



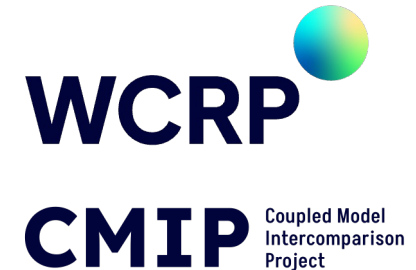
# Governance for a distributed infrastructure to support climate science

Philip Kershaw, Head CEDA, RAL Space, STFC  
NFCSTNetwork+ Meeting, 6 Mar 2025



# A clear driver for the creation of a Federation

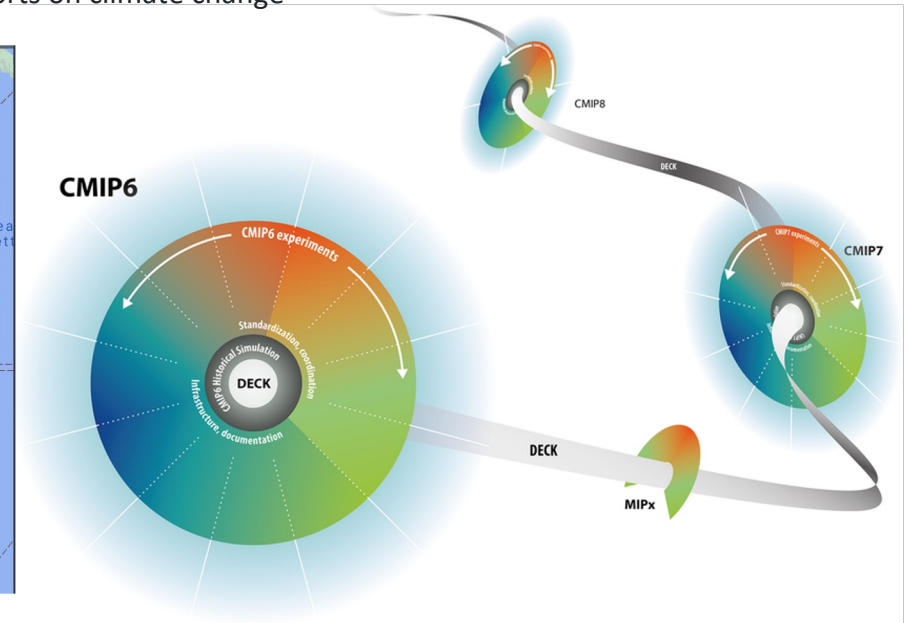
“The Coupled Model Intercomparison Project (CMIP) is an international climate modelling project, designed to better understand past, present and future changes in the climate.”



The outputs from CMIP provide an important input into the IPCC's assessment reports on climate change

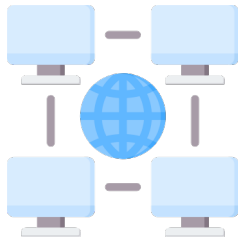


CMIP6 modeling institutes

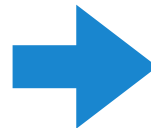


# Big Data driving a federated approach

Early 2000s



**Grid Computing,  
e-Science programme**



**Communities  
of best practice**

**Global Organization for Earth  
System Science Portals**



**Research federations**



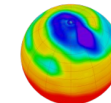
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Data Analysis**

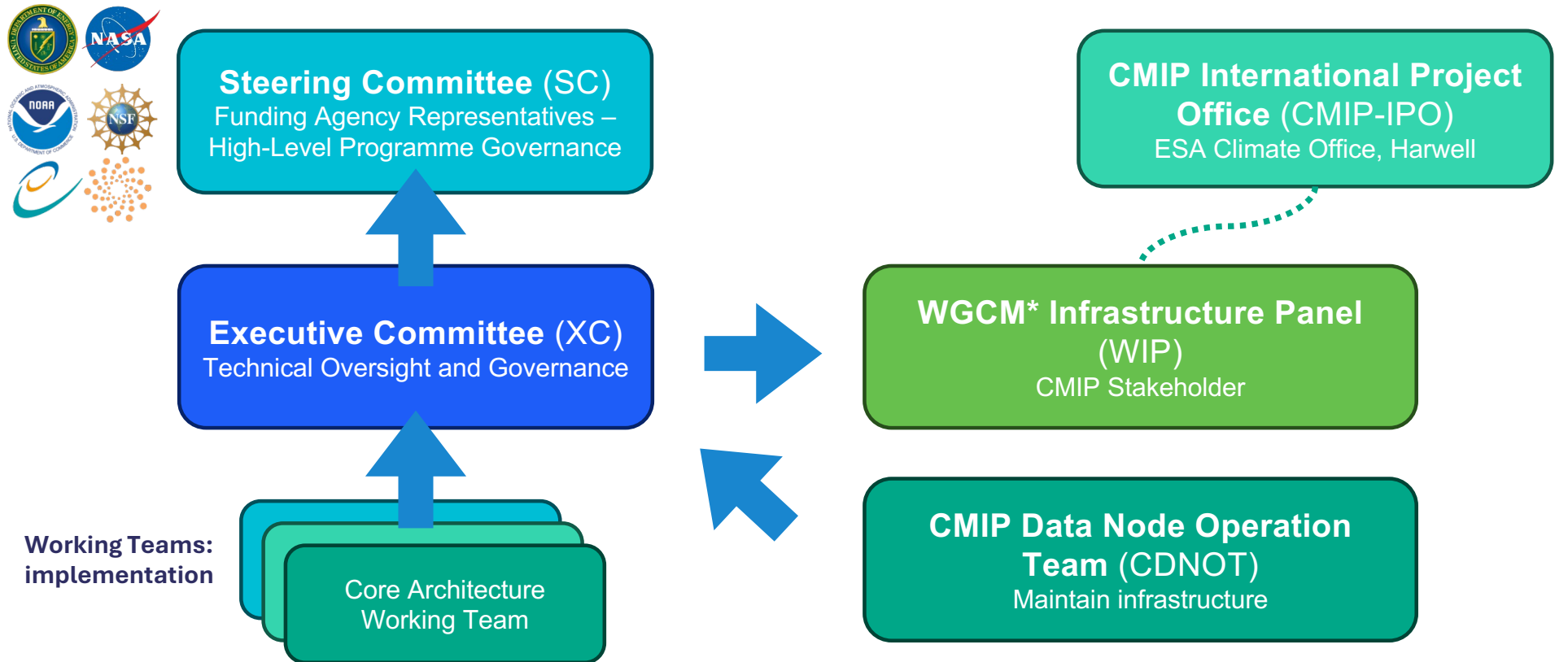
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# ESGF Objectives

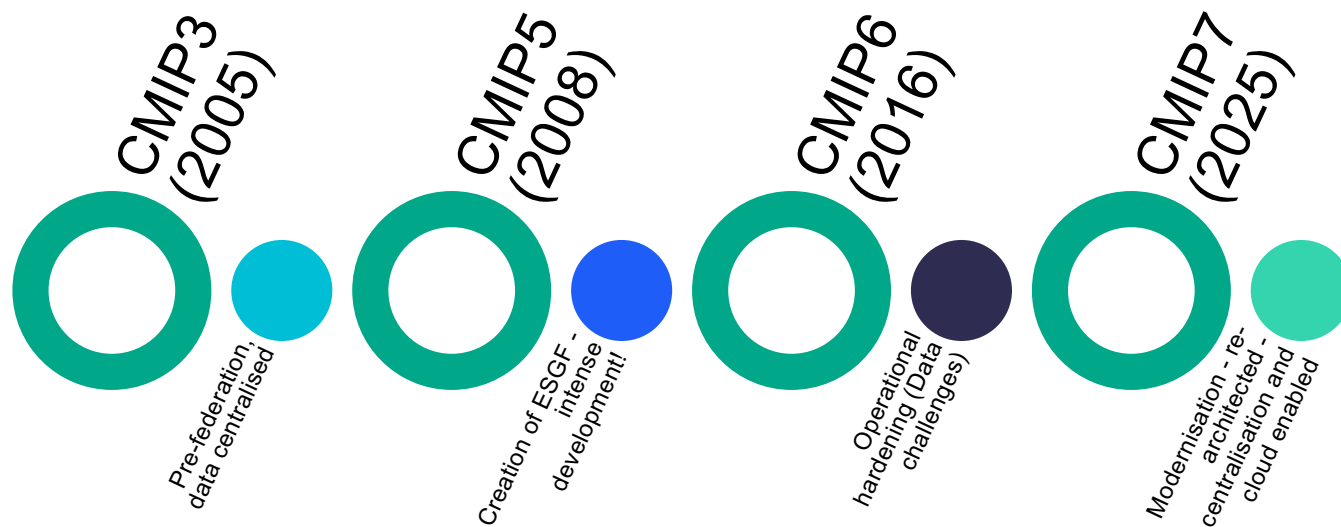
To provide access to climate data primarily \*MIP (Model Intercomparison Project) activities. ESGF may support access to other Earth science data but the core community to support is \*MIP.

Address the challenge of hosting and access to large volume climate datasets through the provision of a distributed system of collaborating data provider organisations linked together in a federation.

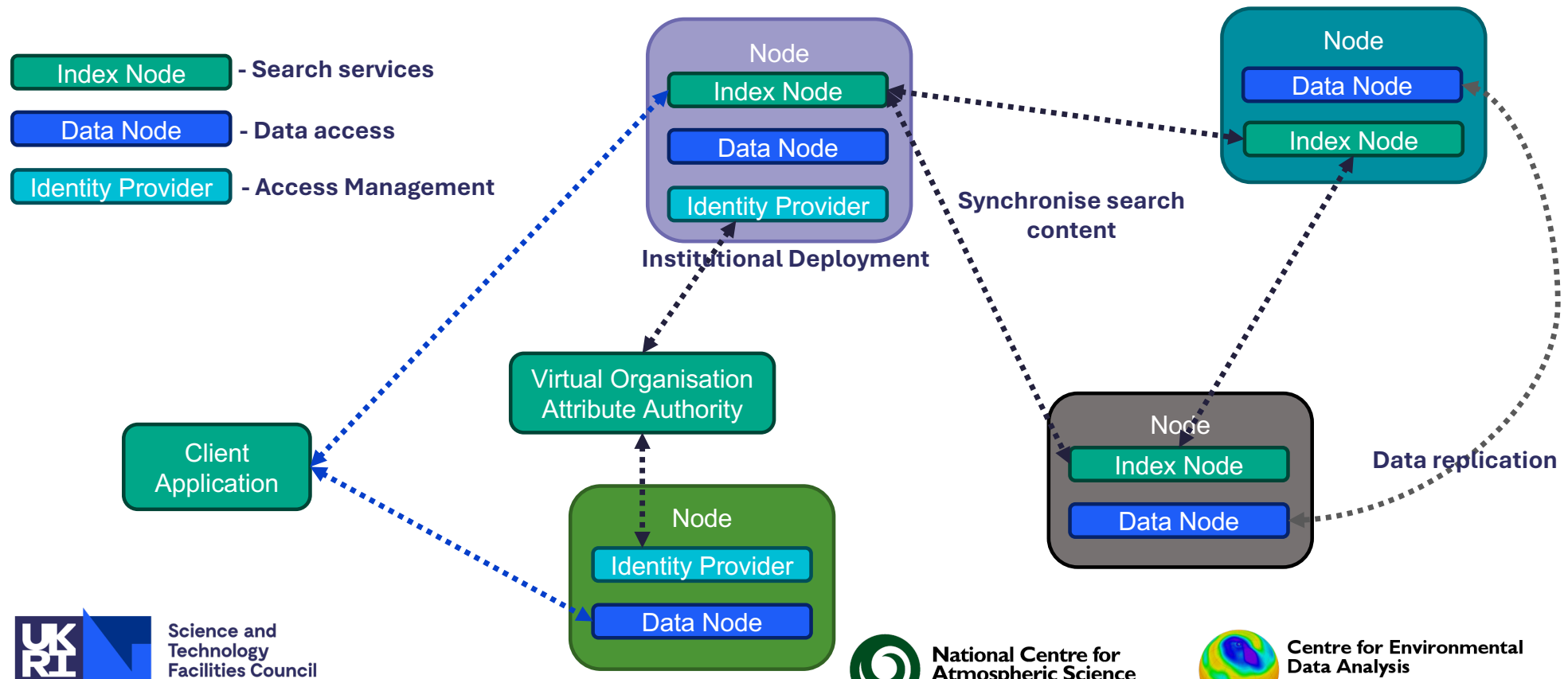
# Governance Structure



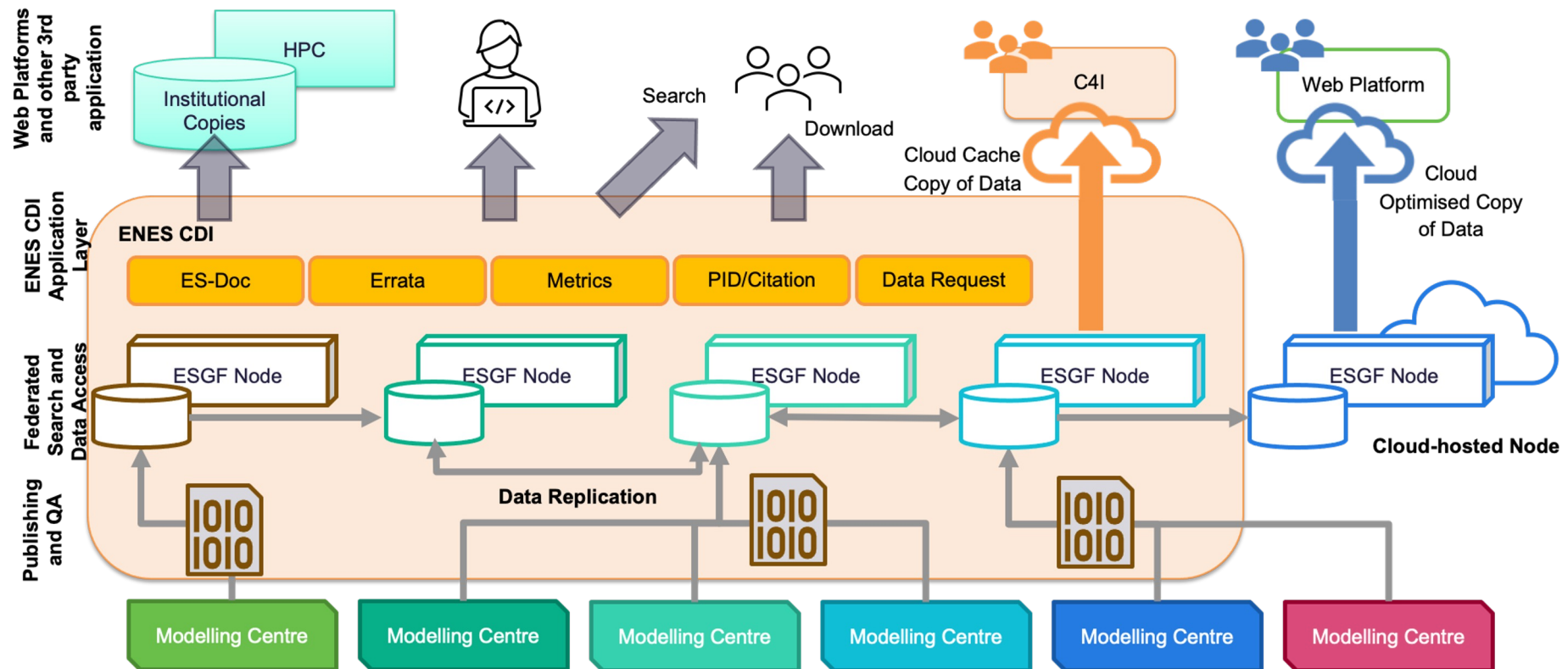
# ESGF and CMIP history in one slide



# Original ESGF 1.0 High-Level Architecture Blueprint



# ESGF as part of an eco-system





# Successes



37  
Projects



194  
Countries



26  
Data nodes



15,983,967  
published datasets



280,334,473  
files downloaded



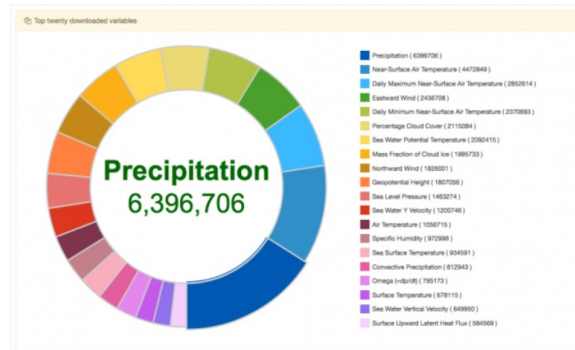
49.76  
PB downloaded

## ESGF Federation



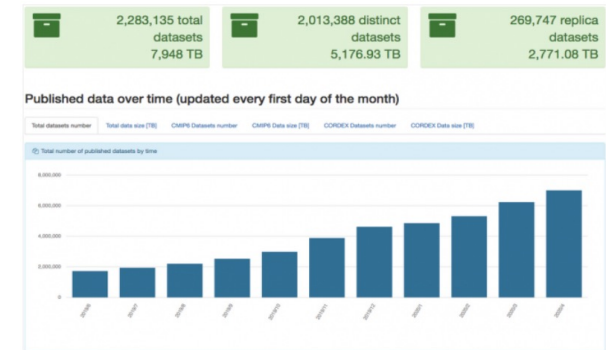
This user interface provides a set of data usage and publication metrics across the Earth System Grid Federation. Statistics refer to the period January 2018 to present.

## Data usage



Cross-project and project-specific sections, with a rich set of charts and tables, provide different views about the data downloaded across the ESGF federation.

## Data publication



A view of the total amount of data published and available through the ESGF infrastructure gives users an in-depth view about the ESGF data archive.

# Successes – CMIP6 in Figures



13,606,408 total  
datasets  
25,212.14 TB



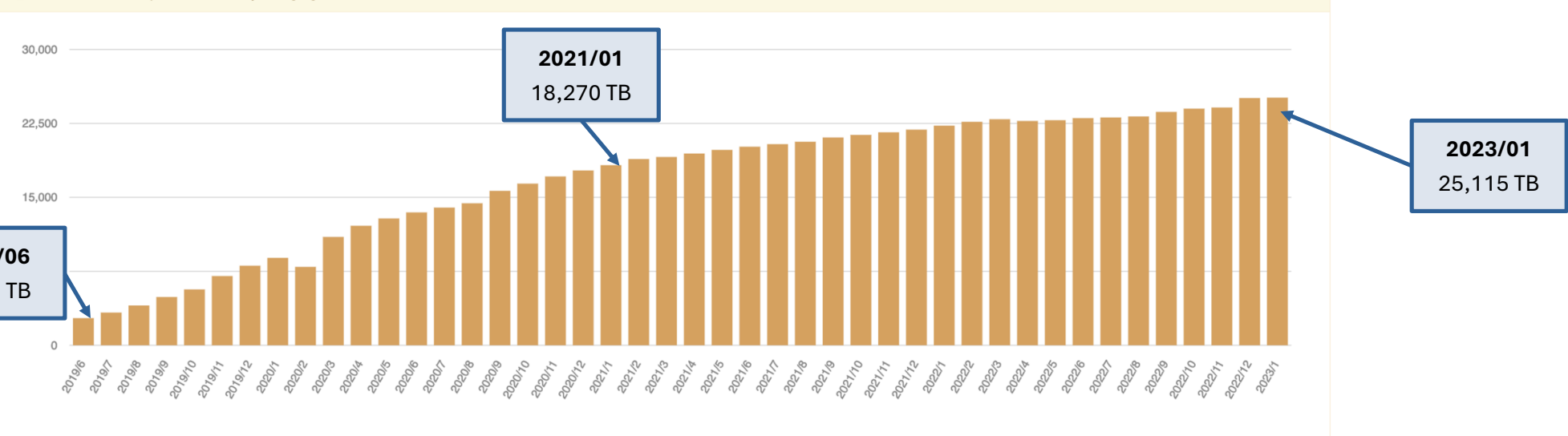
6,759,621 distinct  
datasets  
14,295.37 TB



6,846,787 replica  
datasets  
10,916.77 TB

- 44 institutions
- 120 models

Total size of CMIP6 published data by time [TB]



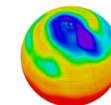
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Slide credit - Paola Nassisi, CMCC



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# Issues

Keeping the software contract – local fixes to federation-wide problems

- Data publishing

Complex solutions missing the user need

- Esp. IAM solution

Understanding the needs of an operational living system

- Clarity about what each partners can provide

- Investing in ongoing development

Managing disagreements

Funding seesaw between US and European funding lines

# Lessons Learnt

A clear common goal and deadline galvanised the partners towards creating a solution – a SMART\* target

Set up clear governance and responsibilities from the outset

Firm, enforced standards with data worked for interoperability

Agree service levels for partners so that there are clear expectations

Development and Operational needs to live together in harmony 😊

Implement simple and clear governance for technical changes to avoid incompatibilities

Be user-focussed

\* Specific, Measurable, Achievable, Realistic, Timebound

# Summary

15 years of federation is an achievement to be proud of!

It has continued on the basis of goodwill without legal agreements or formalisms that might be expected for such an undertaking

There is a strong sense of a common purpose and desire to collaborate towards a common goal

