

Copernicus and H2020 Program: Diagnostics Needs and Overview

S.Denvil¹, M.Lautenschlager², S.Fiore⁴,
F.Guglielmo¹, S.Joussaume¹, M.Juckes²,
S.Kinderman², M.Kolax⁷, C.Pagé³,
W.Som de Cerff⁶.

¹Institut Pierre Simon Laplace, IPSL, France

²Centre for Environmental Data Analysis, CEDA, United Kingdom

³Centre Européen de recherche et de formation avancée en calcul scientifique, CERFACS,
France

⁴Euro-Mediterranean Center on Climate Change Foundation, CMCC, Italy

⁵Deutsches Klimarechenzentrum, DKRZ, Germany

⁶The Royal Netherlands Meteorological Institute, KNMI, Netherland

⁷Swedish Meteorological and Hydrological Institute, SMHI, Sweden

Separation of concerns

- User needs state-of-the-art :
 - **Science** of model evaluation
 - **Software** tools for model evaluation
- Different experts -> different governance & maintenance
- Otherwise one of them becomes obsolete
 - High risk of mis-use
 - Loss of trust, wasted ressources
- Articulation/modularity via clear interfaces
- e.g. lessons learned for CMIP, ESGF, ES-DOC,...

Science of model evaluation

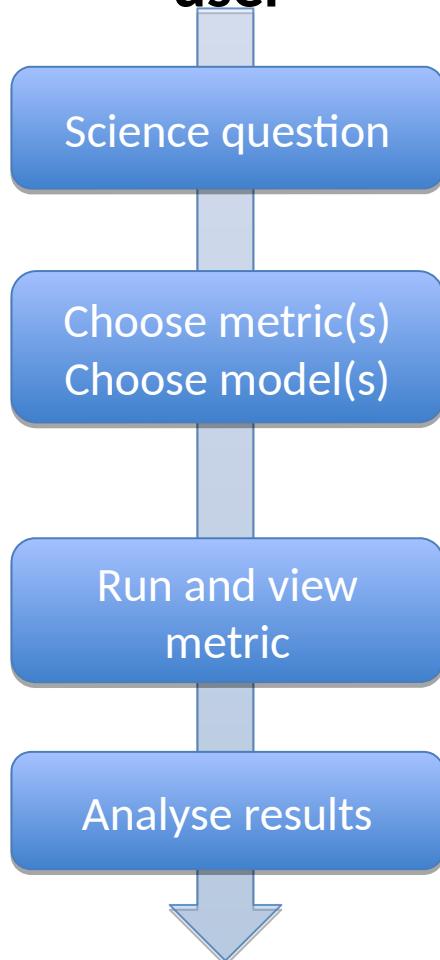
- What is the scientific question ?
- What are the related metrics (performance, process-based, teleconnections,...) ?
- What are the reference “observations” ?
 - Obs4MIPs,...
- Who has the knowledge for governance/trust ?
 - Climate scientists, observations experts
 - WCRP/CLIVAR/PAGES/... panels that gather scientific expertise on specific topics (climate sensitivity, ENSO, monsoons, THC, MJO, salinity, carbon cycle,...)

Software for model evaluation

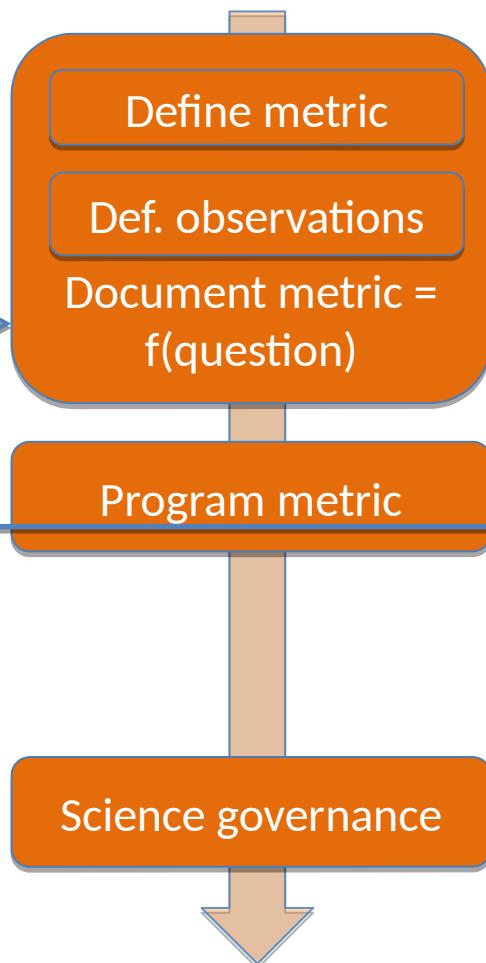
- How to best compute the metrics (get data, run on computer, visualize,...)
- Challenging project: define workflow, process, development, modularity, funding, etc.
- « Time to solution » is high in the must have list
- Who has the knowledge for governance/trust?
 - IT and data experts
 - e.g. ENES, WIP, ESGF, ES-DOC...
 - Or any new team that uses the common framework

Model evaluation workflow

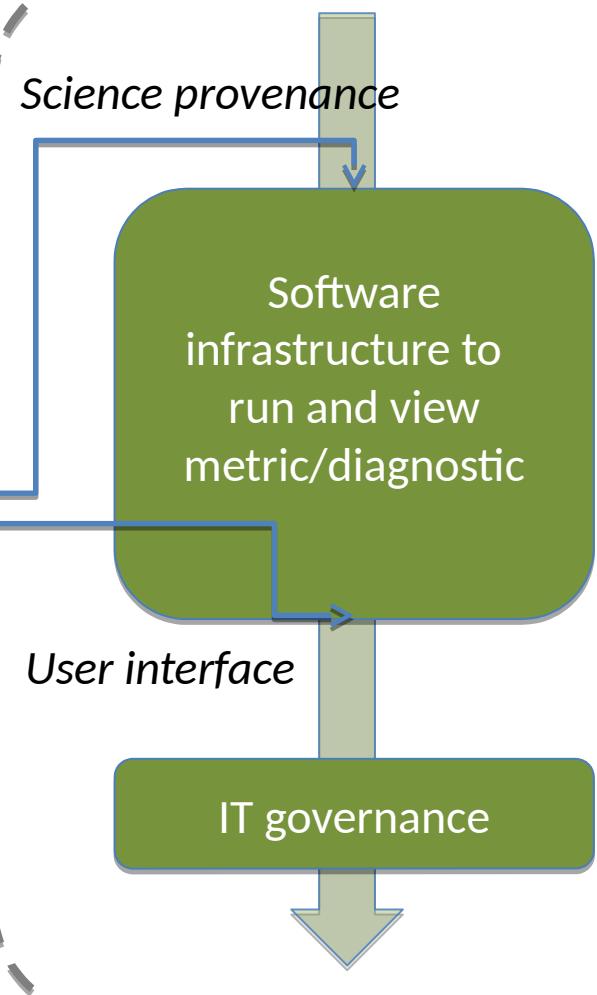
Climate information user



Climate expert



IT expert



IS-ENES 3 scope

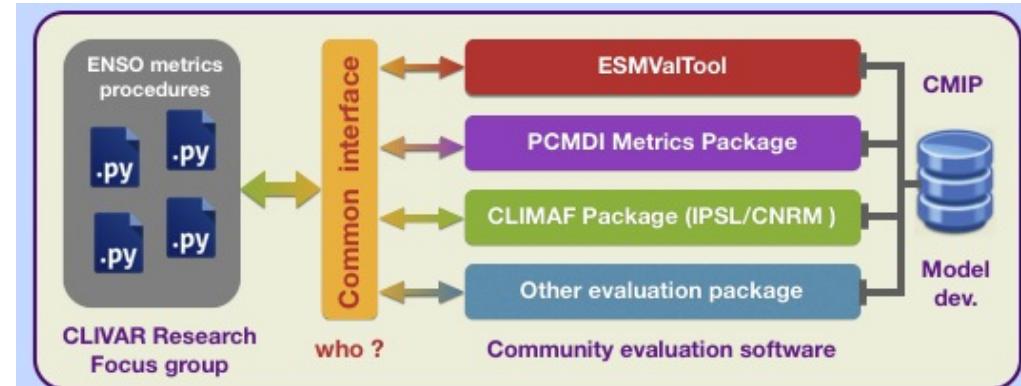
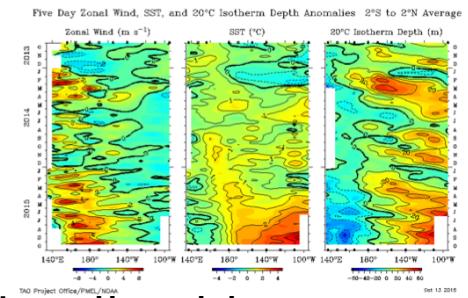
ENSO and tropical Pacific metrics for CMIP6

On behalf of the CLIVAR Research Focus “ENSO in a changing climate”

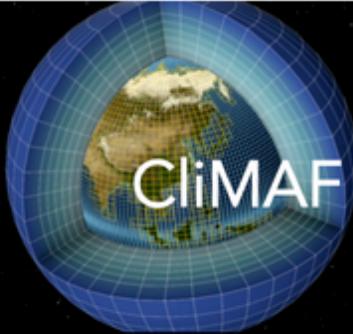
- Despite 30 years of progress, ENSO continues to surprise us and challenge our assumptions - It remains a major unsolved climate puzzle
- It is the “elephant in the room” for regional impacts of climate change
- ENSO research very active field
 - diversity of events, extremes, role of atmosphere,...

Coupled GCMs are choice tools to understand ENSO

- ENSO simulation and prediction still suffer from long standing biases
- Little improvement from CMIP3 to CMIP5
- Beyond performance metrics, process-based metrics are required during model development phase
- Poster provides examples of the such metrics and how to develop their use in the community



CMIP5 workshop
Dubrovnik Oct. 2015



Comparison setup: IPSLCM6013_pd_20171204

[Metrics for model tuning](#)

[Parallel Coordinates - PMP PCMDI](#)

[Atmosphere Surface - seasonal](#)

[NH Polar St. - Atmosphere Surface](#)

[SH Polar St. - Atmosphere Surface](#)

[Atmosphere Standard press. lev. - seasonal](#)

[NH Polar St. - Atmosphere Standard press. lev.](#)

[SH Polar St. - Atmosphere Standard press. lev.](#)

[Atmosphere Zonal mean - seasonal](#)

[NEMO - general diagnostics](#)

[NEMO - T & S @depth](#)

[NEMO zonal means](#)

[Focus Atlantic - Atmosphere Surface](#)

[Focus North Atlantic for AMOC](#)

[PISCES](#)

[ENSO CLIVAR Diagnostics](#)

[ORCHIDEE](#)

[Turbulent Air-Sea Fluxes \(GB2015\)](#)

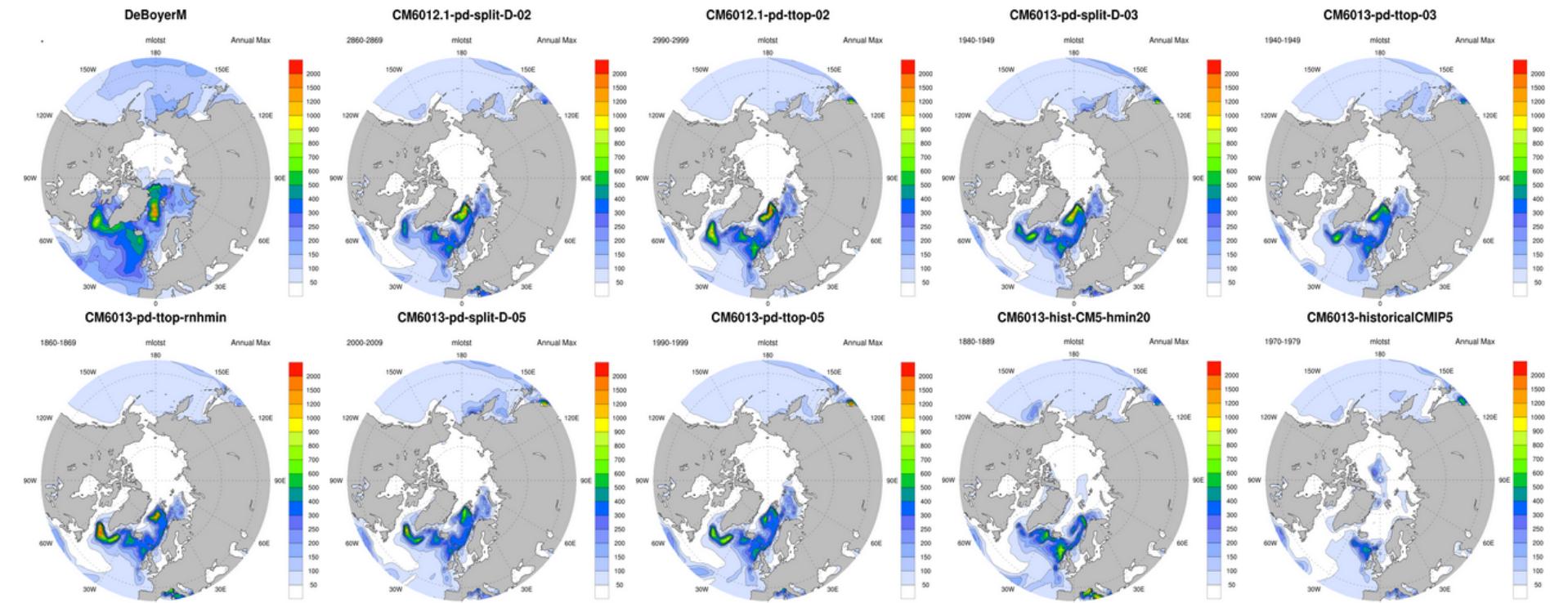
[Hotelling Test on tropical Turbulent Air-Sea Fluxes \(GB2015\)](#)

[CM6011 Essentials - Simulations comparator](#)

[Monsoons Diagnostics](#)

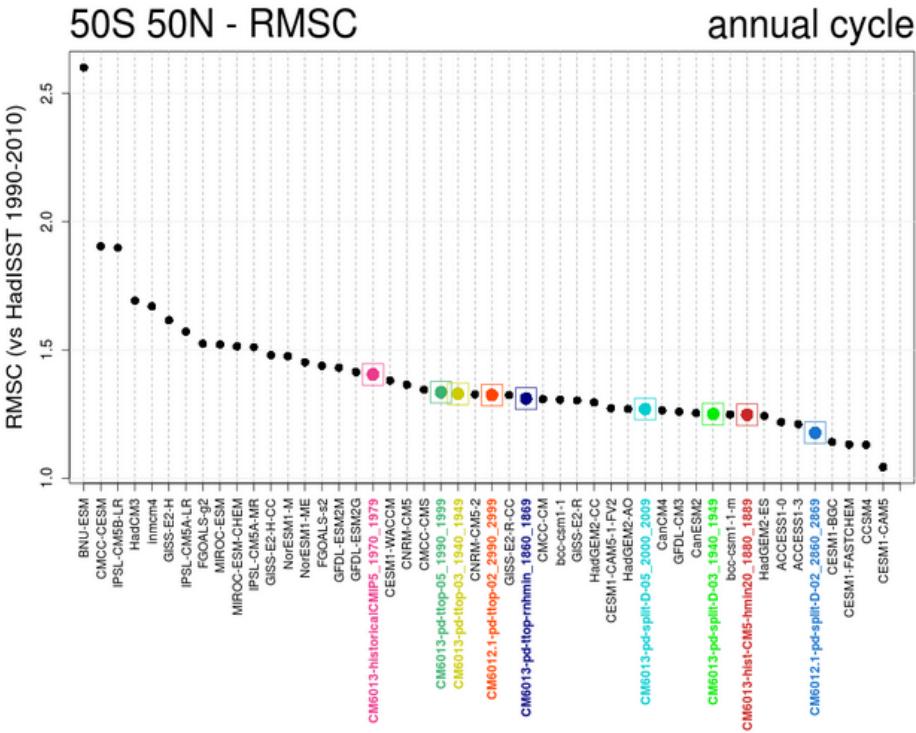
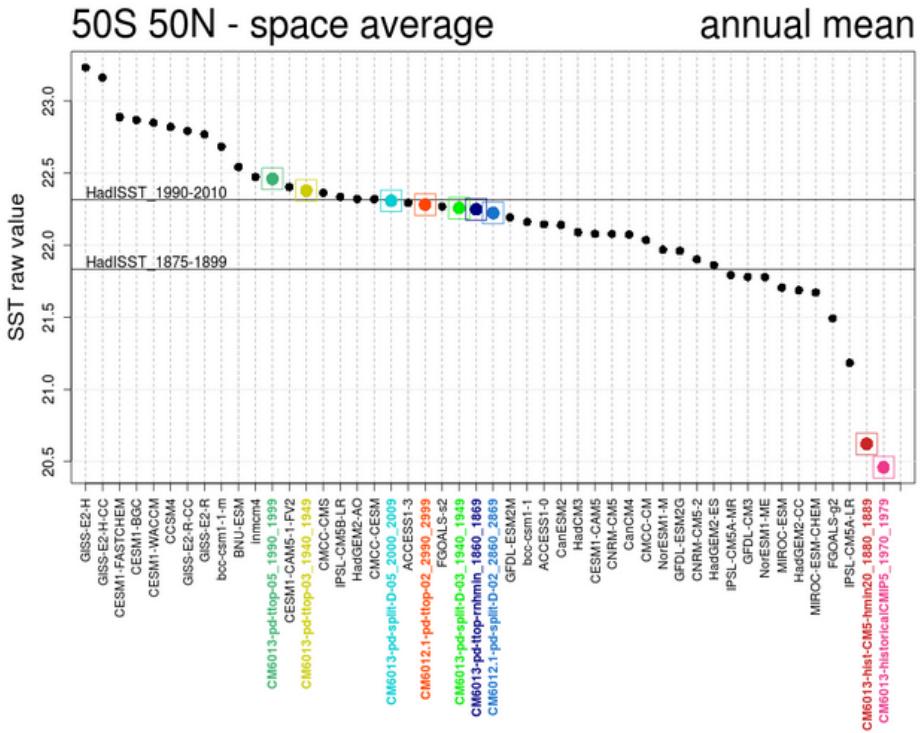
Sweet spots for deep convection

Annual Max NH40 climate MLD (SigmaT 0.03) (mlotst)



Metrics for model tuning

- SST 50S/50N





Questions ?

