# Paleoclimate Modelling

## PMIP

## Intercomparison Project

# A BRIEF HISTORY OF THE PMIP DATABASE

Jean-Yves Peterschmitt – LSCE

And LOTS of famous PMIP scientists

… AND LOTS of anonymous sysadmins and software engineers

# Dataman
## Working with the PMIP community since 1994

Funded position at LSCE since 1994
Helping people with data… **mostly PMIP!**

- Key points from a **1997 talk** …
- Data size and complexity increase, problems are the same
  - Need as much **standard data** as possible for model intercomparison
  - Data must be **correct**, and *easily* usable

# What is the PMIP DB?

- Lots of data files following **community defined standards**
  - **PMIP(1)** started collaborating early with **PCMDI** and adopted the **AMIP standards**
  - Standards were improved for **PMIP2**, and were merged with **CMIP5&6 DB standards** for **PMIP3** and **PMIP4**

- Data files are available on **remote servers** (in *The Cloud*!)
  - **PMIP1** originally on an *ftp* site at PCMDI
  - **PMIP1** and **PMIP2** DB (and web sites) still online at LSCE!
    - https://dods.lsce.ipsl.fr/pmip1db/
    - https://dods.lsce.ipsl.fr/pmip2db/
  - **PMIP3** and **PMIP4** data available on ESGF (Earth System Grid Federation)
    - IPSL node: https://esgf-node.ipsl.upmc.fr/
    - Look for the *PMIP* Activity in the CMIP6 *Search* interface
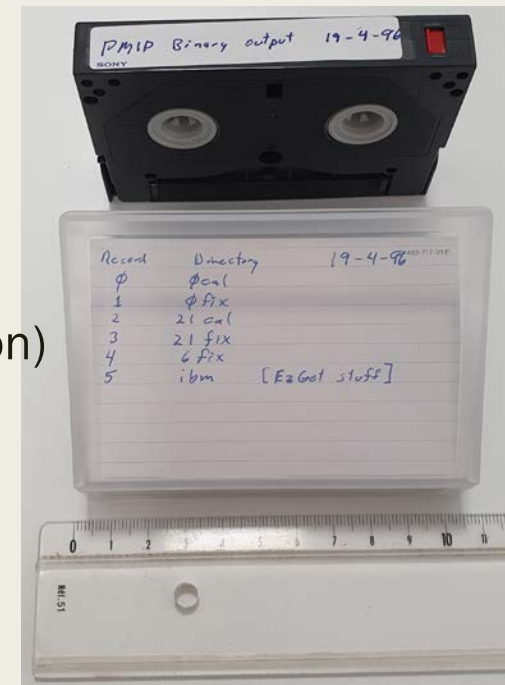
# The PMIP DB evolution



|  | PMIP 1 | PMIP 2 | PMIP 3 | PMIP 4 |
|---|---|---|---|---|
| DB online | 1996 | 2005 | 2011 | 2018 |
| Number of groups/ models | 22 | 18 | 25 | 20 |
| Number of countries | 11 | 10 | 12 | 14 |
| Main experiments | 0 k<br>6 k<br>21 k | Same as PMIP 1 | PMIP 2<br>+ Last<br>Millennium | PMIP3<br>+ Last Interglacial<br>+ Mid Pliocene Warm Period<br>+ Last Deglaciation<br>+ DeepMIP |
| DB Size | 1.7 GB | 482 GB | **distributed**<br>*several* TB | **distributed**<br>LOTS of TB... |
| Data distribution | ftp server<br>LSCE (+PCMDI) | DODS server<br>LSCE | CMIP5<br>ESGF | CMIP6<br>ESGF |
| Data format & Convention | NetCDF<br>AMIP/CF | NetCDF<br>CMIP+PMIP2/CF | NetDCF<br>CMIP5/CF | NetCDF<br>CMIP6/CF |
| Example grid IPSL atmosphere | lmcelmd5<br>64x50 x L11 | IPSL-CM4-V1-MR<br>96x72 x L19 | IPSL-CM5A-LR<br>96x95 x L39 | IPSL-CM6A-LR<br>144x143 x L79 |
| Example grid NCAR atmosphere | ccsm3<br>128x64 x L18 | CCSM<br>128x64 x L17 | CCSM4<br>288x192 x L26 | CESM2<br>288x192 x L32 |
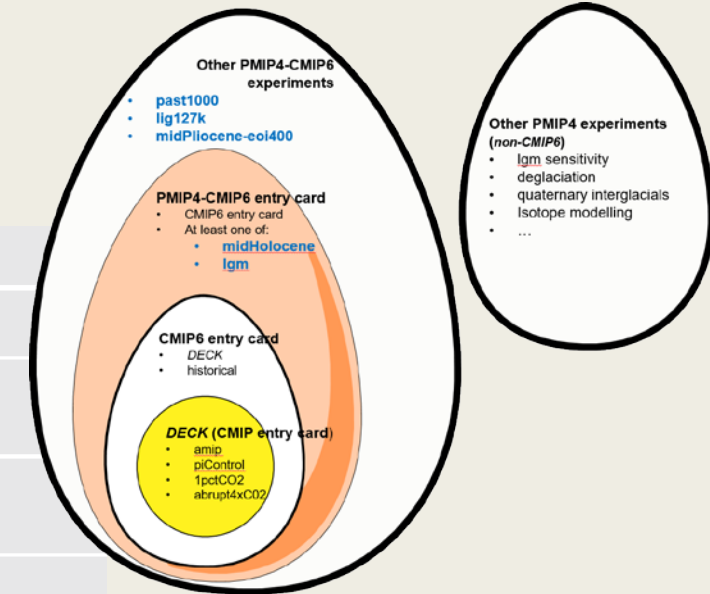
# Data standardization ?
## The ONLY way to successfully share MIP data



- PMIP4 follows CMIP6 standards
  - Self-documented binary NetCDF file format
  - Standard file names, metadata, variables' units and axes
    - Climate and Forecast conventions, CMIP6 Data Reference Syntax, CMIP6 Controlled Vocabulary and CMIP6 Data Request
  - The CMOR3 library is designed to help create standard CMIP6 files
    - https://cmor.llnl.gov/

- **YOUR modelling group HAS TO prepare standard model output and UPLOAD the files to ESGF**

- Standard PMIP1 data files in NetCDF format are still accessible and usable!

- NO STANDARDS and non-official data sharing of multi-model data? ➔Chaos, errors !

# The HUGE work behind the scene
## Earth System Grid Federation



**Major ESGF Node Sites**

| Institution | Gateway URL | Version | Country | Project(s) | Contact |
|---|---|---|---|---|---|
| ❶ CEDA | esgf-index1.ceda.ac.uk | 2.4.0 | U.K. | CMIP5, CORDEX, Obs4MIPs, SPECS, ESA CCI, EUCLEIA, CLIPC | alan.iwi@stfc.ac.uk |
| ❷ DKRZ | esgf-data.dkrz.de | 2.4.0 | Germany | CMIP5, CORDEX, Obs4MIPs, ISI-MIP | berger@dkrz.de |
| ❸ ANU NCI | esgf.nci.org.au | 2.4.0 | Australia | CMIP5 | ben.evans@anu.edu.au |
| ❹ NOAA GFDL | esgdata.gfdl.noaa.gov | 2.4.0 | U.S. | CMIP5, ncpp2013, Obs4MIPs | hans.vahlenkamp@noaa.gov |
| ❺ NASA GSFC | esgf.nccs.nasa.gov | 2.4.0 | U.S. | CMIP5, Obs4MIPs, Ana4MIPs, NEX-GDDP, NEX-DCP30, CREATE-IP | daniel.q.duffy@nasa.gov |
| ❻ IPSL | esgf-node.ipsl.upmc.fr | 2.4.0 | France | CMIP5, CORDEX, Obs4MIPs | sebastien.denvil@ipsl.jussieu.fr |
| ❼ NASA JPL | esgf-node.jpl.nasa.gov | 2.4.0 | U.S. | Obs4MIPs, GASS-YoTC, CMAC | luca.cinquini@jpl.nasa.gov |
| ❽ DOE LLNL | esgf-node.llnl.gov | 2.4.0 | U.S. | CMIP5, CMIP3, input4MIPS, ACME | sasha@llnl.gov |
| ❾ LiU | esg-dn1.nsc.liu.se | 2.4.0 | Sweden | CMIP5, CORDEX, SPECS, CLIPC | pchengi@nsc.liu.se |

**Also Shown:**

| Country | Institute | Gateway URL |
|---|---|---|
| United States | DOE Argonne National Laboratory | dev.esgf.anl.gov/projects/esgf-anl |
| United States | NOAA Earth System Research Laboratory | esgf.esrl.noaa.gov |
| China | Beijing Normal University | naqpms.iap.ac.cn |
| India | Indian Institute of Tropical Meteorology | esg-dn1.nsc.liu.se |
| Spain | University of Cantabria | cordex.org |



- Data preparation and distribution is **not easy**, but is **required**!
- Thanks to all the groups that have already shared standard output (or will do it)!



**ESGF publication workflow for CMIP6**
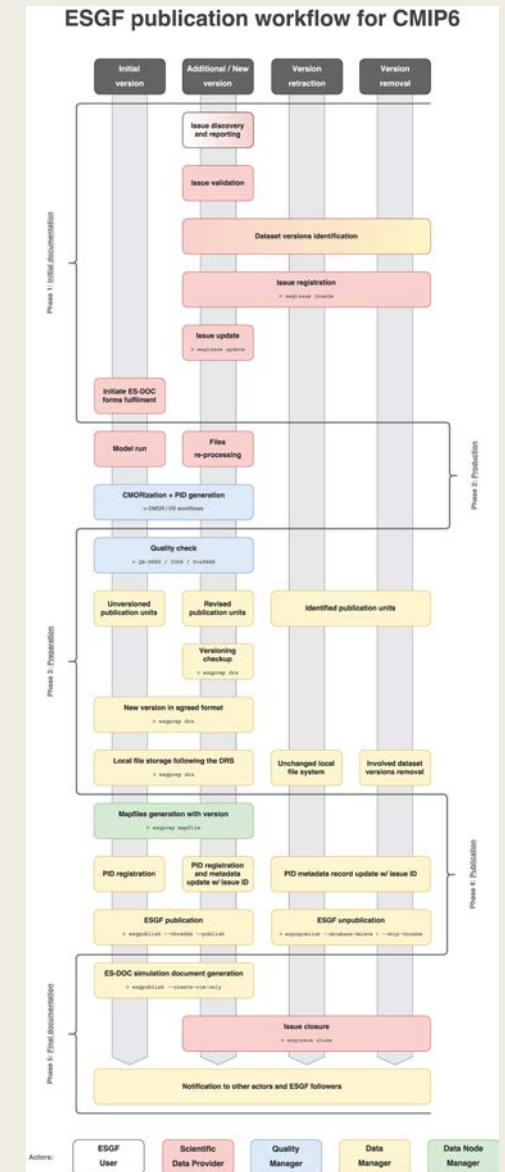
# TODO
## Wrapping up PMIP4, getting ready for the next 30 years!

- GROUPS: Get all PMIP4 data in standard format and on ESGF

- GROUPS: Check and complete [PMIP4 documentation on es-doc](#)

- USERS: Use the available data for lots of publications

- ESGF: Make it easier for non-programmers to use CMIPn data

- Find a way to store PMIP related publications references (more reliable than the extinct citeulike)

- JYP: Update the main PMIP website…

- YOUNG SCIENTISTS: Get ready for PMIP5/CMIP7 adventure

- … probably too many other things to list

# More useful links!

- PAGES [PMIP 30th Anniversary](#) issue

- PAGES [Lessons learned from 25 years of PMIP model-data distribution](#)

- CMIP6
  - [Participation Guidance for Modellers](#)
  - [CMIP6 Global Attributes, DRS, Filenames, Directory Structure, and CV's](#)
  - [Controlled Vocabulary](#)
  - [Data Request](#)

- ESGF
  - [Home](#)
  - [Data usage and data publication metrics](#)
  - [IPSL search node](#)
  - [es-doc](#) (models' and experiments' documentation)
  - [CMIP Errata-Search](#)
  - [CMIP6 Citation Service](#) (models and experiments DOIs)

# BONUS
## The PMIP1 SSTs are using too old standards…