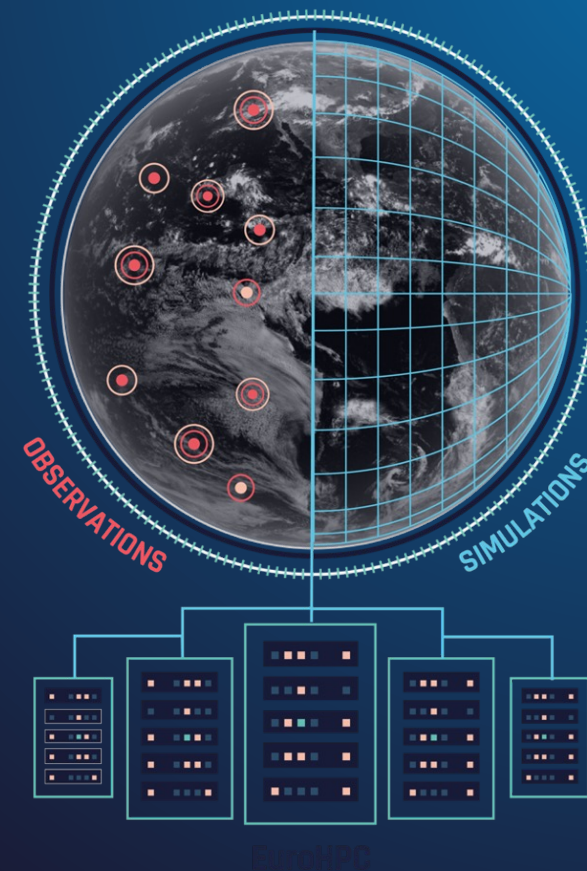


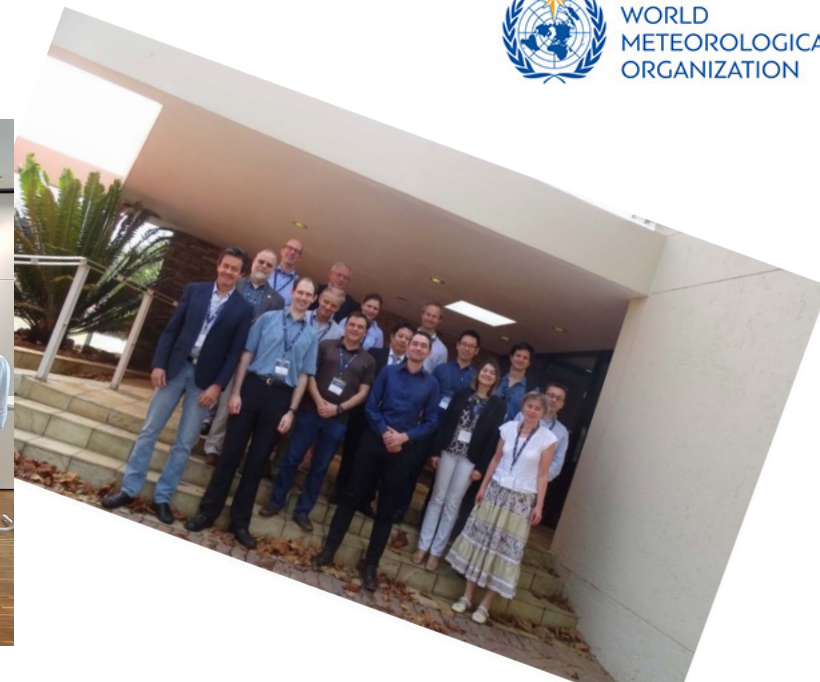
# WGNE – MANAGING CHANGE

Nils Wedi



A reflection of 8 years in WGNE



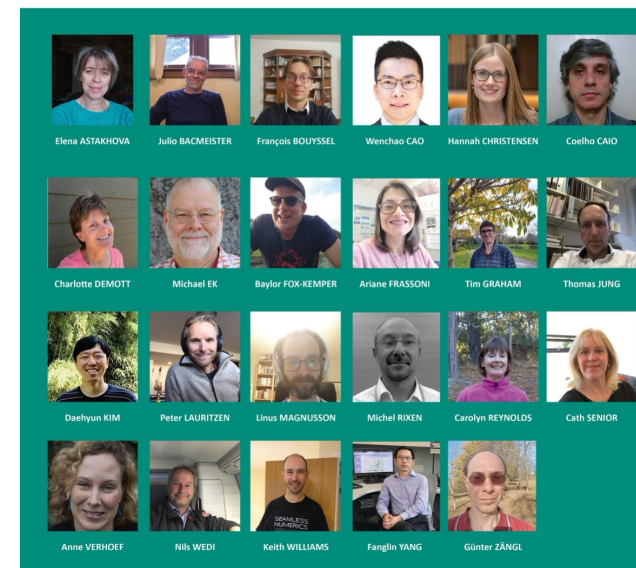


6th WGNE workshop on systematic errors  
in weather and climate models



Participants of the 35th session of the  
Working Group on Numerical Experimentation  
2-5 November 2020 - online

Covid-19



Covid-19 ...



# WGNE - learning the trade

A word cloud of various climate change related acronyms and project names. The text is arranged in a roughly circular pattern, with 'WGNE' prominently displayed in the center in red. Other acronyms include WCRP, WWRP, INFCOM, SERCOM, Lighthouse activity, ESMO, DIMOSIC, RB, WGSIP, GDPFS, WIPPS, CORDEX, YOPP, PDEF, GASS, GLASS, IPCC, S2S, WGCM, WMO regions, CAS, JSC, EPESC, InPRHA, EW4All, DCMIP, CMIP, OMDP, JWGFVR, SAGE, Standing Committees, GPEX, AMIP, PCAPS, Expert Teams, PEOPLE, GEWEX, TT-AI4Wx, Science to Services, HPC, MJO-TF, MUMIP, G3W, GAW, PLUMBER, SAP, DAOS, and WMO Congress.

WCRP

WWRP

INFCOM

SERCOM

Lighthouse activity

ESMO

DIMOSIC

RB

WGSIP

GDPFS

WIPPS

CORDEX

YOPP

PDEF

GASS

GLASS

IPCC

S2S

WGCM

WMO regions

CAS

JSC

EPESC

InPRHA

EW4All

DCMIP

CMIP

OMDP

JWGFVR

SAGE

Standing Committees

GPEX

AMIP

PCAPS

Expert Teams

PEOPLE

GEWEX

TT-AI4Wx

Science to Services

HPC

MJO-TF

MUMIP

G3W

GAW

PLUMBER

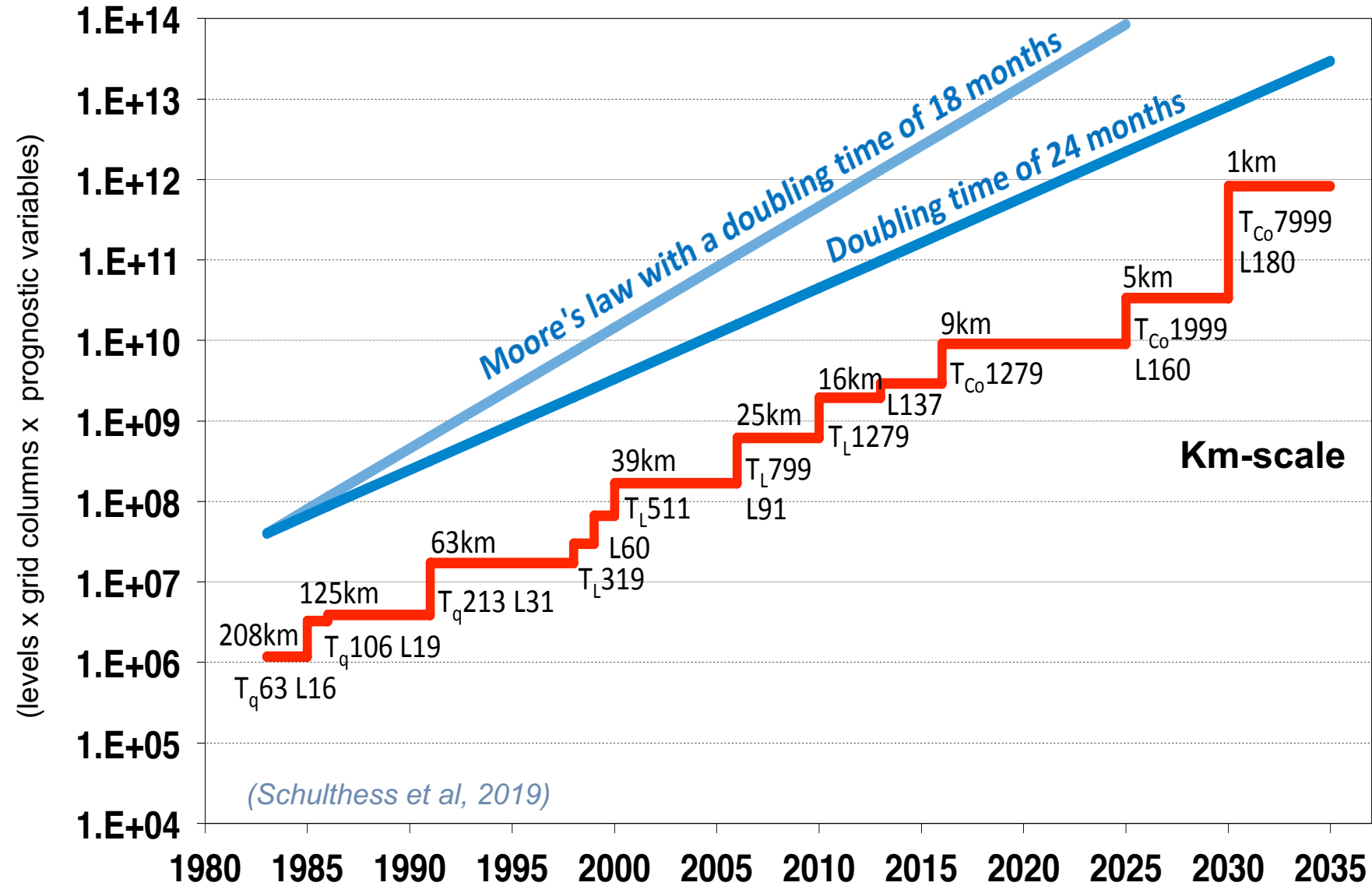
SAP

DAOS

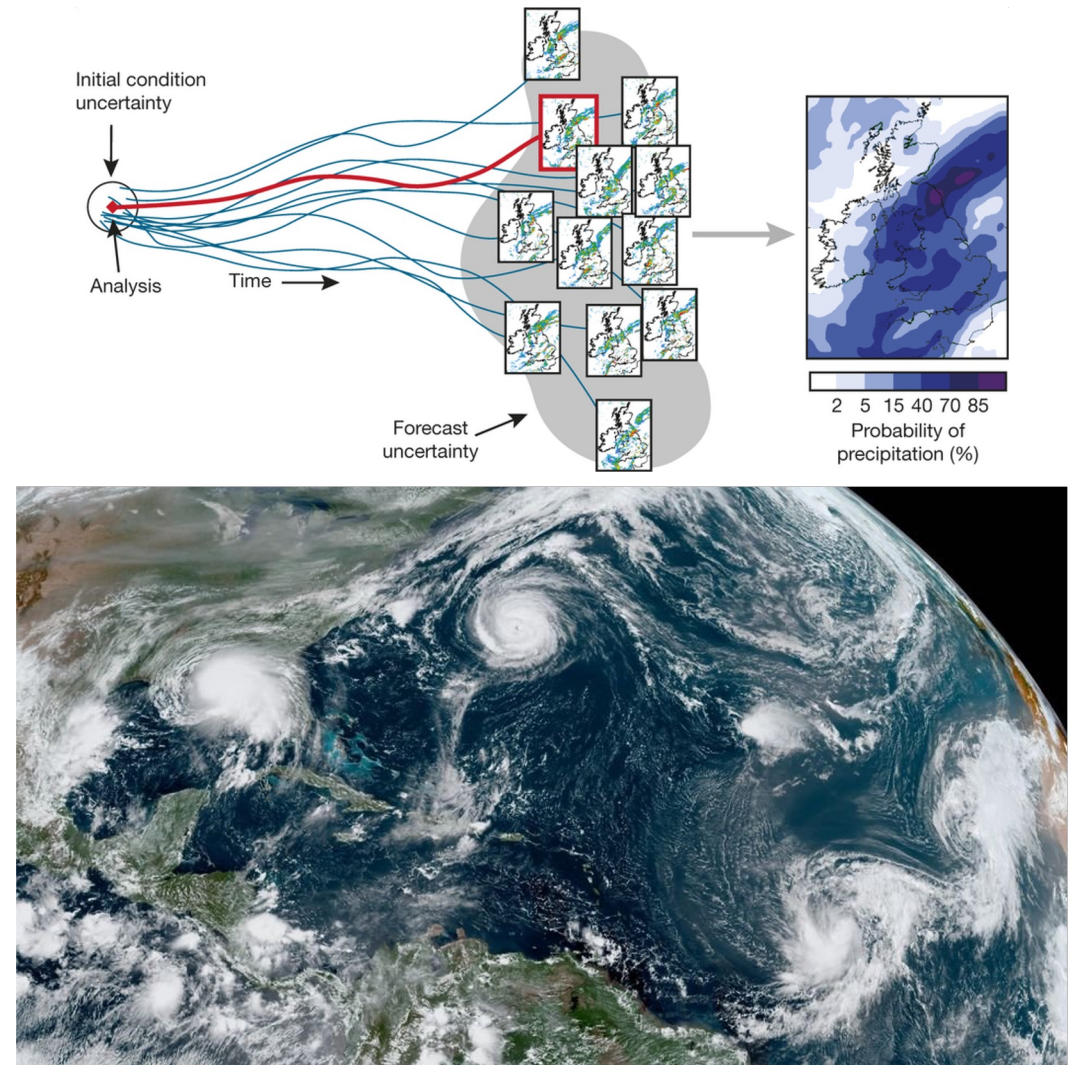
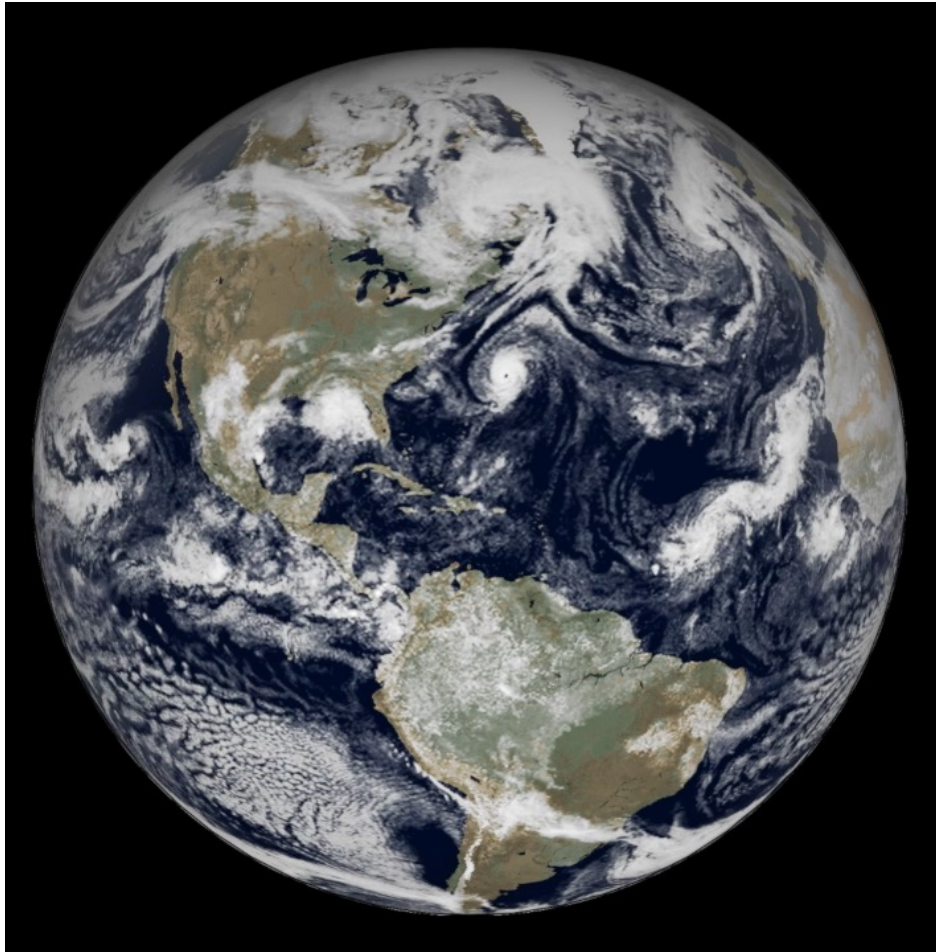
WMO Congress

**WGNE**

## Computational power drives spatial resolution



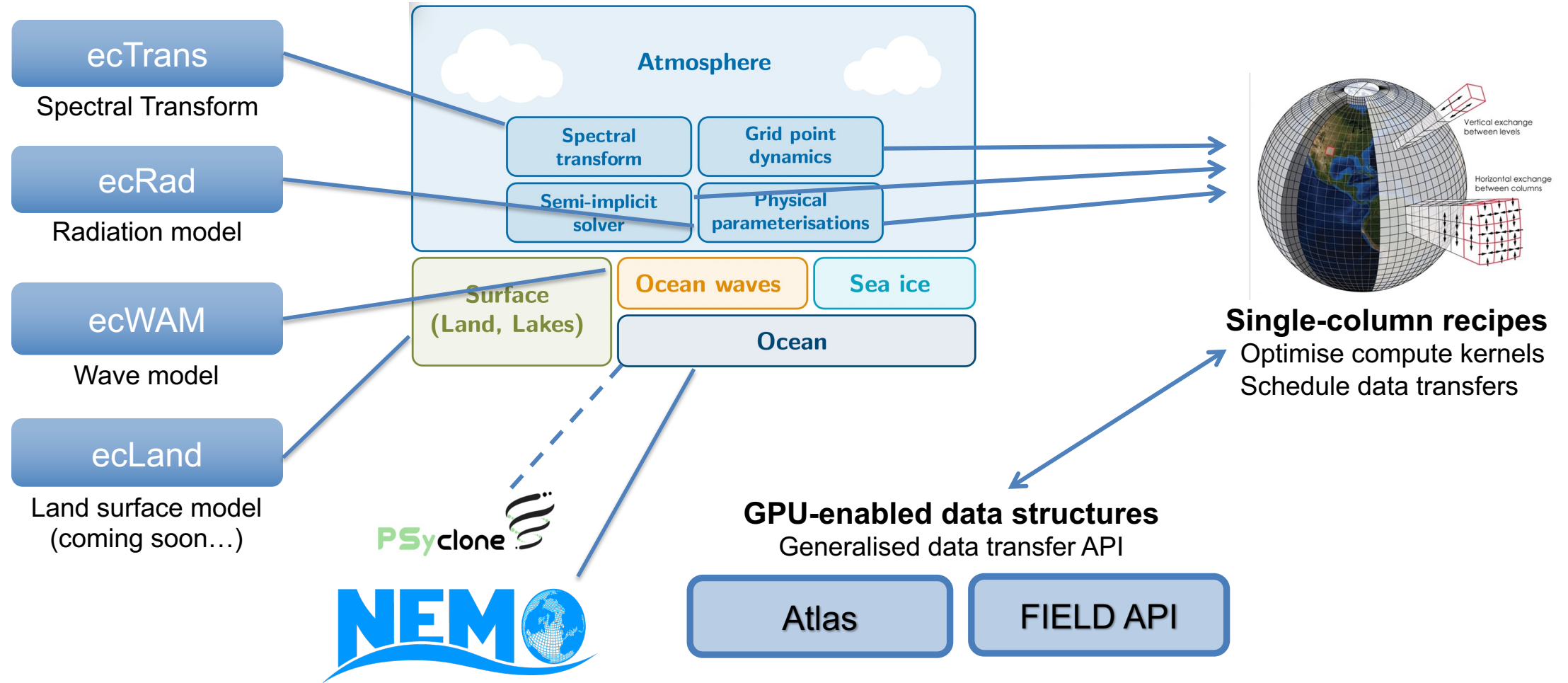
# Ensembles

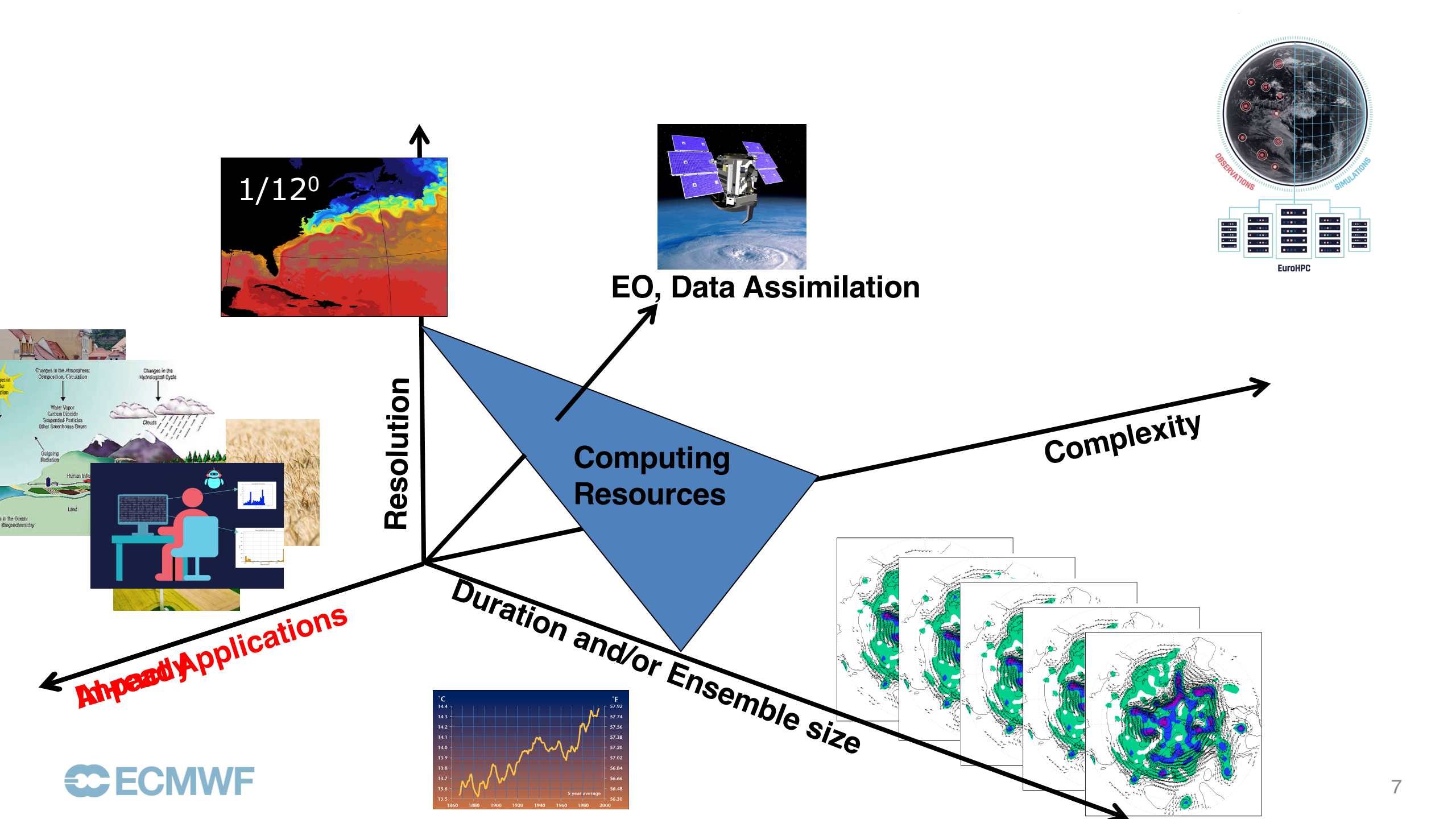


NOAA

*~9km global grid* 51 Ensemble members 20200913 00 UTC + 41 h

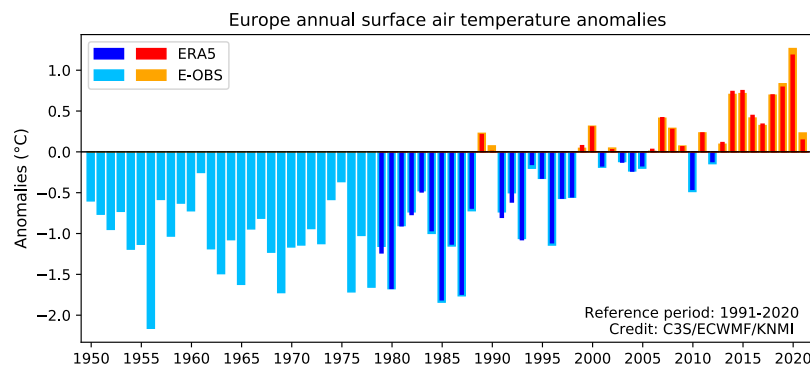
# Model complexity (technical + scientific) - Integrated Forecasting System (IFS)





# Climate Monitoring Services

<https://climate.copernicus.eu>

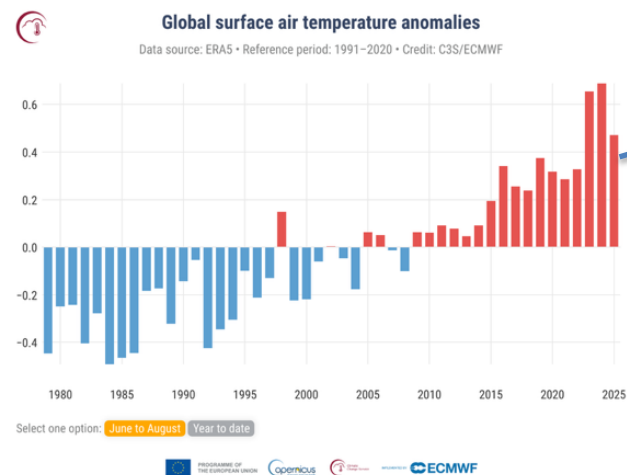


Copernicus Climate Change Service  
European State of the Climate | 2021

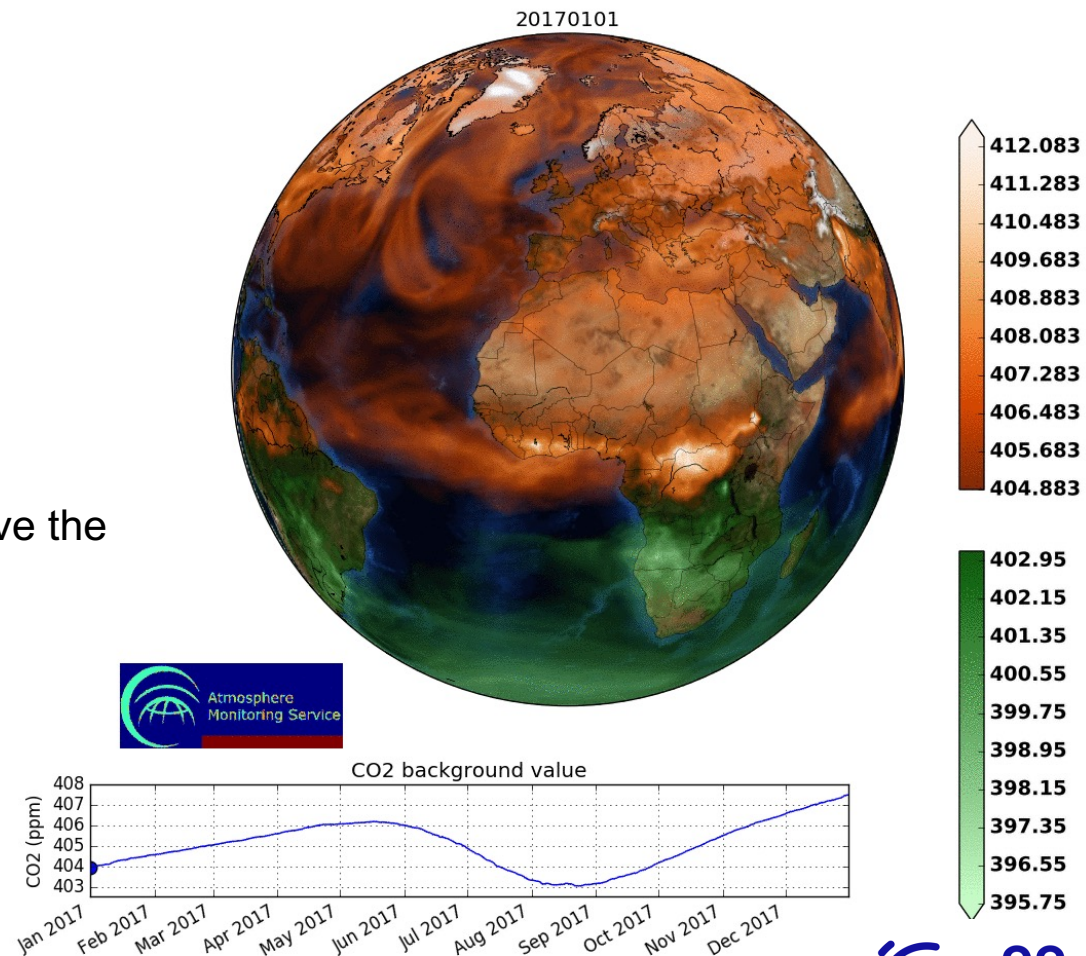
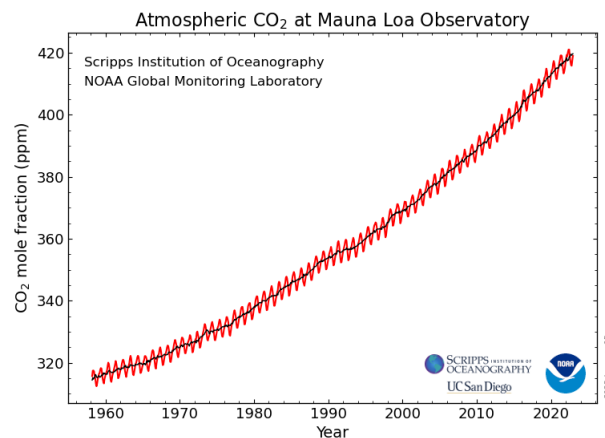
PROGRAMME OF  
THE EUROPEAN UNION

Copernicus  
Europe's eyes on Earth

IMPLEMENTED BY  
ECMWF



2025 boreal summer 0.47°C above the  
1991–2020 average

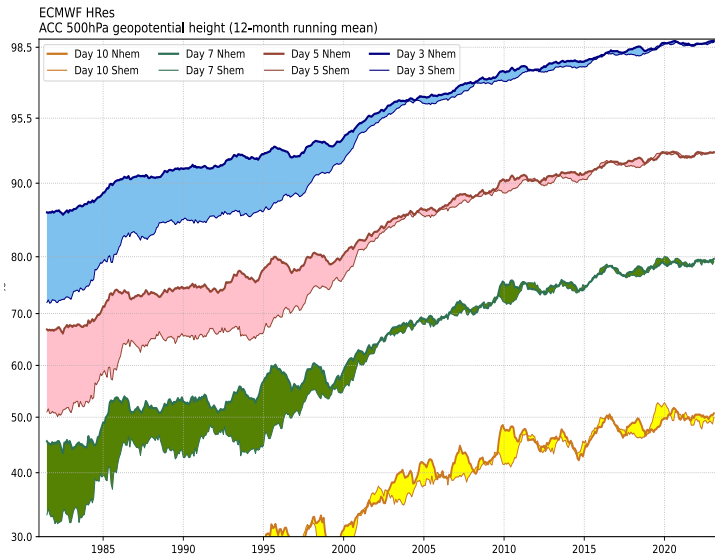


ECMWF

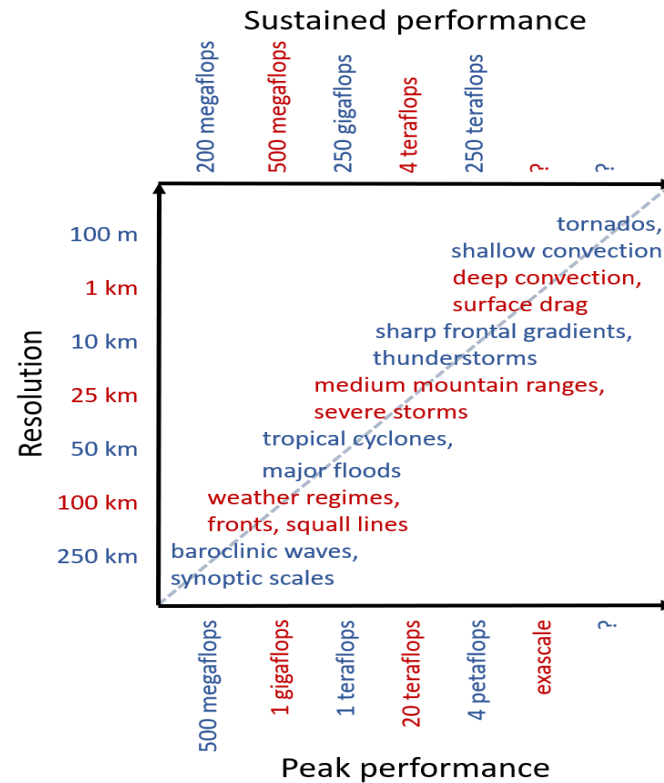
CO<sub>2</sub>  
Human  
Emissions

# The changing weather (... prediction)

## The quiet NWP revolution (1980 - today)



## The digital revolution (2020 – today)



arXiv > physics > arXiv:2307.10128

Physics > Atmospheric and Oceanic Physics

[Submitted on 19 Jul 2023]

## The rise of data-driven weather forecasting

ECMWF unveils alpha version of new ML model

13 October 2023  
The AIFS team

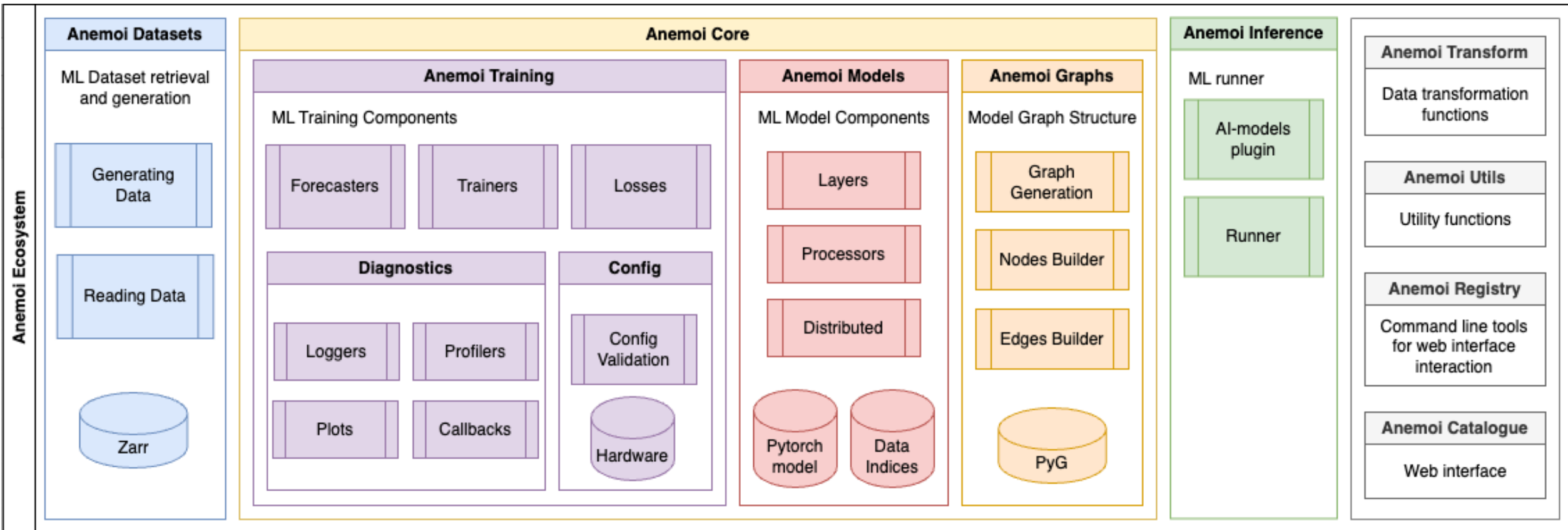
ECMWF is today launching a newborn companion to the IFS (Integrated Forecasting System), the AIFS, our Artificial Intelligence/Integrated Forecasting System (one "I" covering both Intelligence and Integrated).

The AIFS is barely a few months old and proudly entering its alpha version. Its arrival signals the strengthening of ECMWF's efforts in the field of machine learning (ML), which we have been navigating for a few years now. The AIFS forms one of three components of our new ML project, which began in summer 2023 and aims to expand our applications of machine learning to Earth system modelling.

Recent posts

ECMWF unveils alpha version of new ML model

# NEXT GENERATION FORECASTS: ANEMOI – AN AI ECOSYSTEM

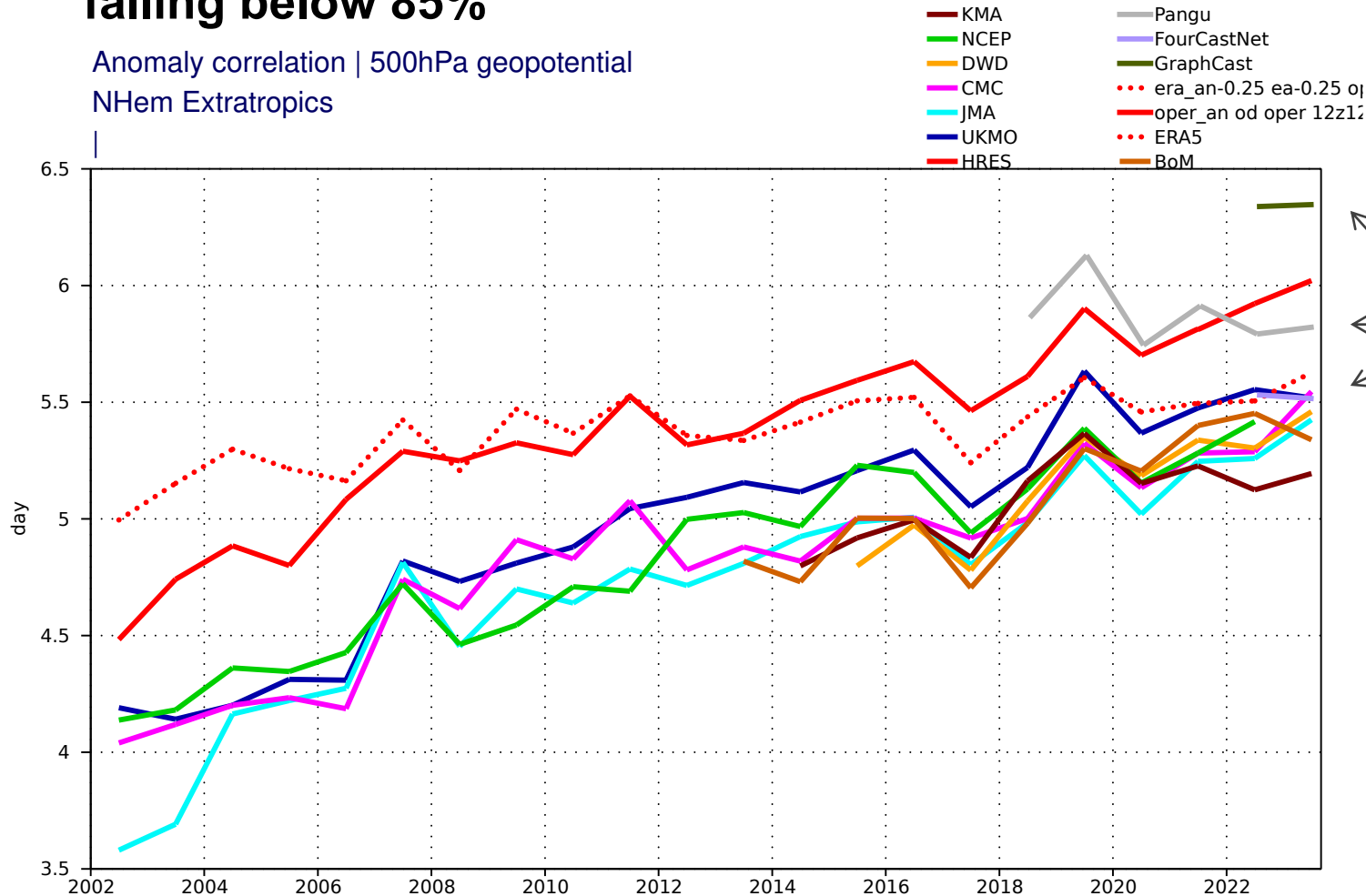


*EMS technology award 2025*

# Headline scores - 500hPa Geopotential

## Anomaly correlation of 500hPa geopotential over Northern Hemisphere Extratropics, falling below 85%

Anomaly correlation | 500hPa geopotential  
NHem Extratropics



ML models

LLM – Chatbots for prediction, visualisation and interpretation ...



# WGNE- systematic error workshops

- 5<sup>th</sup> WGNE workshop on **systematic errors in weather and climate models**, Montreal, Canada, 2017

*Systematic Errors in Weather and Climate Models: Nature, Origins, and Ways Forward*, Zadra et al, 2017 ; <https://doi.org/10.1175/BAMS-D-17-0287.1>

- 6<sup>th</sup> WGNE workshop, Reading, ECMWF, 2022 (<https://events.ecmwf.int/event/241>)

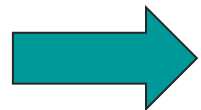
*Systematic Errors in Weather and Climate Models: Challenges and Opportunities in Complex Coupled Modeling Systems*, Frassoni, Reynolds, Wedi et al 2023 ; <https://doi.org/10.1175/BAMS-D-23-0102.1>



# WGNE- Managing Change

- Hierarchical Modelling (AMIP, APE-aquaplanet, DCMIP, physics-dynamics coupling, MJO, QBO, Ensembles, ...)
- Modelling the Earth system (Atmosphere-Ocean-Land-Sealce-Waves)
- Seamless prediction: NWP & climate, extended-range, seasonal, decadal
- Services
- MIPs
- Process-based verification
- HPC & Emerging Technologies
- AI/ML

## WMO structural changes



**AI/ML everything ?**



*"The journey is the reward"*

German in Brazil



Brazilian in England



@NCAR



Thank you!