINGDOM RESEARCH AND INNOVATION

Short name: UKRI

Address

Street POLARIS HOUSE NORTH STAR AVENUE

Town SWINDON

Postcode SN2 1FL

Country United Kingdom

Webpage <https://www.ukri.org/>

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **UKRI**

Department(s) carrying out the proposed work

Department 1

Department name

STFC RAL Space

not applicable

Same as proposing organisation's address

Street

Rutherford Appleton Lab, Harwell Campus

Town

Didcot, Oxfordshire

Postcode

OX110QX

Country

United Kingdom

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name UKRI

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

Sex Male Female

First name **Ag**

Last name **Stephens**

E-Mail **ag.stephens@stfc.ac.uk**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Caroline	Gore	caroline.gore@ukri.org	+441235445697

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name FACULTY OF SCIENCE UNIVERSITY OF ZA

PIC

999558617

Legal name

FACULTY OF SCIENCE UNIVERSITY OF ZAGREB

Short name: FACULTY OF SCIENCE UNIVERSITY OF ZAGREB

Address

Street HORVATOVAC 102/A

Town ZAGREB

Postcode 10000

Country Croatia

Webpage <https://www.pmf.unizg.hr/>

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.....23/03/1998 - no

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **FACULTY OFSCIENCE UNIVERSITY OF ZA**

Department(s) carrying out the proposed work

Department 1

Department name

Department of Geophysics

not applicable

Same as proposing organisation's address

Street

HORVATOVAC 102/A

Town

ZAGREB

Postcode

10000

Country

Croatia

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name FACULTY OF SCIENCE UNIVERSITY OF ZA

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 **Maja**

Last name **Telisman Prtenjak**

E-Mail **telisman@gfz.hr**

Position in org. Associate Professor

Department Department of Geophysics

Same as organisation name

Same as proposing organisation's address

Street Horvatovac 95

Town Zagreb

Post code 10000

Country Croatia

Website https://www.pmf.unizg.hr/geof/en/maja.telisman_prtenjak

Phone +38514605907

Phone 2 +xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Antonio	Simunovic	international@dekanat.pmf.hr	+38514606091

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **THE UNIVERSITY OF READING**

PIC

999984156

Legal name

THE UNIVERSITY OF READING

Short name: THE UNIVERSITY OF READING

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 101003463-1

Acronym

SOMMAR

Short name **THE UNIVERSITY OF READING**

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 101003463-1

Acronym

SOMMAR

Short name THE UNIVERSITY OF READING

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

Sex

Male Female

First name **Pier Luigi**

Last name **Vidale**

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

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
EU-Unit	Reading	eu-unit@reading.ac.uk	+441183784967

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **NATIONAL UNIVERSITY CORPORATION T**

PIC

998361734

Legal name

NATIONAL UNIVERSITY CORPORATION THEUNIVERSITY OF TOKYO

Short name: NATIONAL UNIVERSITY CORPORATION THEUNIVERSITY OF TOKYO

Address

Street HONGO BUNKYO KU 7 3 1

Town TOKYO

Postcode 113 8656

Country Japan

Webpage <https://www.u-tokyo.ac.jp/en/index.html>

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.....27/10/2008 - no

SME self-assessment unknown

SME validation sme.....27/10/2008 - no

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name NATIONAL UNIVERSITY CORPORATION T

Department(s) carrying out the proposed work

Department 1

Department name

Research Center for Advanced Science and Technology

not applicable

Same as proposing organisation's address

Street

4-6-1 Komaba, Meguro-ku

Town

Tokyo

Postcode

153-8904

Country

Japan

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name NATIONAL UNIVERSITY CORPORATION T

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

Sex Male Female

First name **Hisashi**

Last name **Nakamura**

E-Mail **hisashi@atmos.rcast.u-tokyo.ac.jp**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

Other contact persons

First Name	Last Name	E-mail	Phone
Masaaki	Hanashima	zaimu@office.rcast.u-tokyo.ac.jp	+81-3-5452-5393

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **UCAR**

PIC

982967834

Legal name

UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH NONPROFIT CORPORATION

Short name: UCAR

Address

Street Table Mesa Drive 1850

Town Boulder Co

Postcode 80307 3000

Country United States

Webpage <http://www2.ucar.edu/>

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.....09/10/1996 - no

SME self-assessment unknown

SME validation sme.....09/10/1996 - no

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **UCAR**

Department(s) carrying out the proposed work

Department 1

Department name

National Center for Atmospheric Research

not applicable

Same as proposing organisation's address

Street

3090 Center Green Drive

Town

Boulder

Postcode

80301-2252

Country

United States

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **UCAR**

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 **Gokhan**

Last name **Danabasoglu**

E-Mail **gokhan@ucar.edu**

Position in org. Community Earth System Model (CESM) Chief Scientist

Department National Center for Atmospheric Research

Same as organisation name

Same as proposing organisation's address

Street 3090 Center Green Drive

Town Boulder

Post code

80301-2252

Country United States

Website <https://staff.ucar.edu/users/gokhan>, <http://www.cesm.ucar.edu/?re>

Phone 303 497 1604

Phone 2

+xxx xxxxxxxxx

Fax

+xxx xxxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Amy	Smith	fedaward@ucar.edu	303 497 8872

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **JAMSTEC**

PIC 951361645 **Legal name** Japan Agency for Marine-Earth Science and Technology

Short name: JAMSTEC

Address

Street Natushima-cho 2-15

Town Yokosuka

Postcode 237-0061

Country Japan

Webpage www.jamstec.go.jp

Specific Legal Statuses

Legal personyes

Public bodyno

Non-profitno

International organisationno

International organisation of European interestno

Secondary or Higher education establishmentno

Research organisationyes

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..... unknown

SME self-assessment unknown

SME validation sme..... unknown

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name **JAMSTEC**

Department(s) carrying out the proposed work

Department 1

Department name

Application Laboratory

not applicable

Same as proposing organisation's address

Street

3173-25 Showa-machi, Kanazawa-ku

Town

Yokohama

Postcode

236-0001

Country

Japan

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Proposal ID 101003463-1

Acronym

SOMMAR

Short name JAMSTEC

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 **Masami**

Last name **Nonaka**

E-Mail **nona@jamstec.go.jp**

Position in org. Senior Scientist, Group Leader

Department Application Laboratory

Same as organisation name

Same as proposing organisation's address

Street 3173-25 Showa-machi, Kanazawa-ku

Town Yokohama

Post code 236-0001

Country Japan

Website <http://www.jamstec.go.jp/apl/e/>

Phone +81457785747

Phone 2 +xxx xxxxxxxxx

Fax

+81457785496

3 - Budget

Total requested EU contribution for the proposal/ €

12 000 000

Simulating the Ocean Mesoscale in the Earth system to support Mitigation and Adaptation and reduce Risks for society - SOMMAR

1. Excellence

1.1 Objectives

The overarching objective of SOMMAR is:

To develop the next generation of usable and verifiable high-resolution European Earth System Models (ESMs), capable of predicting and projecting Earth system processes with unprecedented fidelity.

The key scientific objective is to understand how low-frequency variability (seasonal to decadal) drives increased predictability, modulates the impact of climate change on weather type events and on Earth system processes. Predicated on the evidence that small scale oceanic processes (e.g. fronts and eddies, boundary currents, eddy-mean flow interactions at work, Fig. 1) are key to credibly simulating low-frequency variability¹⁻⁵, a new class of ESMs, capable of running at high resolution for centuries, with demonstrable skill, is required. The developments intended in SOMMAR are expected to result in sharply increased ability to answer the most pressing questions in climate science and decision making, largely due to the credibility of key processes related to oceanic resolution.

Specific objectives of SOMMAR are:

- To advance the simulation of Earth system processes, natural variability and extremes, by resolving the ocean mesoscale and reducing long-standing biases in ESMs, and by developing novel techniques for enhancing the efficiency of ESMs in computation and storage (**Themes 1, 2**).
- To develop and coordinate the first European ensemble of global high-resolution (10 km ocean, 10-25 km atmosphere resolution) ESMs by coupling Earth system components, at a sufficient level of complexity, to process-oriented physical climate models (**Themes 2, 3**).
- To produce new, more robust seasonal predictions and projections, aiming to reduce epistemic uncertainties, by using multi-model ensemble simulations (**Theme 3**).
- To develop enhanced understanding of key processes which drive inter-annual to decadal timescale variability in the climate system (**Theme 4**).
- To exploit and further develop process-based diagnostics and metrics capable of assessing ESMs at high resolution and to produce actionable information for policy makers (**Themes 1, 4**).
- To provide tools for novel, robust and trustworthy climate services for Europe, by developing and exploiting synergies between high-resolution ESMs and atmospheric convection-permitting regional models (**Themes 1, 4, 5**).
- To provide enhanced support for the operationalisation of the Paris Agreement, with a view to delivering effective climate action, as well as informing major international assessment reports (e.g. IPCC) (**Theme 5**).

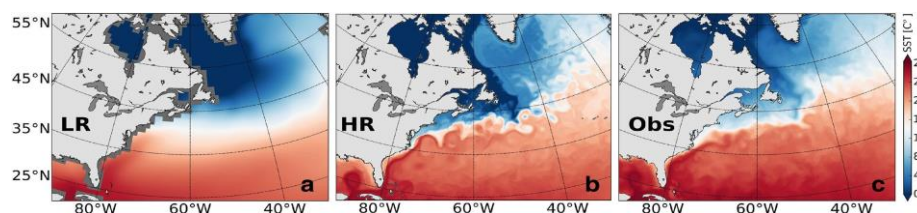


Fig. 1: Siqueira and Kirtman (2016): Snapshot of 5m monthly mean temperature in CCSM a) LR=1° ocean, b) HR=0.1° ocean, c) high resolution SST observations.

1.2 Relation to the work programme

SOMMAR responds to the call “H2020-LC-CLA18-2020, Developing the next generation of Earth System Models”. SOMMAR will address the *competing demands that surround the advancement of ESMs* by combining improved model resolution and including, for the first time at this resolution, Earth system components. SOMMAR will *couple existing models*, for example, ice sheets, ocean biogeochemistry and terrestrial carbon to the high-resolution physical climate models. The focus of SOMMAR on a more realistic representation of low-frequency variability by resolving the mesoscale will improve the *process realism* and will reduce long-standing *systematic biases in ESMs*, such as the North Atlantic cold bias, the signals they imprint on the atmosphere and on Earth system processes. SOMMAR will produce simulations of the past and the future, thus *linking Earth system processes to climate change, and enabling new investigations, at unprecedented process level resolution, of the decadal variability of the climate system and processes therein*.

SOMMAR will concurrently perform *ensembles of seasonal predictions* to explore the *prediction capability* of the improved models. We will use predictability emanating from the ocean to robustly quantify the predictability of current and future risks of extremes. The models and infrastructure elements will be developed to make high resolution models suitable for operational use. This will entail the combined use of reduced model output, newest

technology to speed up models, semi-automatic tuning of the models and algorithmic-controlled launch of convection-permitting regional models for European domains, at the km scale, for realistic simulation of extreme events.

1.3 Concept and methodology

(a) Concept

Authoritative science-based decisions on mitigation and adaptation need to be based on the best available scientific knowledge as well as tools that incorporate the state of the art.

The **main ambition of SOMMAR** is thus to progress the state-of-the-art in Earth System Models to a **new paradigm space, applicable for both predictions and projections**, delivering multi-model ensembles of seasonal to centennial (1850-2100) simulations with unprecedented resolution and fidelity **within the project lifetime**.

MODEL SKILL

Current operational model skill is limited: for example, in seasonal forecasting, the low amplitude of predictable signals in models ('signal-to-noise' paradox⁶) suggests that they lack low-frequency variability, so that large ensembles are required to recover some part of the predictable signal. Equally, we must understand variability in the context of predictions of climate change, and how it governs high-impact weather: e.g., results from a unique ensemble of high-resolution atmosphere simulations showed that the strongest Tropical Cyclone categories are expected to decrease in the future, contradicting the results from low-resolution Global Climate Models (GCMs)⁷.

Multi-model seasonal hindcasts will be performed in SOMMAR to explore the prediction capabilities of the high resolution models. Seasonal hindcasts are also an excellent tool to help test theories about the drivers of variability and predictability in the climate system and have been used to investigate the low signal-to-noise ratio⁶. Since they are initialised and verified against recent observations and have large ensemble sizes, both statistical and process-oriented analysis can be used to trace the evolution of model errors from hours to months and hence give insight into missing processes that need to be represented for robust climate projections.

OCEAN and ATMOSPHERE EDDIES AND THE LARGE SCALE

Three main lines of research stand out and attribute the lack of low-frequency variability in current (low resolution) GCMs respectively to (a) a lack of self-maintenance of the signal, due to too weak eddy mean-flow interactions^{1,2,4}; (b) a modulation of teleconnections from the tropical oceans⁹⁻¹⁰; or (c) a missing pathway connecting the SST to the troposphere³. The latter can be divided into studies putting an emphasis on the high-resolution SST forcing on large scale modes of atmospheric variability^{5,11-13} and those focusing on emerging physical mechanisms in high-resolution atmospheric models¹⁴⁻¹⁵. In particular, increased variability in SST along the Gulf Stream⁵ (Fig. 2) – due to oceanic mesh refinement – leads to significant changes in atmospheric circulation interannual variability, while increased atmospheric resolution is needed to resolve the air-sea coupling on smaller scales¹⁶.

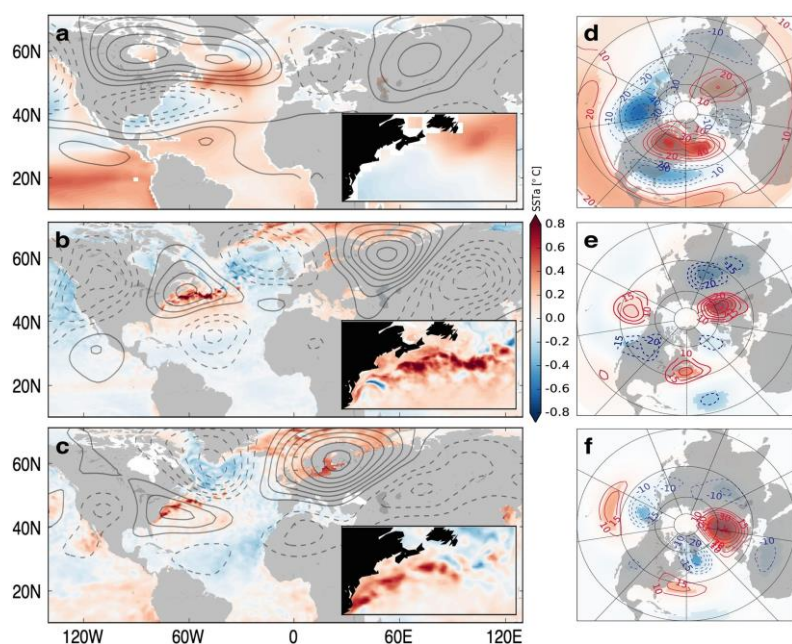


Figure 2 (left): Taken from Siqueira and Kirtman (2016), Fig 3 (left) Composites of SST warm North Atlantic phase (shaded) and winter (NDJFM) 200 mbar geopotential height anomalies (m) (contours) for (a) LR = 1° ocean, (b) HR = 0.1° ocean, and (c) Observations. **(right)** Winter (NDJFM) composites of 200 mbar geopotential height anomalies (m) (contours) for SST warm phase for (d) LR, (e) HR, and (f) Observations.

Changes in models decadal variability or mean state biases¹⁷ strongly influence the forced atmospheric response. The time evolution of SST warming patterns is a key driver of atmospheric circulation change, including the well-known poleward shift of mid-latitude jets¹⁸, with implications for drought risk in Mediterranean-like climates¹⁹.

Detection of low-frequency variability impact on extremes may be possible in the near future²⁰, but their prediction remains challenging. It is also imperative to understand how resolving ocean mesoscale eddies affects projected changes in extremes of regional atmospheric circulation via a modulation of the GHG-forced SST warming patterns.

Among the scientific highlights of the Horizon-2020 PRIMAVERA project was the demonstration that increased resolution, to 1/4° and further to 1/12°, leads to reduced SST-biases, particularly a reduced cold bias in the North Atlantic²¹. Also, precipitation biases over land²² and deeper ocean biases seem to improve at higher resolutions, which might have implications for the length of the spin-up of high resolution models^{23,24}. These advances opened the opportunity for SOMMAR to study Earth system processes with unprecedented fidelity.

MESOSCALE and EARTH SYSTEM PROCESSES

Resolving these fundamental scale interactions and reduced biases also matter for Earth system processes. Thus, SOMMAR will implement Earth system modules into the high resolution models.

Ocean circulation and mixing processes dominate ocean-atmosphere carbon exchanges. Decadal variability in carbon uptake by both ocean and land²⁵⁻²⁶ poses a challenge to current ESMs, lacking in variability, and an opportunity to improve them via a constraints approach. Internally generated mesoscale variability and eddy-driven subduction events are important drivers for local export of organic carbon below the mixed layer^{27,28} as well as for the effective downward transport of anthropogenic carbon in the Southern Ocean²⁹ where mesoscale eddies also modulates the cross-frontal transport of biogeochemical tracers³⁰. High ocean resolution is important for correctly estimating the uptake of anthropogenic carbon by the Arctic, with the uptake being some 30% too low in coarser resolution models³¹. Further, resolving the ocean mesoscale is necessary to correctly represent the carbon uptake in eastern boundary upwelling systems, such as the California Coastal Current: at lower resolutions the net uptake is underestimated by a factor of three³². Current ESMs underestimate global gross primary production, potentially exaggerating future CO₂ concentrations in the atmosphere³³. Realistic simulations of continental extremes at the intra-seasonal to interannual time scale are important for describing the terrestrial ecosystems; they have regularly responded to droughts with a significant reduction of carbon uptake, detectable at the hemispheric scale³⁴.

Ocean-driven ice loss processes control the future of the Antarctic Ice Sheet and its fringing ice shelves because iceberg discharge and the basal melting of ice shelves are the principal drivers of ice loss^{35,36}. The related effect on the freshwater input into the ocean is important for the local ocean mixing but can also affect the large scale oceanic circulation. To simulate the penetration of warm water masses into ice shelf cavities realistically, ocean models need to resolve ocean mesoscale processes³⁷ and both ice sheet and the atmospheric models require a sufficiently high spatial resolution³⁶.

Aerosols affect the climate in various ways, mainly via direct and semi-direct radiative effects and through their impacts on the activation and lifetime of clouds. The representation of aerosols in global models is strongly simplified³⁸ compared to the complex aerosol - cloud - radiation interactions in the real world. In SOMMAR, we will develop simplified descriptions that can be used in high-resolution climate models, but still capturing the aerosol projection on climate variability, and go beyond the simple-plume approach used in some CMIP6 models³⁹.

Positioning of the project

SOMMAR will go beyond the achievements of **PRIMAVERA** (70 publications so far) and **CRESCENDO**: achievements in simulation and process-based analysis are now ripe for the insertion of targeted Earth system capabilities. The legacy of PRIMAVERA and HighResMIP (both led by SOMMAR partners) is a set of high-resolution GCMs with advanced scientific capabilities, supported by strongly enhanced technical capabilities, and widely cited in IPCC AR6. SOMMAR partners will jointly produce flagship simulations including ESM processes, based on our collective CMIP6 experience, continuing to project European operational and scientific capabilities on the world climate research arena. The cumulative knowledge and expertise of the partners will enable the SOMMAR ambition.

Links to other research and innovation activities

SOMMAR will closely collaborate with the International Laboratory for High-Resolution Earth System Prediction project (**iHESP**) which is performing both CMIP-like and prediction experiments at high-resolution with a physical model, and the Japanese **Hotspot2** project, which performs high resolution regional to semi-global simulations to investigate air-sea interactions and cyclones in a changing climate. Members of iHESP and Hotspot2 are participating as external partners in SOMMAR, further strengthening the large experience of the SOMMAR team. SOMMAR's focus on coupled high resolution processes is in line with programmes such as **CLIVAR** and **WCRP-GEWEX**, which are especially interested in air-sea interactions, moisture transport and extremes at increasingly fine scales.

SOMMAR will particularly benefit from recent developments of technical infrastructure in the **IS-ENES3** and **ESiWACE2** projects to overcome challenges with the infrastructure for high-resolution climate modeling and the increased complexity of the new generation of ESMs. ESiWACE2 will provide demonstrators of high-resolution ESMs (around 10 km for all components) and explore how to improve the models to run them in a reasonable period of time. IS-ENES3 will improve computationally critical components of ESMs such as the IO server XIOS or the coupling tool OASIS. SOMMAR will closely follow the work in the **IMMERSE** project, which aims to deliver a new NEMO code able to describe ocean dynamics, sea ice processes and biogeochemistry at kilometric scale. SOMMAR partners involvement in **CRESCENDO** and **COMFORT** will provide knowledge on Earth system processes and its relations to physical processes, which will be used to implement relevant simplified earth system descriptions for the SOMMAR models. The knowledge gain from **APPLICATE**, **BlueAction**, **INTAROS** and other international projects (e.g. NordForsk **ARCPATH**, JPI-Belmont **InterDec**) on Arctic drivers of the European weather and climate variability and strategies to initialise sea ice for predictions will be helpful for SOMMAR. Equally, and just as importantly, SOMMAR simulations have the potential to provide valuable input to projects under the **EU-Polar Climate call LC17-2020**.

SOMMAR will pioneer online regional downscaling, which will be compared to the standard approaches used in **EUCP** and in **CORDEX** and will extend the integration of global and regional models. Leading institutions of the CORDEX community (SMHI, hosting the CORDEX office, DMI, KNMI, NORCE) are partners in SOMMAR.

SOMMAR will benefit from, and use, observational datasets from **Copernicus Climate Change Service (C3S)** for ocean, atmosphere, sea ice and biogeochemistry for both the seasonal and climate simulations. SOMMAR results are, on the other hand, expected to inform forthcoming production of C3S simulation data, based on enhanced climate processes in the ESMs.

(b) Methodology

Based on the expertise gained in HighResMIP and PRIMAVERA, SOMMAR advances to the level of enabling mesoscale ocean processes with a number of expected benefits for the atmosphere and other system components. SOMMAR will implement selected Earth system processes in cryosphere, ocean biogeochemistry, land and aerosols to take advantage of a more reliable representation of the climate system in the high-resolution models.

Partner	SMHI BSC CNR DMI FMI KNMI	MetOffice NOC UREAD	CMCC	ECMWF	NORCE NERSC	AWI	CNRS-IGE	SMHI DMI
Model names	EC-Earth4 OpenIFS NEMO	HadGEM MetUM NEMO	CMCC-CM CAM NEMO	ECMWF IFS NEMO	NorESM CAM BLOM	AWI-ESM IFS FESOM	ENERGETICS NEMO-WRF	HCLIM
Ocean res	1/12°	1/12°	1/16°	1/12°	1/8°	variable (5-60 km)	1/36°	no
Atm res	10-25 km	10 km	25 Km	10-25 km	50 km	50 km	1/12°	2-3 km
Ice Sheet	PISM IMAU-ICE	BISICLES	no	no	no	PISM	no	no
OBGC	PISCES-lite	Medusa-lite	BFM	no	iHAMOCC	no	no	no
Others	LPJ-GUESS veg-model CamaFlood river model	RED dyn. veg-model, LSM-model JULES	River model HYDROS	WAM wave model Ozone: Cariolle C-IFS aerosol			regional: North Atlantic	regional atmos: Europe

Table 1: SOMMAR models and simulations. Blue: models performing seasonal predictions + hist/ future simulations; green: only seasonal; yellow: only hist/ future; grey: regional runs; orange: prototype simulations. Seasonal predictions will be done with the GCM-versions.

In SOMMAR, for the first time at this resolution, the models will be carefully tuned, and adequate spin-ups will be performed to reduce drifts. The models participating, and the resolution deployed, are shown in Table 1.

Regional modelling results with convection-permitting resolution indicate a further improvement in representation of cloud-radiation interactions and convective precipitation extremes. While it is not yet realistic to use such resolution globally to perform CMIP-like experiments, SOMMAR will explore possibilities to automatically launch regional convection-permitting simulations for defined categories of extreme events.

Experimental protocols:

By necessity, given the ambition of the flagship simulations, protocols for more efficient use of resources, model tuning, spin-up and technical improvements to accelerate the model performance will be developed (Theme 1).

SOMMAR will follow an **always running model approach**, which means SOMMAR will run simulations with pre-industrial forcing from early on in the project. Into this pre-industrial run, model improvements and ESM components (Theme 2) will be gradually incorporated; all tuning and implementation will be added to the always running simulations, ensuring the availability of the best model versions at all times of the project. This run will pass over to the PI-spinup and followed by a PI-control. Parts of the Theme 1 and 2 developments will be implemented into the ESMs early in the project and will be part of the climate simulations (Theme 3), while further developments will continue throughout the project time and will be tested in shorter control (prototype) simulations to ensure full usability at the end of the project. Tables 1 and 2 provide more details on the planned simulations, and Figure 3 indicates the timing of the SOMMAR-work.

Seasonal hindcasts	At least one start date (Nov), 4-months runs, 1993-present, at least 10 members
Pre-industrial simulations	Start from EN4 (1950), 1850-forcing based on CMIP6, including tuning, spin-up; criteria for a spun-up model will be defined based on CMIP6 spin-up simulations. ESM components will be spun-up offline and included in the physical model.
PI-control runs	Start from end of PI-spin-up simulation. At least 250 years.
Historical simulations	Start from PI-control run, 1850-2014
Future scenarios	Start from end of hist simulations, 2015-2100, SSP1-1.9 and SSP3-7.0
Prototype simulations	20-30-year PI-control simulations to test impact and usability of model developments, started from 250-year PI-control run
Ensemble simulations	At least 10 members/ model. 1995-2014, ocean – atmosphere perturbations
Regional downscaling	Downscaling of extreme events from hist, ensemble and future runs, 1month length, number of events: 50-100

Table 2: Plan for the model simulations in SOMMAR.

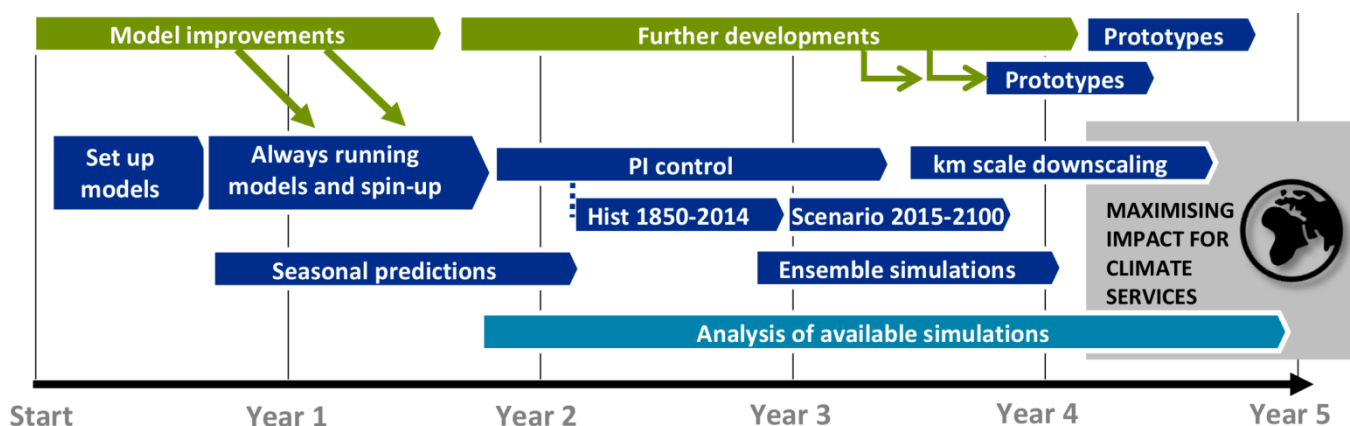


Figure 3: Timing and workflow in SOMMAR.

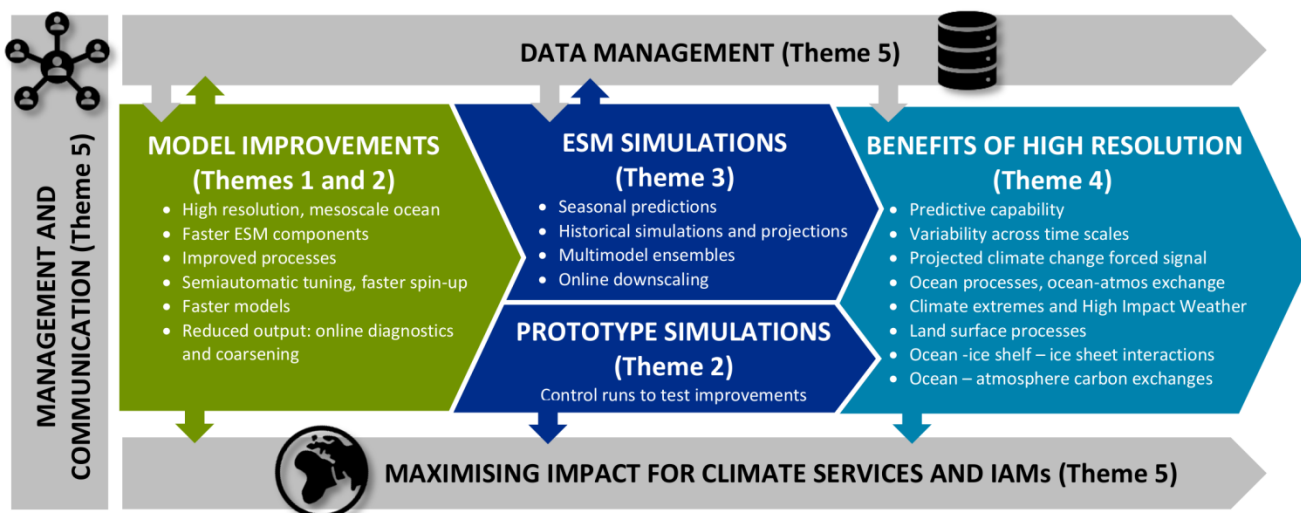


Figure 4: Schematic of SOMMAR activities.

Scientific and technical themes

The work in SOMMAR is organized around **five interlinked core themes** (Figure 4):

Theme 1: Improvements of efficiency and productivity of high-resolution Earth System Models

Allowing the future operational use of improved ESMs, with greater resolution and complexity, will require advancing technical model performance, allowing for a more efficient use of resources, and developing protocols for model tuning and spin-up with faster convergence. Theme 1 addresses technical improvements to speed up models by investigating reduced numerical precision approaches, the use of accelerators to explore heterogeneous implementations, the development of asynchronous I/O server solutions and development of a general framework for computational performance analysis of ESMs. Novel methods for more efficient tuning of the models and accelerating the convergence of spin-ups will be investigated. Online-diagnostics and online coarsening will be developed to limit the need for data storage. Additionally, this theme will develop a novel concept for triggering online dynamical downscaling by convection-permitting models, through the automatic detection of extreme events or their precursors in GCMs, thus limiting the need for storage of high-frequency and high-resolution data.

Theme 2: ESM processes and parameterizations for high resolution climate models

High-resolution, ocean mesoscale resolving climate models represent more realistic transport of momentum and energy in the water column, thereby resulting expectedly in a more accurate simulation of large-scale circulation, and less biased model climatology. In Theme 2 we will incorporate component modules in the ESMs that benefit from the high-resolution physical model. This will include ocean biogeochemistry models where we will only retain a minimum number of prognostic tracers (5 or 6) to represent key processes such as air-sea CO₂ fluxes, primary production and oxygen distribution, and basic parameterisation for coastal permafrost, which insets a carbon flux into the near-coastal ocean and results in changes in ocean acidity. Further, we will implement a land carbon module and interfaces for land carbon and nitrogen transfer to the ocean, an ice sheet model including ice shelves and icebergs to simulate ice sheet - iceberg - ocean and ice shelf - ocean interactions, as well as the representation of atmospheric chemistry and aerosols by developing novel approaches based on emulators, the use of single-precision numerical representations in existing aerosol schemes, and the development of a reduced-resolution atmospheric composition grid that is embedded in the high-resolution model physics grid.

Theme 3: Sub-seasonal to centennial climate simulations

The simulations (Table 2) have been chosen to investigate the impact of the ocean mesoscale from weather to climate timescales using complementary ensembles of seasonal hindcasts and both multi-century and ensembles of climate simulations, all using an eddy rich ocean component. The models will incorporate improvements and ESM components from Themes 1 and 2, and produce outputs driven by the analysis requirements of Themes 4 and 5. The simulations will be used to assess drivers of variability, predictability, signal-to-noise ratios, synoptic weather and extreme events.

Theme 4: The benefits of high-resolution Earth System Models

The overarching goal of Theme 4 is to demonstrate the benefits of resolving the mesoscale in terms of enhancing our predictive capability, the fidelity in the representation of seasonal-to-decadal variability and projected climate change. Focus will be on ocean processes, climate extremes and High Impact Weather (HIW) affecting Europe. Analysis will focus on the main hypothesis of Theme 4, namely, that decadal variability in the oceans provides a substantial modulation of HIW over Europe, and that their realistic representation depends on simulating the ocean mesoscale and resolving ocean-atmosphere coupling at this scale. Hence, Theme 4 will answer to what extent the HIW variability is a result of unpredictable atmospheric “noise” and to what extent it is influenced by specific, predictable drivers.

Another focus will be on the benefits of resolving the ocean mesoscale for Earth system processes, such as ocean - atmosphere carbon fluxes or ice sheet – ice shelves - ocean interactions.

We will use the latest reanalysis data sets for ocean and atmosphere (ERA-5, EURO4M, UERRA, CERRA, CERA-20C, ERA-CLIM2, ORAS5, ICOADS), satellite products (ESA-CCI), in-situ observations (RAPID, OSNAP) and Earth system data sets (GEOTRACES, GLODAP, ICOS), combined with CMIP6 simulations as comparison.

Theme 5: Cross-Cutting Issues

This theme includes work to bridge the gap between the ESMs and the Integrated Assessment Model community (IAM), links to climate services, dissemination and outreach activities and the data and overall management.

SOMMAR will ensure that future ESMs are able to represent the main mitigation actions that emerge from mitigation scenarios, e.g. large-scale afforestation, and that the results from ESMs could be used to produce novel, reduced-complexity representations for usage in IAMs themselves. SOMMAR will also use an intermediate complexity IAM (Marine Food Security, MFS) based on an econometric approach in order to assess the state of the global marine food security and its contribution to the global food equation under climate change.

SOMMAR will link with climate service providers (both Copernicus and national climate services) to maximize the usability of the model developments and therefore the project impact. The improved ESMs will have a direct impact on core C3S activities at ECMWF.

High-resolution modelling requires a thorough management of data and their analysis. A dedicated WP will implement a data management plan. SOMMAR will adapt and develop the successful approach of PRIMAVERA to bring the analysis tools to the data and will use JASMIN as the common data storage and analysis platform.

Gender dimension

H2020-LC-CLA18-2020 does not have a gender dimension explicitly integrated. However, careful considerations have been given to how gender aspects are applicable to the project, content, communication and dissemination. The project will consider how these activities can be designed such that there is no gender bias within them.

While the nature of work within the research themes of SOMMAR is considered to be gender-neutral, gender considerations can be relevant when communicating to specific users. SOMMAR will ensure that it strives to promote gender balance and equality when announcing positions and will promote family-friendly approaches for the entire project.

1.4 Ambition

State-of-the-art

The advances in simulating the global physical climate system over the last decade have led to considerable improvements in skill and process representation. Seasonal forecasts have enhanced skill, now extending to the mid-latitudes¹ (ECMWF), with resolutions of 50-25km in the atmosphere and 25km in the ocean playing a key role. Individual climate studies and more recent coordinated international efforts (CMIP6 HighResMIP⁴⁰ and PRIMAVERA) have demonstrated benefits of increased resolution to the climate mean state^{21,22}, variability¹⁷ and extremes, with daily precipitation over Europe often better than specifically configured CORDEX regional simulations⁴¹. Further increases in ocean resolution to 10km^{4,24,42,43} have suggested important changes in deeper ocean processes and heat uptake, while air-sea interactions at these scales have also been shown to be important. The iHESP - project begins to perform CMIP-like simulations with a physical model in comparable resolution to the SOMMAR-ESMs.

Progress beyond the state of the art and ambition

[1] *Building on PRIMAVERA to design a new generation of high-resolution ESMs*

SOMMAR will develop a **suite of high resolution global coupled ESMs that can be used both for predictions and future climate projections**. It builds on the concept of *seamless prediction*⁴⁴ where improved skill in the representation of processes at seasonal to decadal timescales and the representation of drivers governing regional climate change would benefit mutually. Thus, the scientific challenge of SOMMAR is not to favour the comparison of processes across resolutions, as was the case in HighResMIP, but rather to demonstrate how those processes can improve the representation of modes of variability across all time scales. This new challenge requires high resolution models that are carefully tuned and spun-up. SOMMAR intends to develop and exploit automatic tuning, spin-up and applying these techniques in coordinated experiments, largely following CMIP6-protocols. SOMMAR will closely cooperate with iHESP (through SOMMAR's external partner NCAR) but will go beyond iHESP through the multi-model ensemble approach and the implementation of ESM-components into the models.

[2] *Maintaining the diversity of high-resolution models while sharing the effort in improving model performance*

SOMMAR will **pursue and extend the partnership initiated between PRIMAVERA partners**. With its simplified approach (prescribed aerosols, reduced spin-up), PRIMAVERA has played the role of a pioneer. SOMMAR takes over this role by demonstrating the value of small-scale processes in improving key Earth system feedbacks and integrating new components in high resolution models which are known to play an important role in climate variability (system processes such as ice sheet – ice shelf – ocean interactions, ocean – atmosphere carbon fluxes, ocean primary production, land carbon processes). Thus, SOMMAR will make **an essential step towards high-resolution ESMs and enhance prediction capabilities** at prediction centres. The SOMMAR consortium with six different ESMs will share the effort to improve model performance while keeping the diversity of modelling strategies of the European community to address the role of model uncertainty.

[3] *Addressing computational challenges for improved performance and optimised storage*

SOMMAR will further address the **computational challenges of improving model performance and optimising storage**. To facilitate usage of high-resolution models, SOMMAR will exploit technical improvements to speed up the models, to reduce the data output and to analyse the large volumes of high-resolution output data.

[4] *Reducing the long-standing biases by simulating previously missing small-scale processes*

SOMMAR models are expected to **reduce long standing biases in ESMs**. Ocean resolution will be increased to about 10 km as a standard to resolve the ocean mesoscale and its important impact on mean state and low

frequency variability. This will lead to a **reduced reliance on physical parameterizations** in SOMMAR models. For instance, resolving the ocean mesoscale is expected to rectify the misplacement of the Gulf Stream and its related North Atlantic cold bias, a bias that is typically seen in standard CMIP6 models¹⁷. SOMMAR will exploit and evaluate this assumption in the coordinated coupled multi-model ensemble simulations. In order to understand the importance of resolving the ocean mesoscale for the climate system, a key approach will be to analyse and better understand **the propagation of energy from small to large scales** and the impact on ocean - atmosphere interactions.

[5] Improving simulation of climate variability by simulating previously missing feedbacks

Simulating realistic variability of the climate system is key to unlocking improvements in both seasonal forecasting and climate simulations. The upscale effect of the mesoscale on the large-scale circulation is believed to favour the forcing and maintenance of modes of variability. The climate predictions will be validated **against the newest high resolution observational based data sets** and the understanding from this validation will feed the understanding of processes in the long climate simulations.

[6] Simulating climate extremes with increased fidelity for more reliable European climate services

High resolution has been demonstrated to improve the **capabilities of models to realistically simulate weather extremes** such as e.g. heavy precipitation or tropical storms. SOMMAR models have the potential to close the gap between global coupled models and high-resolution regional climate models. Global models satisfy global energetic constraints and close the large-scale circulation which exerts a control on extremes, while regional climate models are better able to simulate the meso- and convective scales crucial to reliably represent extremes. Further, it has been argued that high-resolution global models provide more reliable boundary conditions for convection-permitting regional models, without the need for double-nesting approaches. SOMMAR aims at demonstrating an **online-regional downscaling approach** to allow for realistic statistics of extremes for recent and future climate.

Innovation potential

As described in the “Beyond the state-of-the-art”- section above, SOMMAR breaks new ground by passing the limit to the new operation space of ocean eddy resolving climate modelling, and by combining high resolution and implementing Earth system components of adequate complexity. Those basic innovation steps open up a range of potentials for qualitatively improved climate simulations:

Designing a generation of ESMs running routinely at 10 km resolution: developments to improve model performance will make it possible to run centuries-long simulations at around 10 km resolution in the ocean and atmosphere (including model tuning and spin-up). While all SOMMAR-simulations are planned to be performed on existing national resources of the partners, the technical developments envisioned in SOMMAR will make it possible to exploit efficiently the next generation of European HPC resources (in particular pre-exascale and exascale machines installed in the framework of the EuroHPC Joint undertaking) and European HPC developments, in particular the EuroHPC exascale computing initiative.

Using high-resolution ESMs as a laboratory to improve parameterisations and coupling between physical processes: Ice sheet - ice shelf - ocean interactions, ocean - atmosphere carbon fluxes, ocean primary production, and land carbon processes will benefit from the more realistic representation of the physical climate system.

Enhancing prediction capabilities at prediction centres, such as ECMWF, BSC, CMCC, DMI, Met Office, KNMI and SMHI, particularly through improved representation of climate variability and extreme events.

Increase the trust in climate models in general, and in climate projections in particular, and provide important new information sources to Climate Services and stakeholders for adaptation and mitigation.

Developing online spawning of regional models to explore the impacts of extreme weather with more fidelity: New ways to assess convection processes despite non convection permitting resolution on the globe will be provided. Convection-permitting regional models have passed a threshold to a realistic regime in the representation of local extremes and are thus an important source of information for km scale Climate Services such as COPERNICUS.

2. Impact

2.1 Expected impacts

SOMMAR aims to reconcile the efforts towards a better understanding of the Earth system processes with the efforts to produce seasonal predictions and climate projections and actionable knowledge in support of the Paris Agreement. Through innovative research strategies, standards and practices, SOMMAR will lift ESMs to the next qualitative level of more complete representations of Earth system processes, while concurrently providing a modelling tool designed to serve societal needs for more relevant input to decisions on climate mitigation and adaptation, and through the provision of climate services by the end of the project.

SOMMAR results will contribute to all five expected impacts for this call:

[1] Improved models for the provision of climate services:

“A critical element of enhancing the quality and relevance of climate services is strengthening the scientific basis of the modelling and predictive aspects behind those services”⁴⁵. SOMMAR will enhance the basis for climate services by a scientifically-sound approach and an adequate infrastructure design that allows for unprecedented provision and exploitation of climate model information, by a more realistic representation of climate variability, extremes, circulation patterns, and enhanced prediction capability.

SOMMAR will represent extreme events with increased fidelity, by carefully combining global resolution and, in parallel, innovative automated downscaling to the km scale. The SOMMAR approach promises to improve climate projections and predictions, emerging as a key source of information for climate services in need of relevant, actionable information in the time range of a few years. Confronted with the new abilities of SOMMAR models, climate services can define new ways of utilizing high resolution model data. SOMMAR will cooperate with the Copernicus program and with national Climate Service groups in partner countries.

Copernicus C3S, as provider of information for the climate data store on regional climate projections and on predictions and sectorial impacts, will be a strong beneficiary of these developments. The link between SOMMAR and C3S will be easily and naturally established, since several SOMMAR-partners are Copernicus C3S seasonal forecast providers (e.g. CMCC, ECMWF). Information coming from SOMMAR ESMs has the potential to become a key constituent in future European climate services.

[2] Increased confidence in climate projections:

The improvements in SOMMAR’s ESMs, together with the strong verification of processes enabled by the seasonal hindcast simulations, will lead to more reliable climate projections, benefiting future model inter-comparison projects, scientific assessments, decision support for climate mitigation strategies and adaptation measures. SOMMAR models will provide more relevant results because basic climate processes and their variability will be better represented by resolving the ocean mesoscale, rather than parameterizing it. The more complete description of the physical climate will contribute to a reduction of long-standing biases in ESMs and will improve the description of ocean-atmosphere interactions and consequently atmospheric processes. The increased confidence in the simulation of physical climate processes will be key in adding confidence to ESM-processes such as the carbon fluxes between ocean and atmosphere, or the ocean-ice shelf/sheet interactions.

Confidence in climate projections needs to cover the uncertainty due to natural climate variability, explored by ensemble simulations. These are limited by the available computational and storage capacity. SOMMAR ensures multi-model ensemble simulations seasonal hindcasts and ensembles over 20-year time slices.

[3] Sustaining European leadership in climate science and Earth System Modelling:

SOMMAR will comprehensively exploit and extend world-leading European capability in Earth system modelling. We will in particular sustain the European leadership in the context of high-resolution climate models, which has been demonstrated by the lead of HighResMIP through PRIMAVERA. SOMMAR will also for the first time combine ESM-components with high resolution climate models, thus making an important step towards the first high-resolution Earth System Models.

European climate research and Earth system models will largely benefit from SOMMAR as an organised hub, expertly balancing the competing demands of model development that includes both high resolution processes and ESM components. Thereby SOMMAR provides cutting-edge and usable tools for the benefit of decision-making and climate services, but also enables the climate science community to explore additional science questions.

Through the funding of key research projects such as PRIMAVERA and CRESCENDO (both finishing), EUCP, FORCES and COMFORT (now starting), and also IS-ENES3 and ESiWACE2, the EU support has been essential to sustain the European leadership in climate science and Earth System Modelling. SOMMAR partners had and have a strong presence, leadership and/or contribution in all of the above mentioned, with a proven record of high-impact papers in the field. We are ready to extend this record through major new developments (as outlined in section 1.4) and to support and inspire the development of a new generation of leading scientists by recruiting and training outstanding early career scientists.

[4] Supporting the operationalisation of the Paris Agreement with a view to delivering effective climate action:

The Paris Agreement’s central goal is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C. However, how to reach this objective raises a number of issues that SOMMAR research and SOMMAR tools will address. Adapting to unavoidable climate change also relies on information on time horizons ranging from seasonal to multi-decadal.

Through the provision of multi-model projections until 2100 with the next generation of high-resolution ESMs, largely following the CMIP6-ScenarioMIP protocol, SOMMAR will inform mitigation and adaptation policies in support of the Paris Agreement. SOMMAR will particularly contrast the strong-mitigation scenario SSP1-1.9 with the no-mitigation scenario SSP3-7.0, which has been identified by CMIP6 as an unmitigated baseline pathway of special interest⁴⁶.

Mitigation scenarios aiming for 1.5°C involve major deployment of negative emission technologies, comprising a variety of land-based mitigation actions. These scenarios have been calculated with IAMs which typically have very limited representation of Earth system dynamics. SOMMAR ESMs will contribute to investigate the Earth system response to the most promising mitigation actions, e.g. large-scale afforestation, with unprecedented confidence due to the improved process descriptions at high resolution, combined with selected ESM components of feasible complexity. The large-scale deployment of land-based mitigation actions is largely unmapped until now.

[5] Informing major international scientific assessment reports (e.g. IPCC):

SOMMAR will address knowledge gaps, needs and questions both from scientific and societal perspectives by: understanding and reducing biases; improving the representation of variability and predictability; producing multi-model ensembles to allow distinguishing natural variability from the forcing signal, particularly for the occurrence of extremes; analysing the response of ESM components to climate change such as carbon fluxes and ice sheet processes. These questions are very likely to play an important role in CMIP7, with SOMMAR providing a direct contribution to this next assessment cycle.

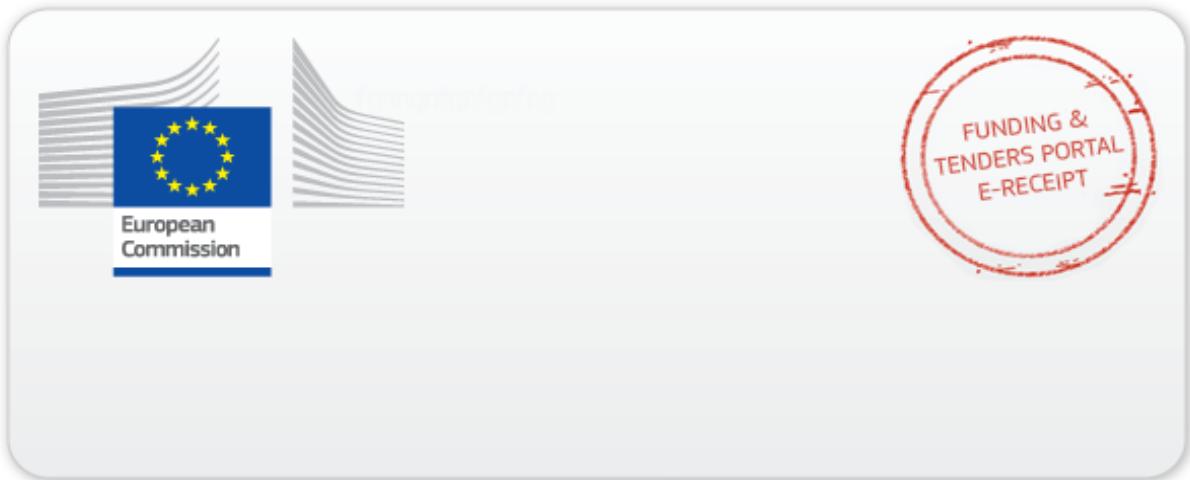
SOMMAR simulations follow largely the CMIP6-protocol and are thus directly comparable to the CMIP6-simulations. SOMMAR developments and science are directly related to the foci of the recent phase of CMIP, which are (1) Systematic Biases, (2) Response to Forcings and (3) Variability, Predictability and Future Scenarios and are in line with the recent IPCC highlight on the ocean as a hotspot for vulnerability from climate change.

Addressing questions related to climate extremes will benefit initiatives such as the WCRP grand challenge on extremes, Copernicus climate services and the forthcoming service on event-based attribution.

The IPCC Special Report on 1.5°C identified the mitigation pathways compatible with 1.5°C as knowledge gaps. These are associated with the carbon cycle response, in particular with respect to negative emissions. Addressing current uncertainties in the carbon cycle and feedbacks is crucial to verifying the effectiveness of negative emissions.

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