WGCM 23
report from the French groups: IPSL and CNRM-CERFACS

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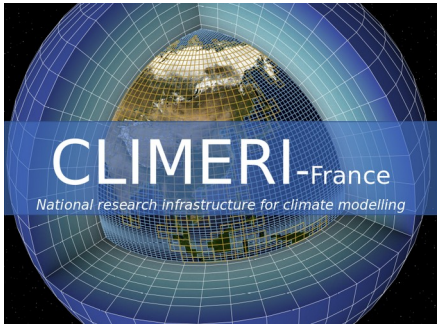
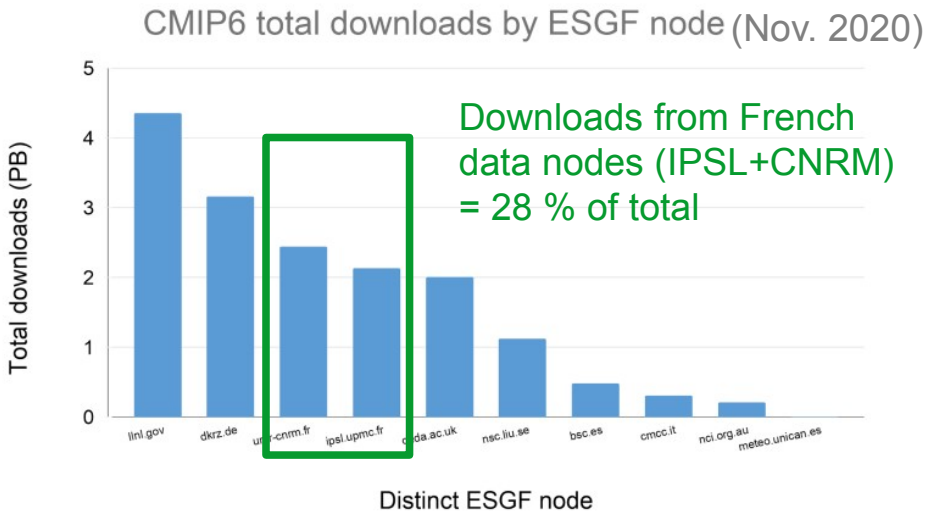


15 December 2020

CMIP6 : where are we now ?

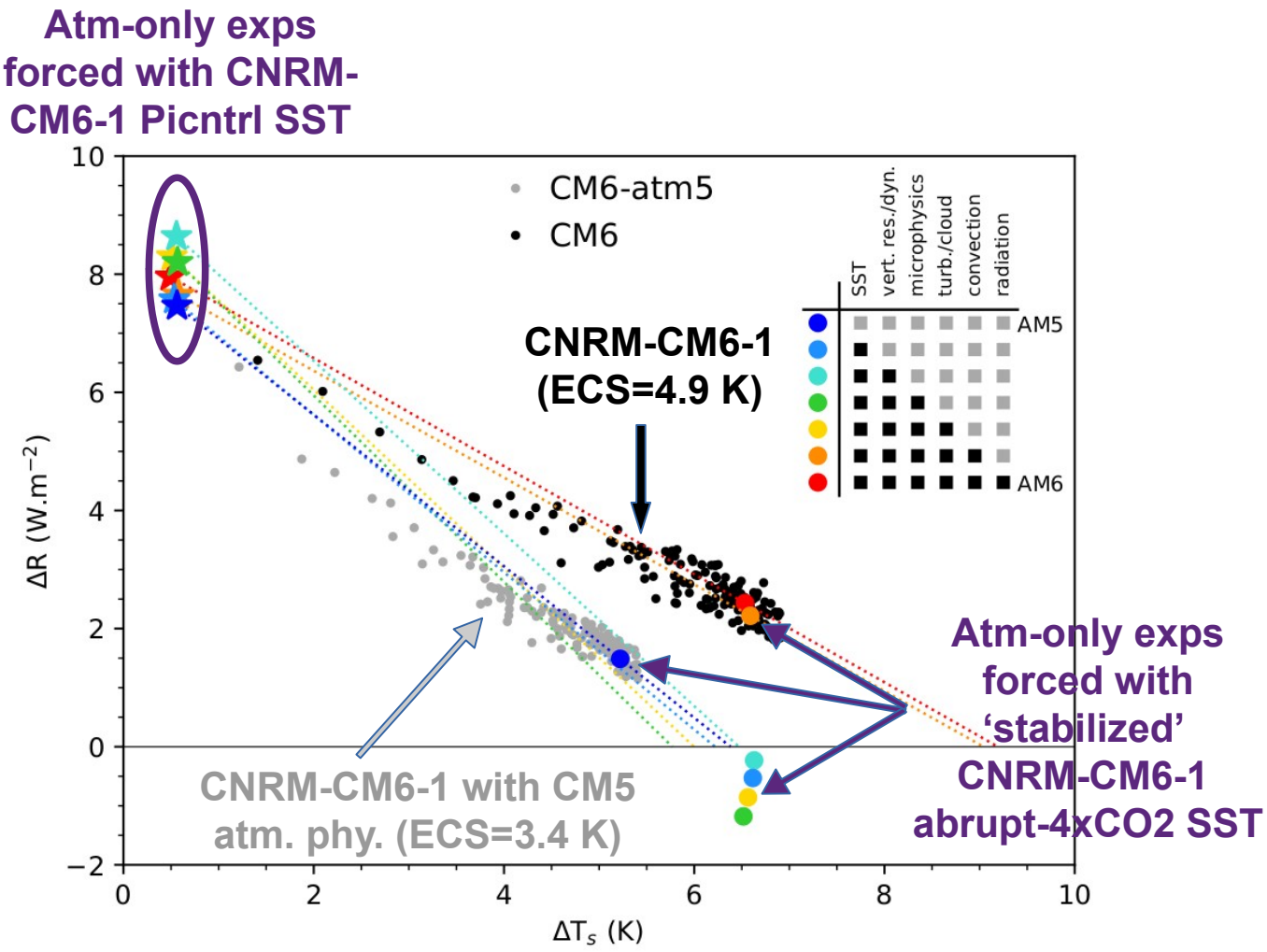
Group	Models	MIPs	Status	More information
IPSL	IPSL-CM6A_LR, IPSL-CM6A_ESM, IPSL-CM6A_MR1, IPSL-CM6A_MR025	All, MIPs except CDRMIP, FAFMIP, DynVarMIP, VIACS-AB	• Ongoing – 75000 simulated years so far • Running more simulations with IPSL-CM6A_ESM + MR configurations	• IPSL's contribution to CMIP6 : https://cmc.ipsl.fr/international-projects/cmip6/ • JAMES special issue 'The IPSL Climate Model Used in CMIP6'
CNRM-CERFACS	CNRM-CM6-1, CNRM-CM6-1-HR, CNRM-ESM2-1	All, except FAFMIP, VOLMIP, DynVarMIP, VIACS-AB	• ~finished – 35000 years so far • Participation in ZECMIP & Covid-MIP	• CNRM-CERFACS contribution to CMIP6 : http://www.umr-cnrm.fr/cmip6/ • JAMES special issue 'The CNRM Climate and Earth System Models for CMIP6'



⇒ Ready-for-publication model output thanks to XIOS I/O

- Coordinated contribution to CMIP6 within the French National Research Infrastructure ClimERI-France
- MIP coordination (ongoing) : OMIP, PMIP, VOLMIP (IPSL)
- Lots of data to be analysed in the coming years… but in many cases, too late for IPCC AR6 !

CNRM : understanding the high climate sensitivity of CNRM-CM6-1



Scatterplot of the global mean air surface temperature response (ΔTs, K) and net TOA radiative imbalance (ΔR, W.m^{-2}) in CNRM-CM abrupt-4xCO2 experiments and atmosphere-only experiments

Saint-Martin et al., submitted

IPSL : Influence of the Atlantic Meridional Overturning Circulation (AMOC) on Global near-Surface Air Temperature (GSAT) in IPSL-CM6A-LR

- IPSL-CM6A-LR = rather large sensitivity
  → ECS of 4.5 K and a TCR of 2.4 K
- Model ensemble mean → larger than observed warming over the historical period (Fig. 1).

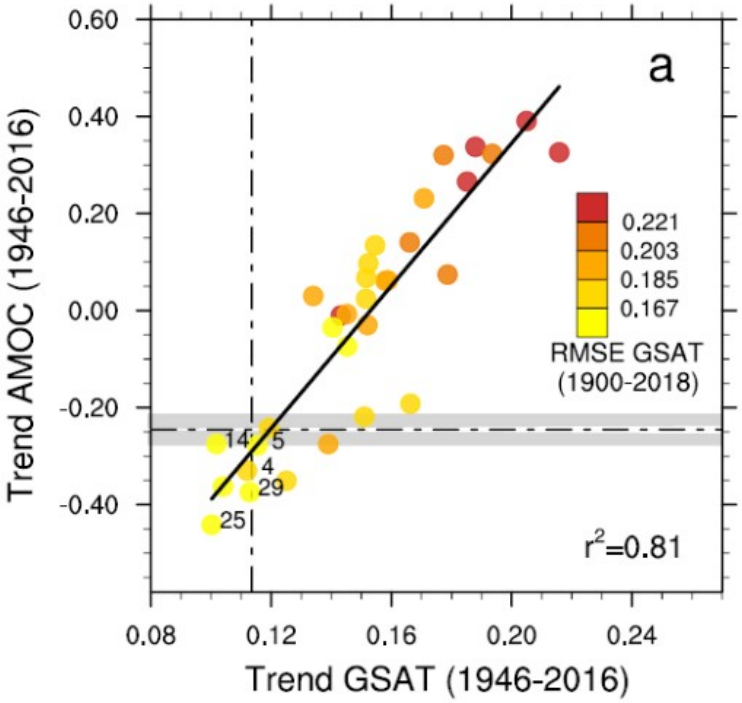


Fig 2. GSAT (K.decade^{-1}) versus AMOC (Sv.decade^{-1}) trends from the IPSL ensemble (filled circles) and the observations (dashed lines), with HadCRUT4 for the temperature and an AMOC fingerprint from Caesar et al., (2018)

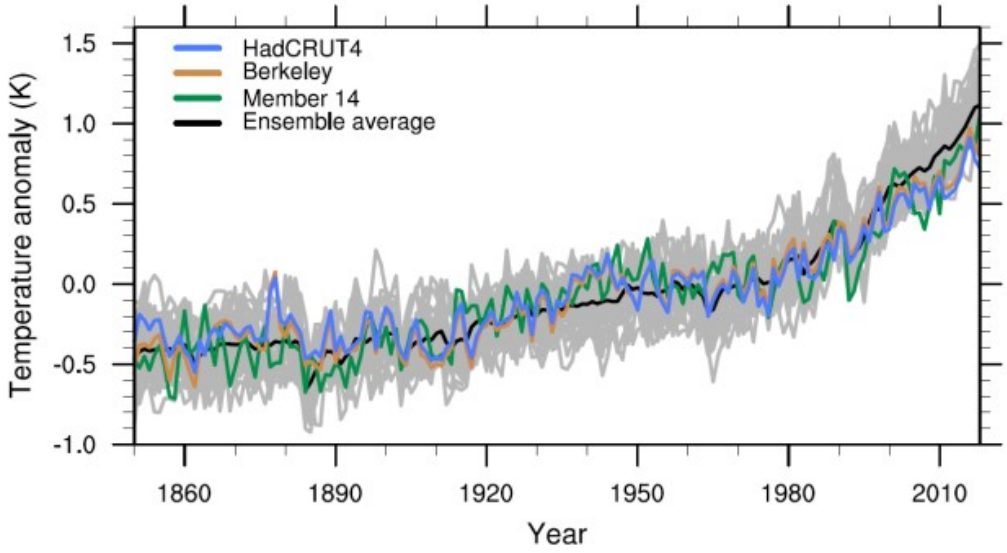


Fig. 1. GSAT anomaly relative to the 1850-2018 period from the IPSL ensemble (32 members)

- Some members (e.g. n°14) → consistent with the observed warming (Fig. 1, 2)
- Strong relationship between the AMOC the GSAT trends in IPSL-CM6A-LR

→ Results suggest that an AMOC weakening since the middle of the 20th century may have masked a fraction of the anthropogenic global warming
→ Implication on the robustness of observationally constraints of the warming of the past century

Bonnet et al., submitted

Appetite for CMIP7

- **Keep the scientific focus of CMIP** (understand the climate system, its response to the different forcings) through different MIPs
- **More time needed for model development but also for running simulations and analysing them :**
  - while MIPs should all still rely on a DECK, CMIP7 MIPs could have different timelines / frequencies - e.g. MIPs with operational implications vs MIPs more focused on 'understanding' (more spread out in time ?)
  - possibility to decouple model development from CMIP cycles, with more frequent model versions
- **Wish for a more 'frugal' CMIP7 :**
  - less MIPs (through merging? More restrictive criteria?)
  - rethink / simplify the data request, e.g. on the basis of the top 100 downloaded variables : http://esgf-ui.cmcc.it/esgf-dashboard-ui/cmip6.html)
- **The CIO could address these points :**
  - keep as much as possible of the CMIP6 infrastructure and maintain existing organisation / conventions (naming of variables, climate data request, forcing datasets, ESGF/CDNOT)
  - Operationalize the definition of forcings. The design of forcings should be better coordinated with the whole community, to avoid inconsistencies between observed recent trends and scenarios (e.g. N2O emissions, Tian et al., 2020)
- **Possible design changes :**
  - gather AMIP/OMIP/L(S3)MIP with CMIP historical (evaluation of coupled models and their components)
  - the MME is an 'ensemble of opportunity', perhaps a PPE MIP to better address uncertainties