# PRIMAVERA: High resolution global climate data A coproduction perspective

#### <u>Dragana Bojović (BSC)</u>, Erika Palin (Met Office), Philipp Stanzel (Pöyry Austria), Paula Gonzalez and David Brayshaw (U. Reading)



This project has received funding from the European Union's Horizon 2020 Research & Innovation Programme under grant agreement no. 641727.





# **PRIMAVERA** project

PRIMAVERA is an EU H2020-funded project about designing and running **high-resolution global climate models**, and assessing their ability to simulate societally important processes and thereby to **support climate risk assessment activities** across Europe.



Representation of ocean surface currents from high to low model resolutions: (left) ~25km (1/12°), (centre) ~60km (1/4°) and (right) ~130km (1°). Data from HadGEM3-based global coupled (atmosphere-ocean/sea-ice) model.

## **PRIMAVERA** consortium



Leading European research and technology organisations with expertise in climate science, climate change modelling, and high-performance computing

+

The user engagement&dissemination and impact analysis team





#### **Knowledge Coproduction**

Coproduction is "a complex meeting place where several different academic traditions and practices converge, overlap, affect each other, come into conflict, or cooperate" Bremer and Meisch, 2017













# PRIMAVERA data for hydrological and hydropower impact research in the Upper Danube basin



#### The objectives were to:

- Evaluate the skill of GCM simulations with different spatial resolutions to represent the regional climate at the scale of the Upper Danube hydrological model
- To compare the GCM-based results with previous results based on ENSEMBLES and CORDEX RCM data

🖸 POYRY



# Climate change impact research for the upper Danube

- Monthly conceptual water balance model
- Input data: precipitation, air temperature
- Historic simulation for an exceptionally long period from 1800
- o Previous applications: ENSEMBLES and CORDEX data





## **PRIMAVERA data**



# Some hitherto findings

- Higher resolution GCMs show lower bias in temperature and precipitation over the Upper Danube basin than lower resolution realizations
- Temperature bias in high resolution HadGEM GCMs is higher than in most RCMs, due to strong cold bias in specific model regions, related to the topography

#### Next steps

- Include more high resolution PRIMAVERA GCMs
- Provide climate change impact scenarios for discharge and hydropower production in the Danube based on high-resolution GCM data









#### **Some reflections**

- Coproduction is an intensive and time consuming process
- Champion users are not easy to find or "randomly" selected
- Relationships building is *a lasting process* and case studies are a good example of how it can be maintained
- Consider different communities' epistemologies: *dismantling the term user* and grasping the heterogeneity of stakeholders and the array of the knowledge they can provide







## Thank You!

dragana.bojovic@bsc.es

⊠primavera\_inquiries@bsc.es





This project has received funding from the European Union's Horizon 2020 Research & Innovation Programme under grant agreement no. 641727.





### High resolution GCM Data from Primavera

In the framework of the PRIMAVERA project, GCM simulations with high horizontal resolutions are generated by seven climate modelling consortia. The simulations are conducted following the CMIP6 HighResMIP protocol (Haarsma et al. 2016). The experiments are divided into 3 tiers consisting of atmosphere-only and coupled runs and spanning the period 1950-2050, with the possibility of extending to 2100.

In the presented initial assessment, six different realizations of HadGEM3-GC3.1, the GCM developed by the MetOffice/Hadley Centre, University of Reading and the NERC are used, for both forced and coupled versions of the GCM, at three horizontal resolutions: 100 km, 50 km and 25 km.

Institution	MOHC, UREAD, NERC	EC-Earth: KNMI, BSC, SMHI, CNR	CERFACS	MPI-M	AWI	CMCC	ECMWF
Model name	HadGEM3 GC3.1	EC-Earth3	CNRM-CM6	MPIESM-1-2	AWI-CM 1.0	CMCC-CM2	ECMWF-IFS
Model componenta	UM, NEMO, CICE	IFS, NEMO, LIM	ARPEGE, NEMO, GELATO	ECHAM, MPIOM	ECHAM, FESOM	CAM, NEMO, CICE	IFS, NEMO, LIM
Atmos nominal resolution	100, 50, 25	100,50	250, 50	100, 50	250, 100	100,25	50, 25

Acronym	Forcings (e.g. GHG, ocean conditions)	Horizontal resolution 100 km	
MOHC LL coupled	Historic 1950-2014 forcings / coupled to ocean model		
MOHC LM forced	Historic 1950-2014 forcings/ observed sea surface temp.	100 km	
MOHC_MM_coupled	pled Historic 1950-2014 forcings / coupled to ocean model		
MOHC_MM_forced	Historic 1950-2014 forcings/ observed sea surface temp.	50 km	
MOHC_HM_coupled	coupled Historic 1950-2014 forcings/		
MOHC HM forced	Historic 1950-2014 forcings / observed sea surface temp.	25 km	

#### HadGEM3-GC3.1 - Upper Danube Elevation

