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Etude des Scénarios Climatiques
Réalisés par l'IPSL et Météo-France

French groups:
IPSL
Meteo-France

Institut Pierre Simon Laplace
Sciences de l'environnement

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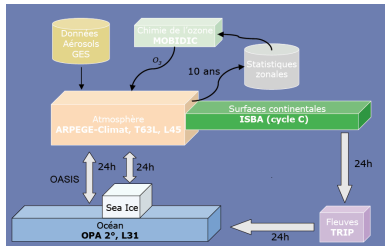
French participation to CMIP5

- Collaboration IPSL, Météo-France, Cerfacs

Modèle CNRM

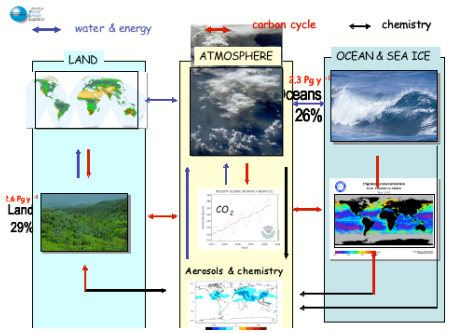


- New model version (OA)
- Improved horizontale and vertical resolution

- CNRM simulations « long term », no carbon cycle
- CERFACS short term

Atm	Ocn
256x128 x L31	362x292 x L42

Modèle IPSL



- ESM = with carbon (aerosols) interactive
- Improved resolution
- All CMIP5 simulations

- IPSL IGCM group coordinates the simulations across 5 labs

Atm	Ocn
96x95 x L39	182x149 x L31
144x142 x L40	182x149 x L31

- ESM only physical part at high resolution
- Subset of simulations

- New model physic
- Subset of simulations

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Simulations

Type d'expérience	IPSL		CNRM	
	Simulations prévues (version modèle)	Nbr années	Simulations prévues (version modèle)	Nbr années
PI Simulation de contrôle pré-industriel	• CO2 imposé (5-BR, 5-MR, 6-BR) • CO2 calculé (5-BR)	3100	• CO2 imposé	850
historical Historique (1850-2005)	• Simulation forçage (5-BR) • Tous forçage (3 membres)* (5-BR, 5-MR, 6MR) • Chaque forçage (*3) (5-BR)	3750	• Forc. anthro. (GES + aéro) x10 • Forc. anthro (GES seuls) x 5 • Forc. naturels + anthro. x 10 • Forc. naturels x 5	4680
Future climate Climat futur	• Simulation forçages (5-BP) • Scénario RCP4.5 (*3) (5-BR , 5-MR, 6-MR) • Scénario RCP 8.5 (*3) (5-BR, 5-MR, 6-MR) • Scénario RCP2.X (*3) (5-BR , 5-MR) • Scénario RCP 6 (*3) (5-BR , 5-MR)	3700	• Scén. RCP 4.5 (2006-2300) • Scén. RCP 8.5 (2006-2300) • Scén. RCP 2.6 (2006-2100) • Scén. RCP 8.5 (2006-2100) x 4	1065
Palaeoclimate Paleoclimat	• Simulation Holocène (5-BR, 5-MR, 6-MR) • Simulation LGM (5-BR, 5-MR) • Simulation dernier millénaire (5-BR, 5-R)	6000	• Simulation Holocène • Simulation LGM	850
Idealised experimens and carbon cycle Sensibilité climatique et étude des rétroactions	• 1%CO2/an (5-BR, 5-MR) • RCP4.5 pour cycle du carbone (5-BR) • 1%/an jusqu'au quadruplement, 4CO2 brutal (5-BR, 5-MR, 6-MR)	1200	• 1% CO2 (-> quadruplement) • 4 x CO2 brutal	290

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Computing

- Meteo-France :

  Computer : 12x8 proc NEC SX8

  Production : 1.5 years

  Storage : 400 To

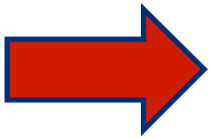
- IPSL

  Computer : 6*16 proc NEC SX9 + some simulations on // machine

  Production : 2 years

  Storage : 2 Po

- Some experiments still running



Huge exercice possible only if :
dedicated computer
specific storage* and dedicated infrastructure

* was under estimated + trouble (IPSL) for the migration on a new storage system

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Climate Dynamics special issue

Guess editors : S. Bony and J. Mignot

- The general purpose of this issue is:
  - To present the IPSL and CNRM Earth System Models.
  - To discuss few results obtained in the framework of the CMIP5 relative to the CMIP3, in terms of simulations and forcings.
- Contributions IPSL/CNRM/LGGE
- Major topics
  - Model description and basic evaluation (accepted : 5 revision : 3)
  - Climate variability and dynamical studies (accepted : 7 , revision: 3)
  - Analysis of the climate response to external forcings (anthropogenic, paleo, volcanic..) (accepted : 4)
  - Regional studies (accepted : 1, revision : 1
  - Earth-System interactions (chemistry, bio-geochemistry) (accepted : 2)

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Very positive : first time key references for the model available prior to multi-model analyses, stimulating discussions, exiting results, more questions than answers…

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Data distribution

- Contributing/leading partners to METAFOR, IS-ENES and ExArch (IPSL)
- Strong cooperation wrt data distribution process (CMORE, ESGF …)
- Data online since April 2011 from 2 datanodes.
  - 15 to 45 To downloaded / month / node (IPSL ; CNRM-CERFACS)
- ESGF p2p index node at IPSL since April 2012
  - French CMIP5/Obs4MIPs/TAMIP/PMIP3/GeoMIP/Lucid
  - indexPMIP3 data and index node
- synchro-data distributed to the community since September 2011 (CMIP5 download managers)
- Leading developer of the ES-DOC software ecosystem (front-end ; back-end)
- Super data cluster on line since April 2011.(IPSL,CNRM,CERFACS access only)
  - 250 cores and 600 To. Climate analysis enabled cluster (software+services)CMIP5 subsets based on scientists needs.
  - Scientist do not directly download the data ; synchro-data will.

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Impressive !!! Difficulties / storage and computing centers, size (simulations, number of variables,…, questions about maintenance organization

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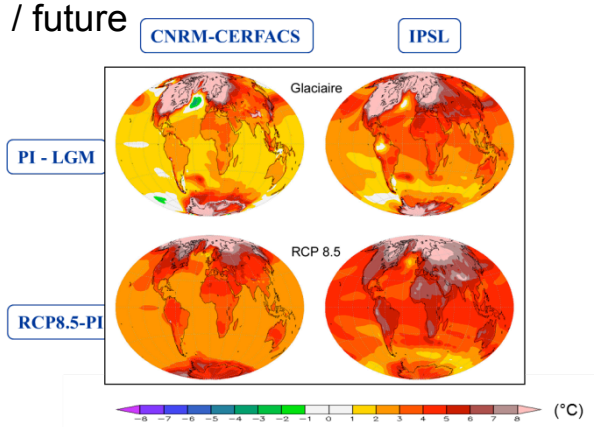
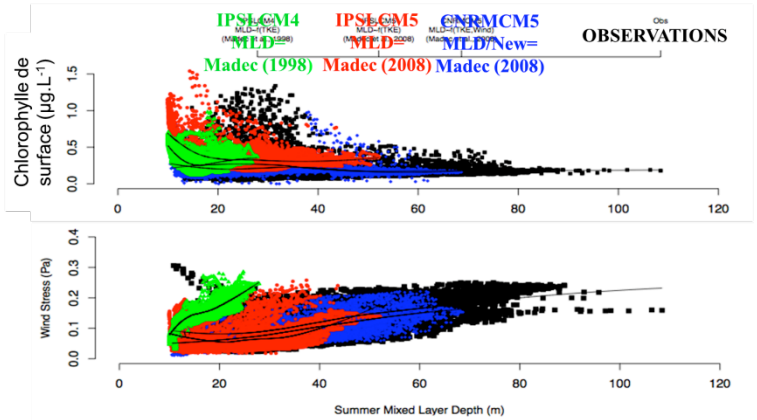
Positive aspects in CMIP5

- Same model version between MIPs
  - Progress past/future ; climate /carbon ; previsions/ projections

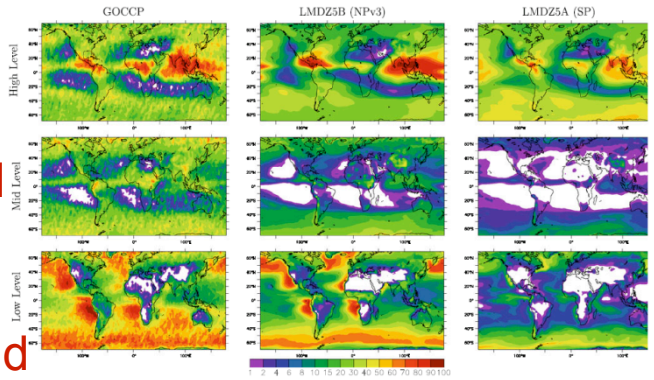
LGM / future





Evaluation of 3 models with same ocean biochemistry

- Role of idealised experiments (cf Sandrine's talk)
- COSP simulator
- ….



Evaluation of 2 versions of LMDZ usiing COSP

Set up and simulations that will remain a standard for several years
Need to ensure discussions and cross analyses between groups and MIPs

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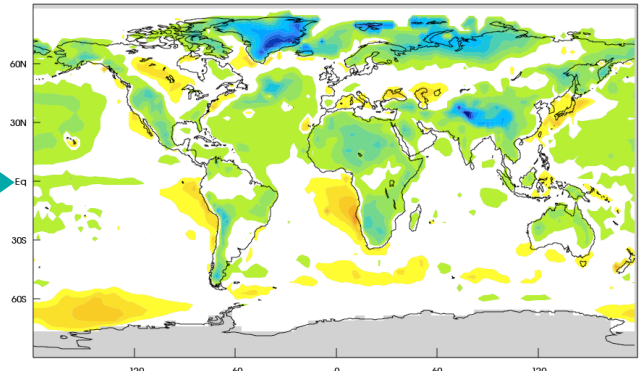
A trigger for model improvement

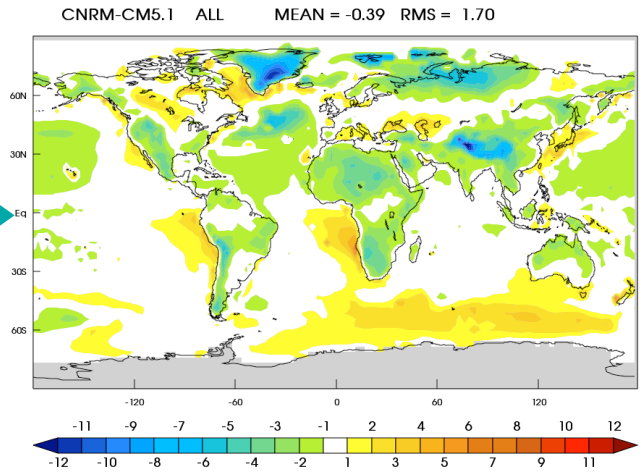
Ex: (Mainly oceanic) updates of CNRM-CM5
Ocean salinity and water conservation (water discharge from temperate regions, ice-ocean water+salt exchanges…) CNRM-CM (CMIP5) ➔ CNRM-CM5.2 (COMBINE EU project)

SST-T2M anomalies / HadSST-CRU2

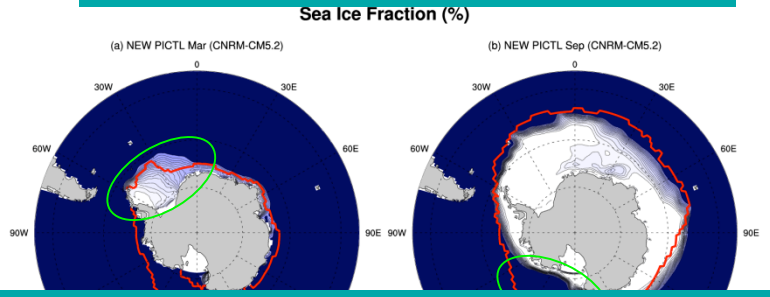
CNRM-CM5.2



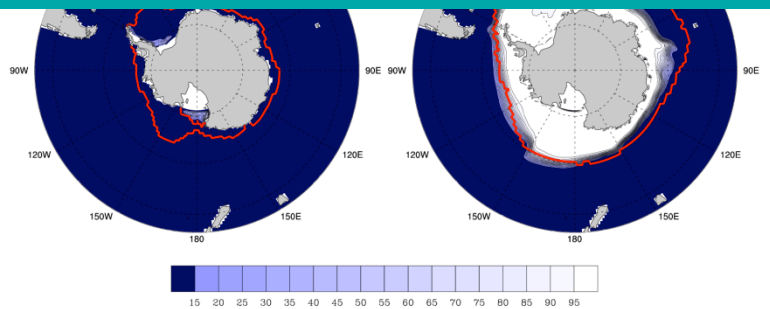
CNRM-CM5.1



SEA ICE
MARCH SEPTEMBER



Mass transport at Drake Passage
CNRM-CM5.1 : 87*Sv*
CNRM-CM5.2 : 133*Sv*
Cunningham et al. (2003) : 137*Sv*



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Aspects to consider

- Organization for the definition and harmonization of lists of variable and diagnoses
- ESGF
  - Transparency / key decisions
  - Roadmap (short/medium/long term) available to all
  - User needs to drive ESGF development
  - Climate modeling representative
  - Open source approach
- CMIP5 : Have a synthesis of results + feedback on the whole project in 2-3 years + conference

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CMIP6?

- Need to define key questions (ex: CMIP5 / carbon feedback, decadal prediction and extremes)
- Should be "reasonable" (smaller gap than between CMIP3 and CMIP5) : CMIP5 as a baseline + additions to cover gaps or new questions
- Results CMIP3/CMIP5 → need to have a focus on model systematic biases
- Need better link with aerosols and land use modeling communities (regional changes)
- Timing with IPCC (different steps?)
- Have time to discuss and share expertise on model development
- Anticipation needed / computing centers, data distribution, sofware for analyses…