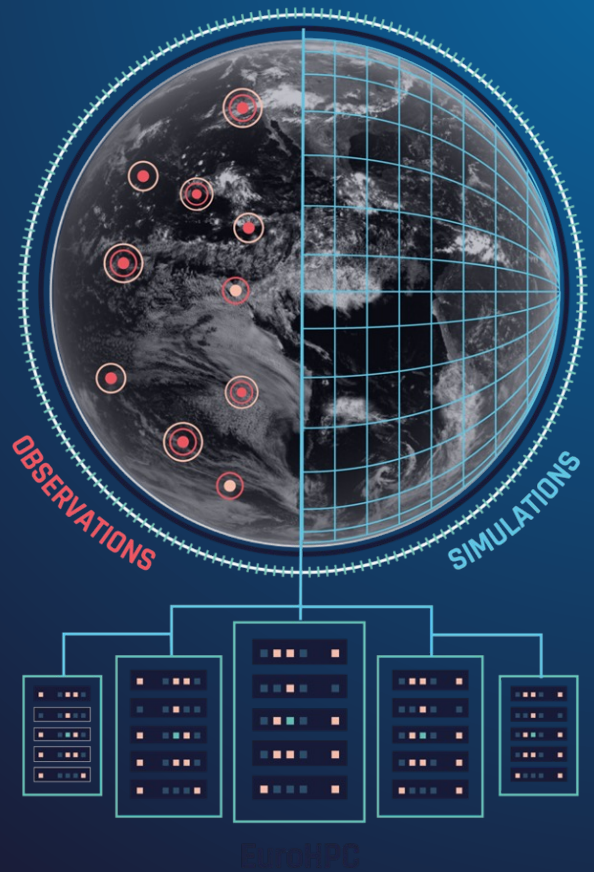
WGNE – MANAGING CHANGE

Nils Wedi



A reflection of 8 years in WGNE

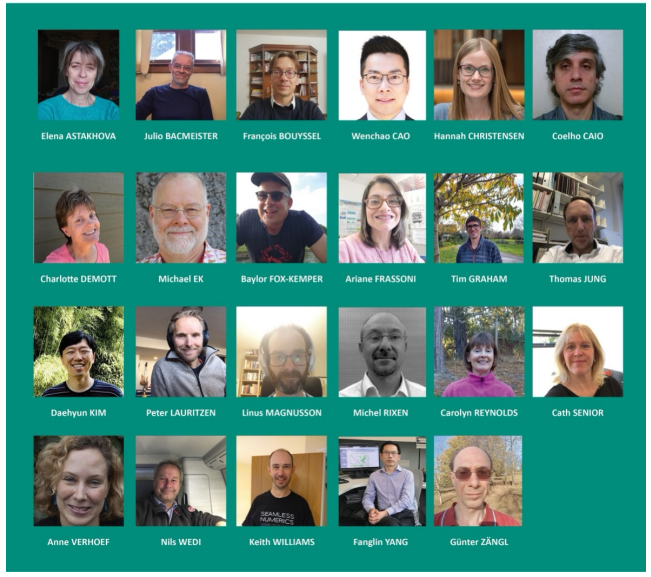
WORLD METEOROLOGICAL ORGANIZATION

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

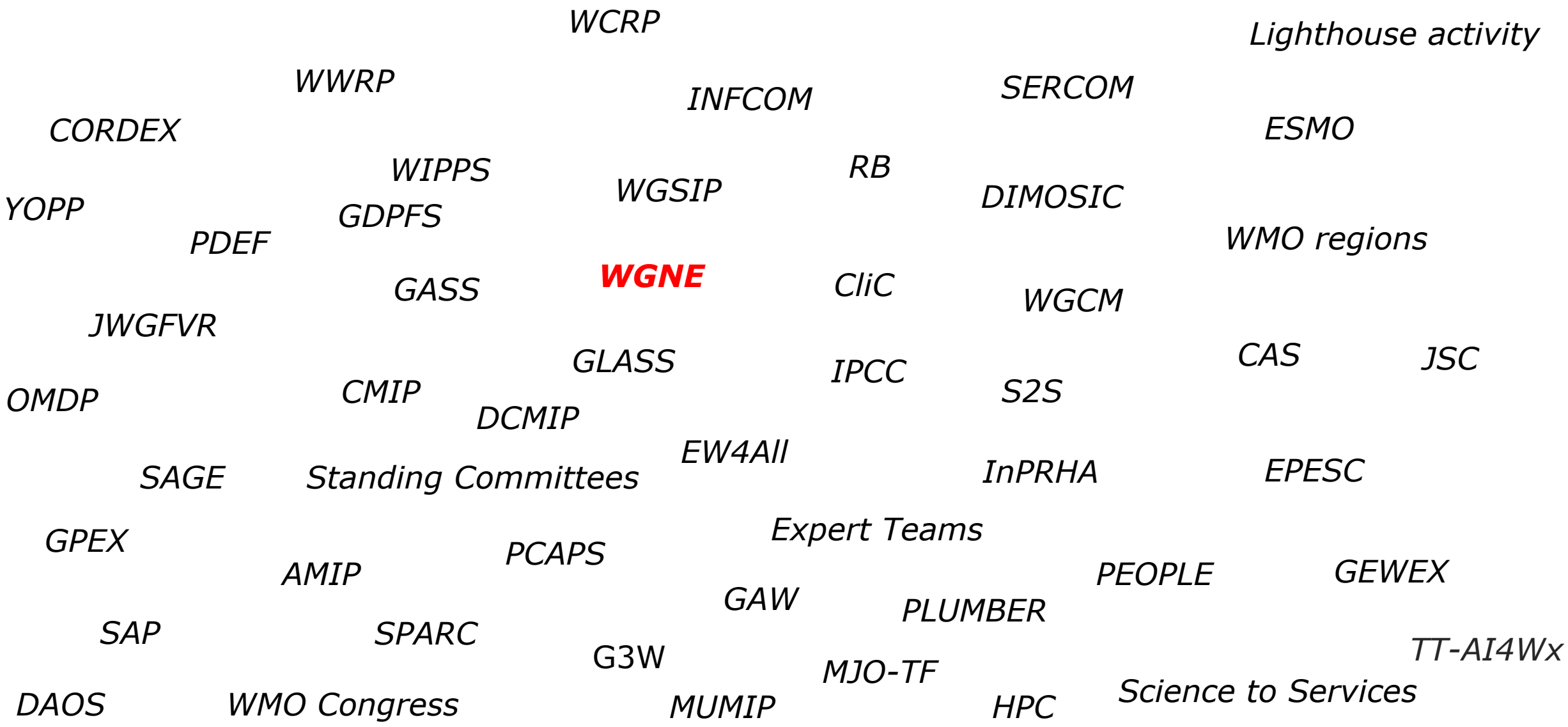
Covid-19 …

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

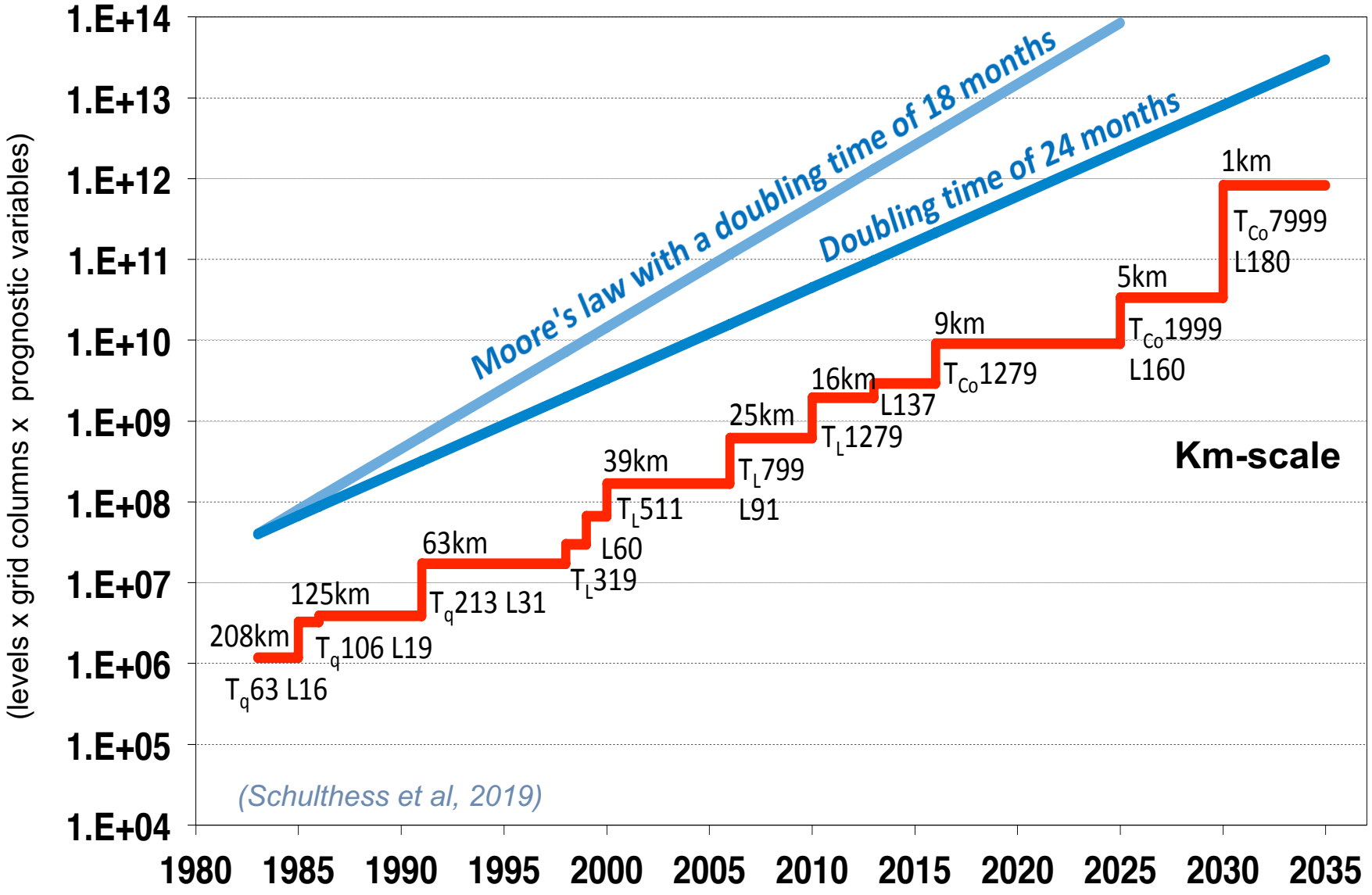
Covid-19



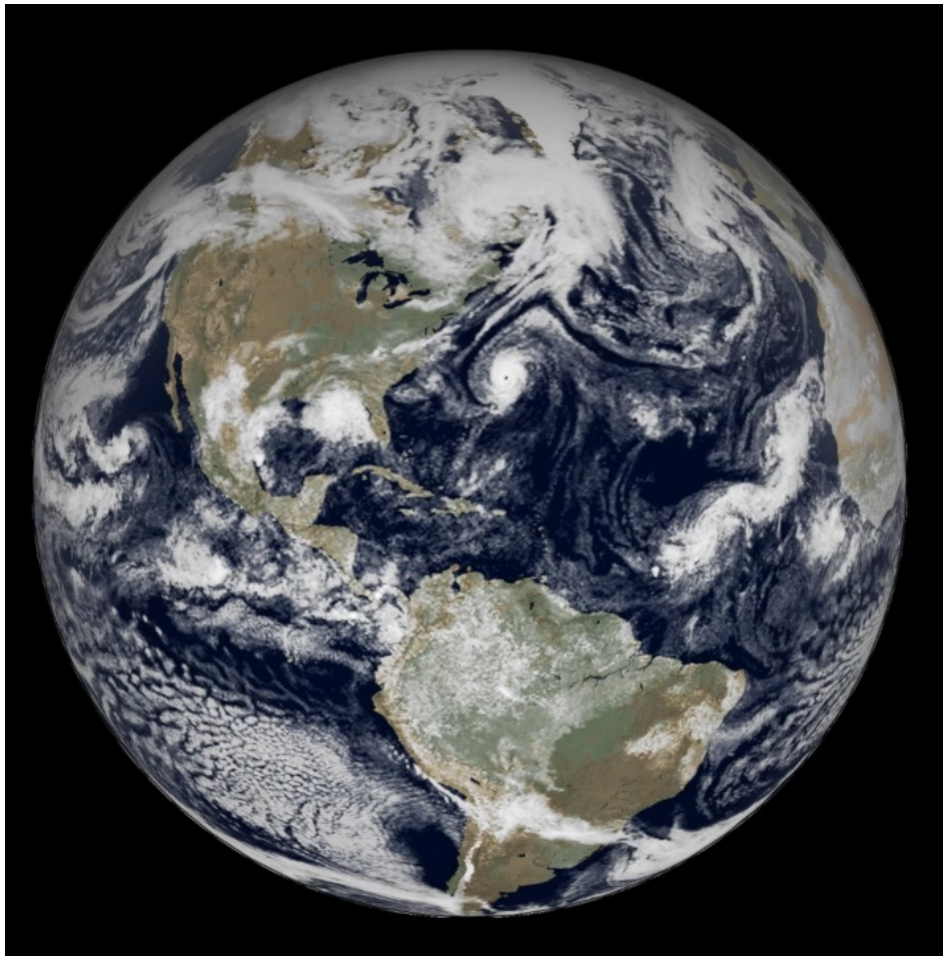
WGNE - learning the trade

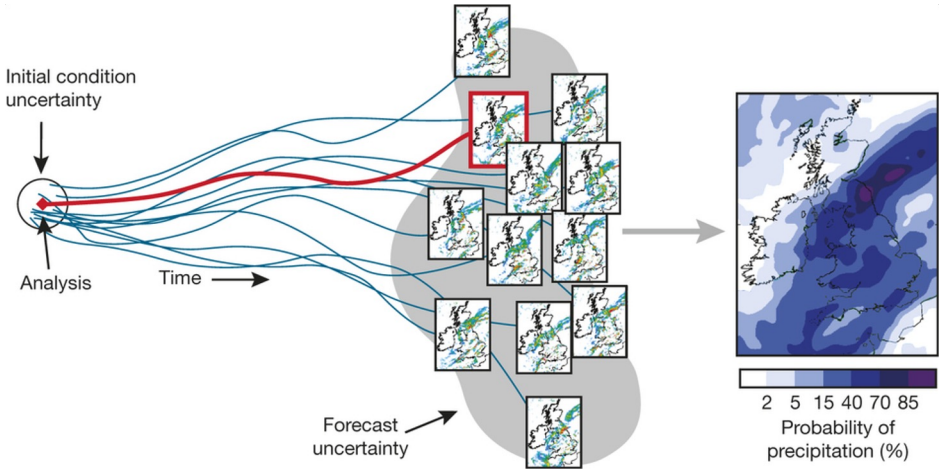


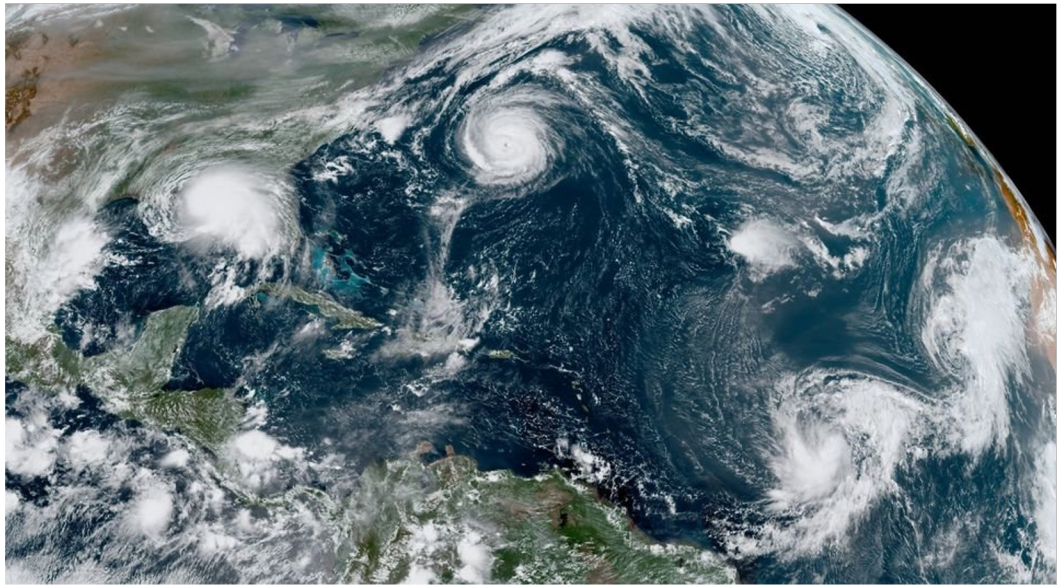
Computational power drives spatial resolution



Ensembles







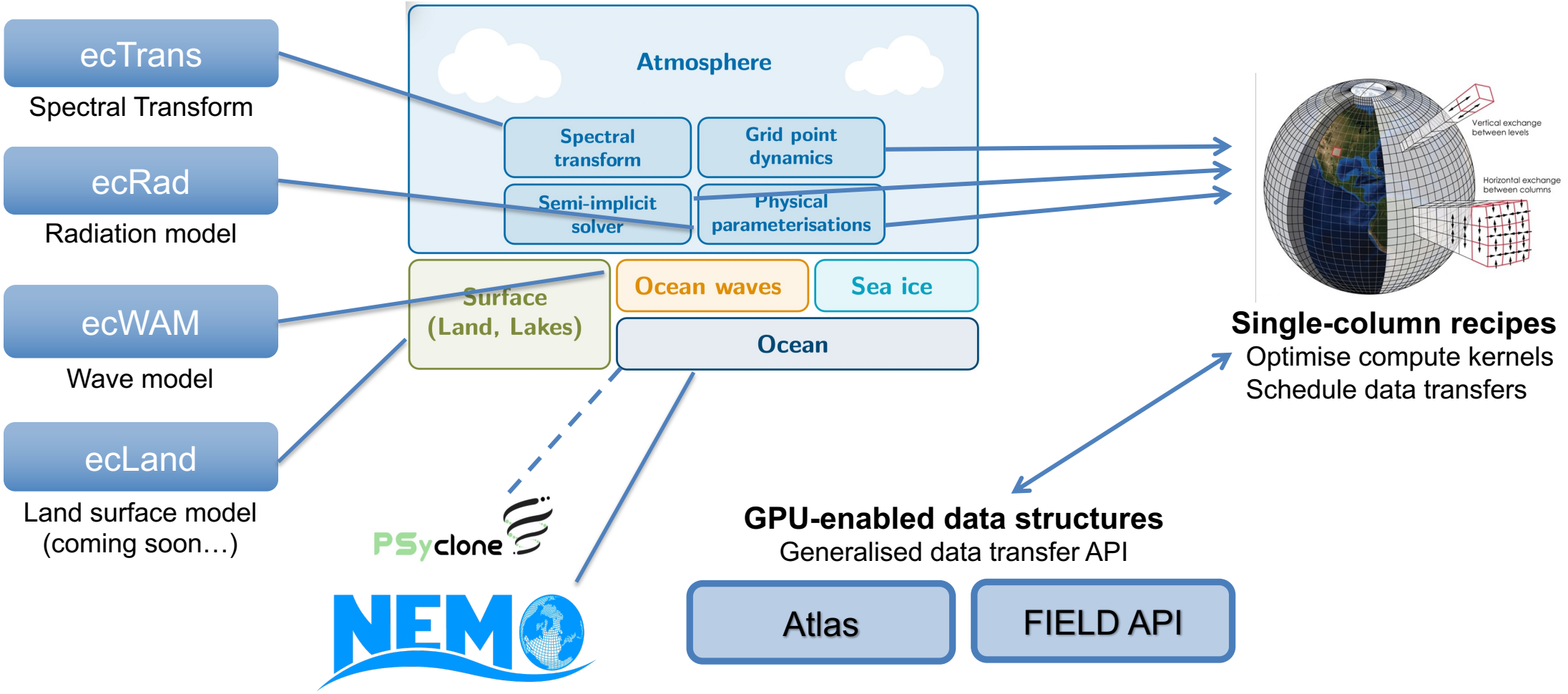
NOAA

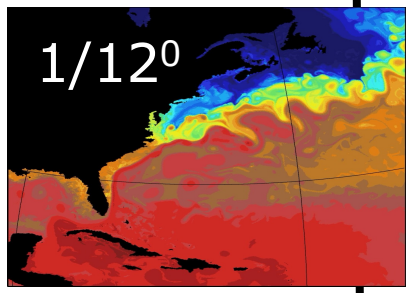
~9km global grid 51 Ensemble members 20200913 00 UTC + 41 h

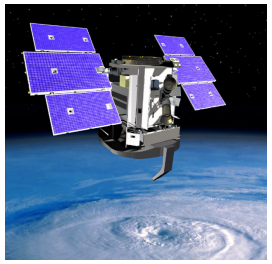
ECMWF

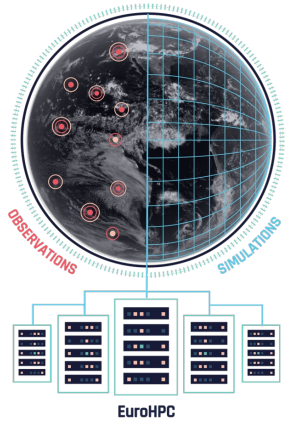
https://www.ecmwf.int/sites/default/files/elibrary/81651-fifty-years-of-earth-system-modelling-at-ecmwf.pdf

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









EO, Data Assimilation

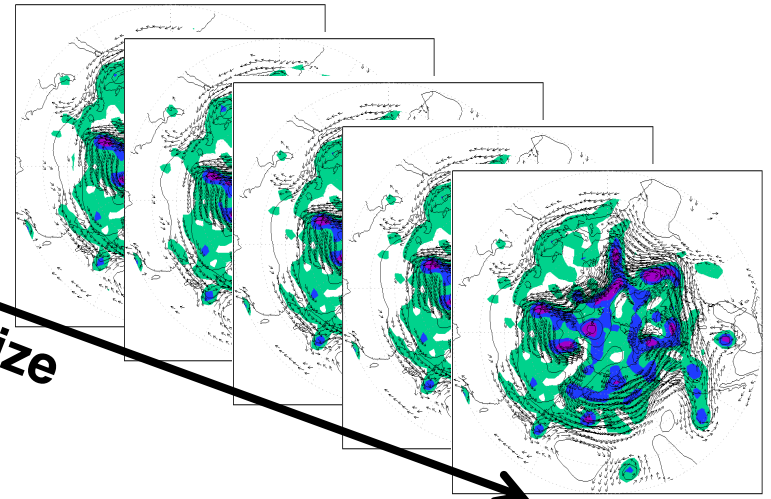
Resolution

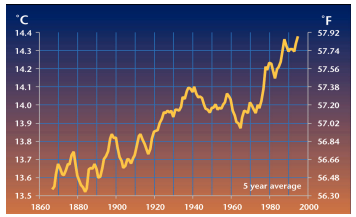
Computing Resources

Complexity

Duration and/or Ensemble size

Applications

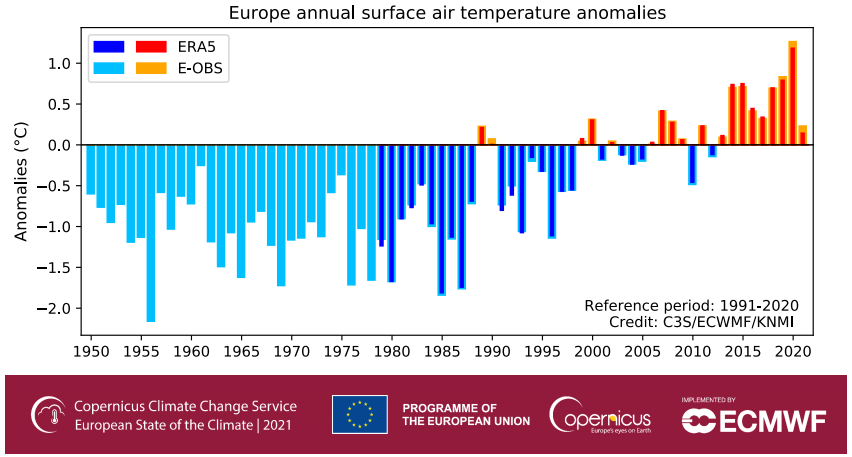


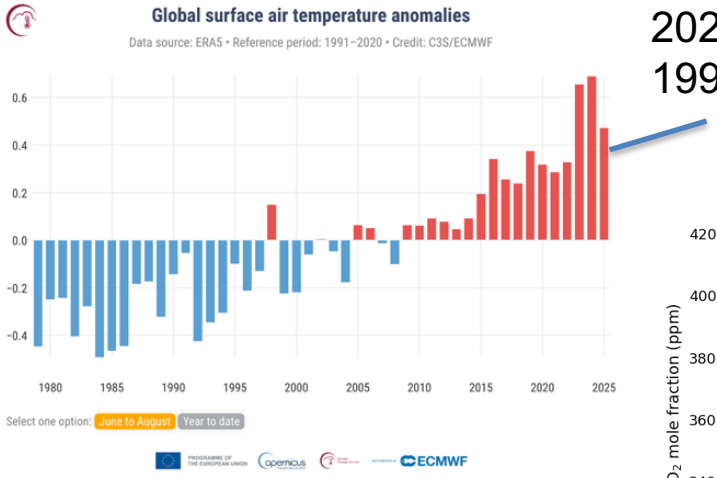


ECMWF

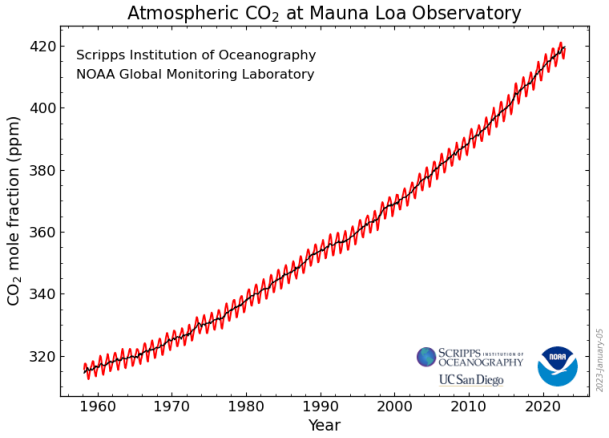
Climate Monitoring Services

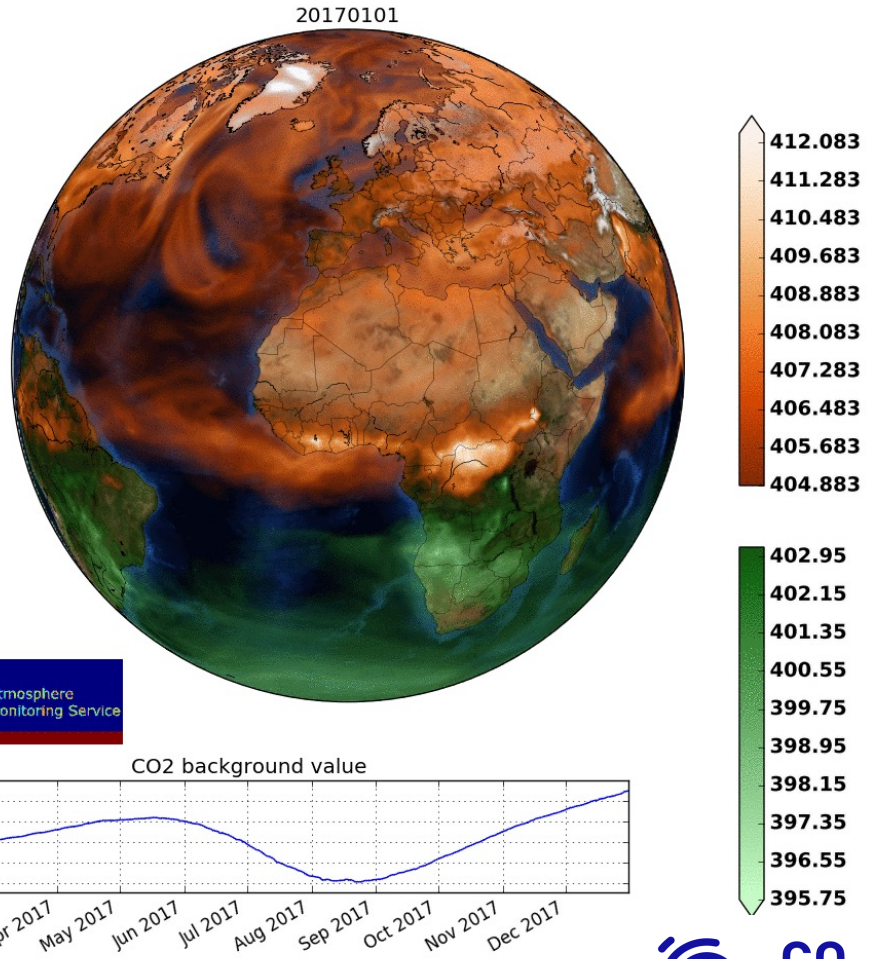
https://climate.copernicus.eu





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



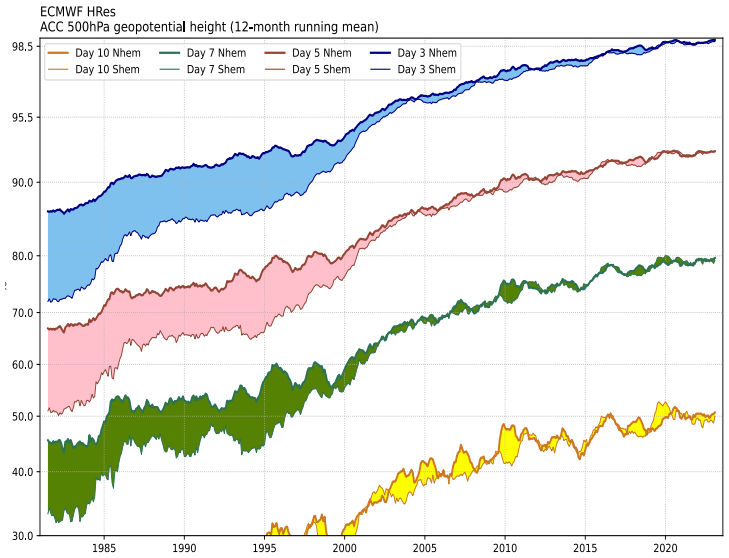


ECMWF

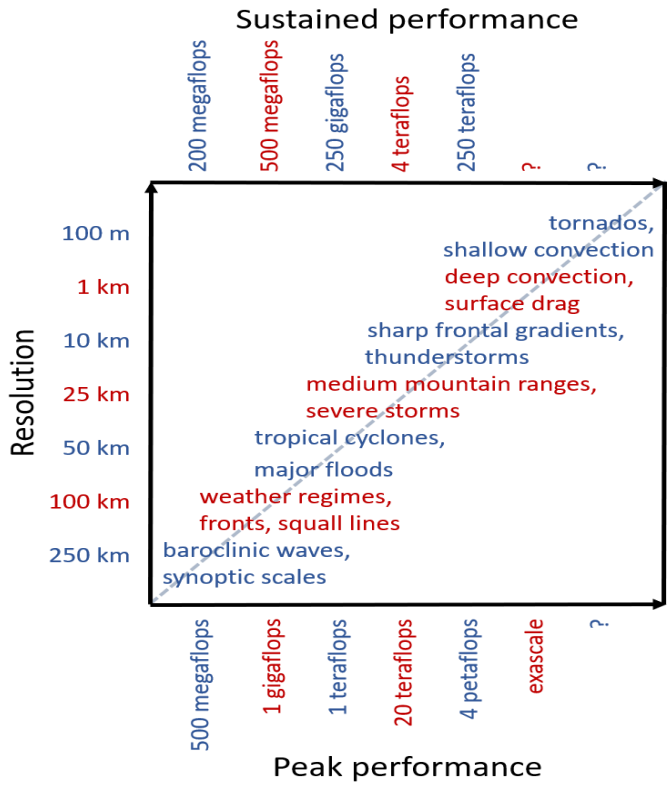
CO_2 Human Emissions

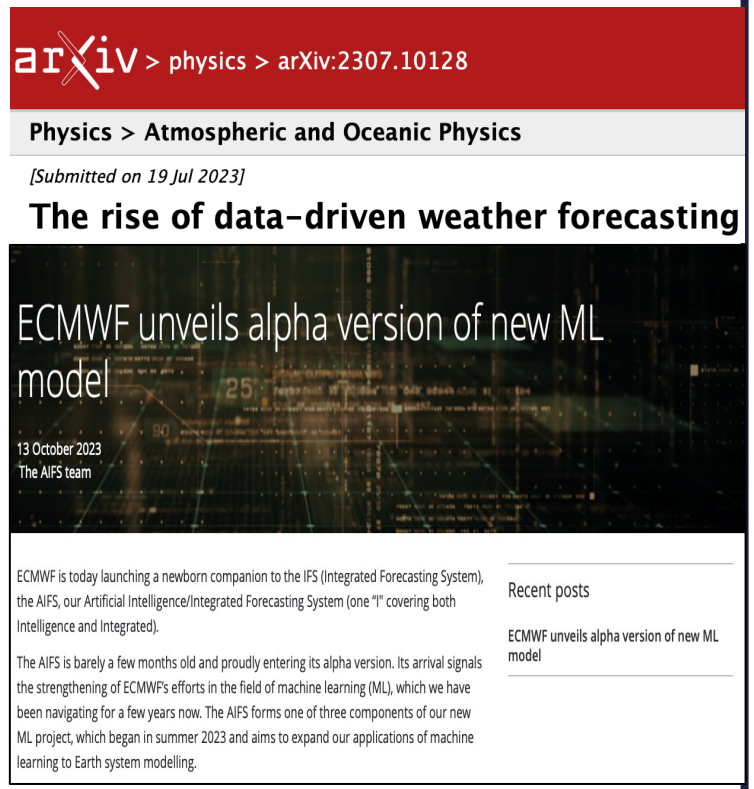
The changing weather (… prediction)

The quiet NWP revolution (1980 - today)



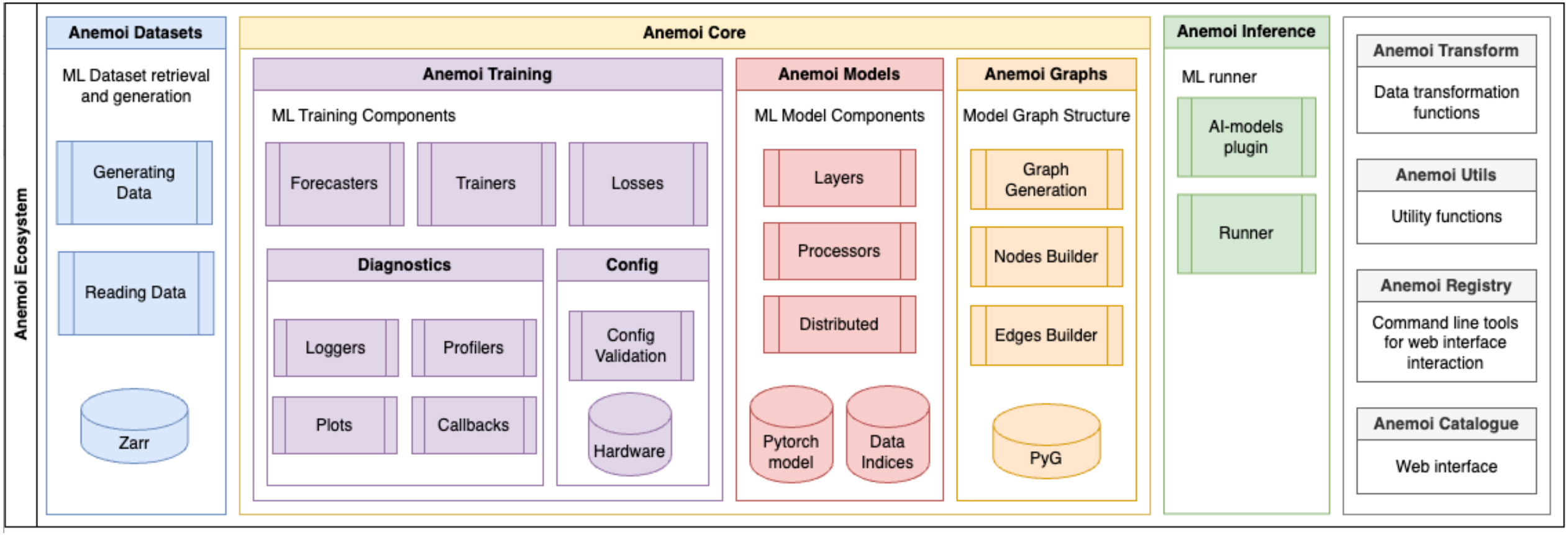
The digital revolution (2020 – today)





ECMWF

NEXT GENERATION FORECASTS: ANEMOI – AN AI ECOSYSTEM

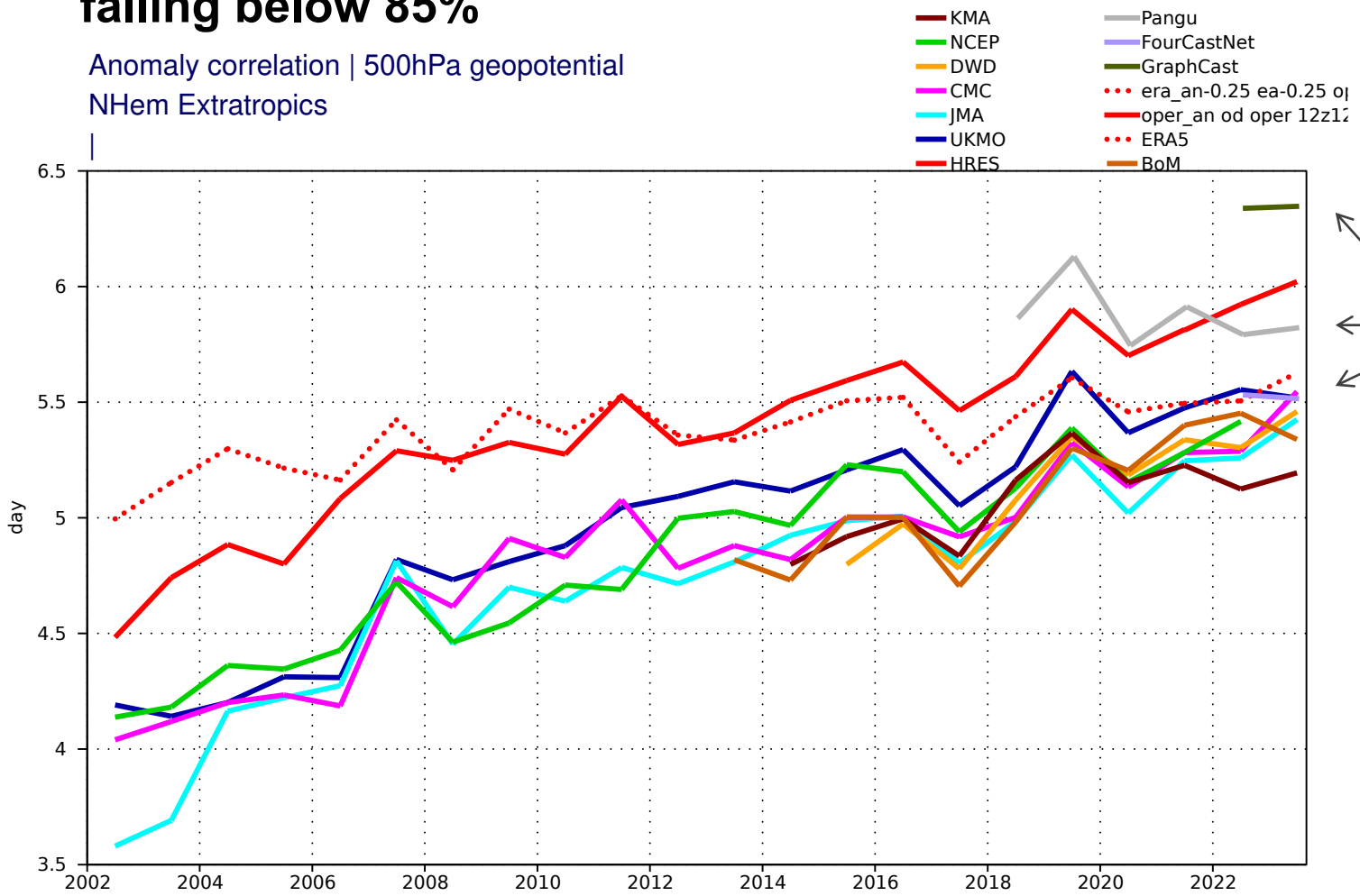


EMS technology award 2025

Relies on **Python** and
packages PyTorch, Lighting, Hydra, Zarr, Xarray and earthkit
(and related other packages e.g. matplotlib)

Headline scores - 500hPa Geopotential

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



ML models

LLM – Chatbots for prediction, visualisation and interpretation …

WGNE- systematic error workshops

- 5th 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

- 6th 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

WMO IMO-WMO

WGNE- Managing Change

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

WMO structural changes

WORLD METEOROLOGICAL ORGANIZATION

AI/ML everything ?

“The journey is the reward”

German in Brazil

Brazilian in England

@NCAR

Thank you!