EUCLIPSE WP2

Objectives

- *To evaluate the simulation of clouds, precipitation and radiation by climate and weather prediction models*, point out systematic and compensating errors, and develop cloud metrics.
- *To investigate whether and how the simulation of cloud and moist processes influences the simulation of the current climate*, in particular the mean tropical precipitation and large-scale circulation, the tropical variability at intra-seasonal and inter-annual timescales, and the simulation of temperature extremes over Europe.
- *To quantify and to interpret the inter-model spread of climate sensitivity estimates and of the cloud and precipitation responses to climate change predicted by ESMs,* to identify the regions, the cloud regimes and the meteorological conditions primarily responsible for this spread, and to explore the mechanisms that control this response in the different models.

Sandrine Bony (LMD/IPSL, Paris)
EUCLIPSE/CFMIP Meeting on Cloud Processes and Climate Feedbacks
Egmond aan Zee, The Netherlands, July 8-11 2014

Deliverables (brief description and month of delivery)

Associated with Task 1:
D2.1: Report on evaluations of clouds, radiation and precipitation simulated by climate models using COSP, clustering and compositing techniques developed in WP1 and satellite observations (Month 30).

D2.2: Report on the evaluation of cloud-aerosols-radiation interactions in ESMs (Month 30).

D2.3: Design and application of a set of metrics that synthesises the ability of climate and weather prediction models to simulate clouds, precipitation and radiation (Month 36).

Associated with Task 2:
D2.4: Report on the ability of models to simulate the ITCZ, the intra-seasonal and inter-annual variability of the tropical atmosphere, and temperature extremes over Europe using a new set of diagnostics (Month 24).

D2.5: Report on the influence of the representation of cloud and moist processes in models (based on D1.4, D2.3 and WP3) on the simulation of the ITCZ, MJO and ENSO, and temperature extremes over Europe (Month 48).

Associated with Task 3:
D2.6: Report on the diagnostic of the climate feedbacks produced by the different models in some CMIP5 simulations; Report on the global and regional spreads of feedbacks and of cloud and precipitation responses to climate change; and their comparison with estimates from the CMIP3 models (Month 24).

D2.7: Report on the identification of the processes or cloud types most responsible for the spread in climate change cloud feedbacks and precipitation responses (Month 36).

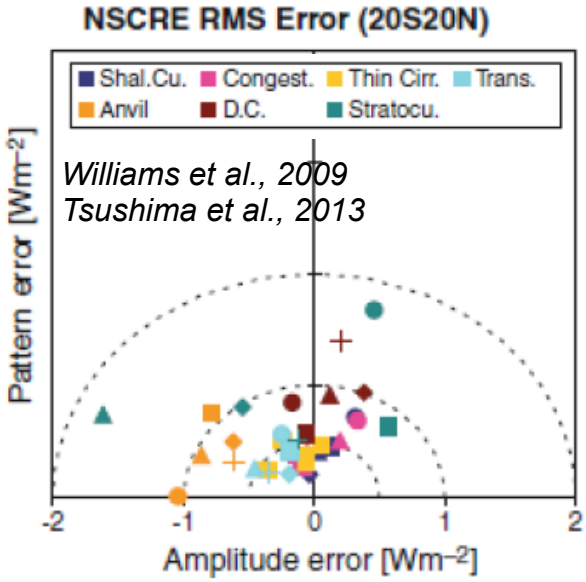
D2.8: Report on the interpretation of the spread of cloud and precipitation responses among models, in interaction with WP3 and WP4 (Month 48).

1. Evaluation & Metrics
2. Understanding of cloud-circulation couplings
3. Understanding of cloud feedbacks, climate sensitivity and precipitation changes

1. Evaluation & Metrics
2. Understanding of cloud-circulation couplings
3. Understanding of cloud feedbacks, climate sensitivity and precipitation changes

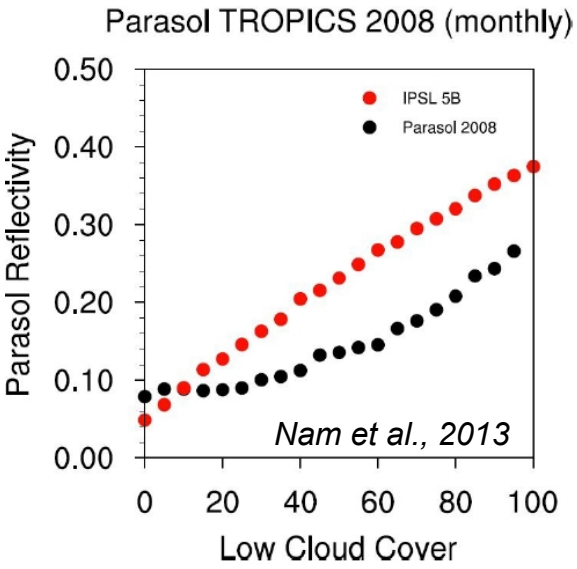
Plenty of metrics and diagnostics developed for the evaluation of clouds

Seasonal cycle ISCCP

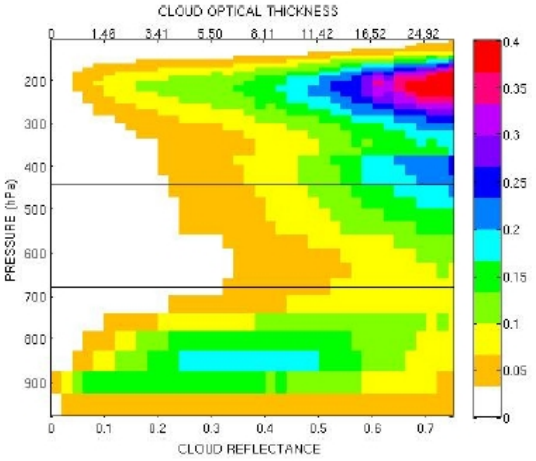


Williams et al., 2009
Tsushima et al., 2013

Tau-cld fraction CALIPSO/PARASOL

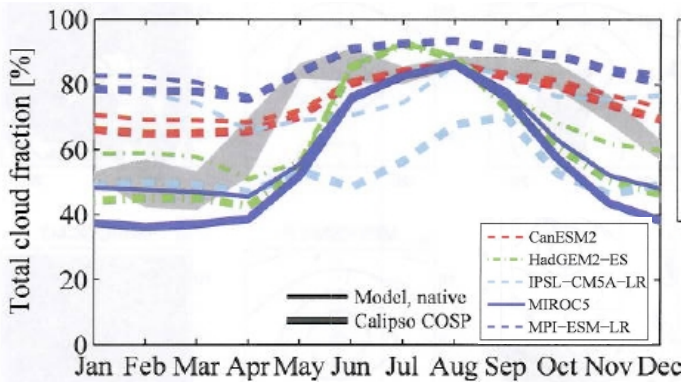


Vertical distribution CALIPSO/PARASOL



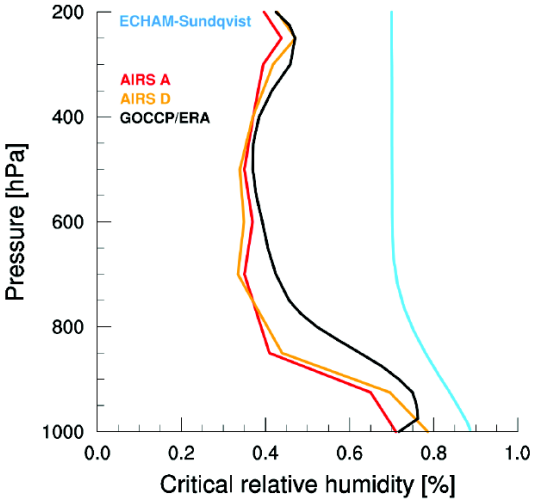
Konsta et al., 2013

Arctic clouds CALIPSO simulator



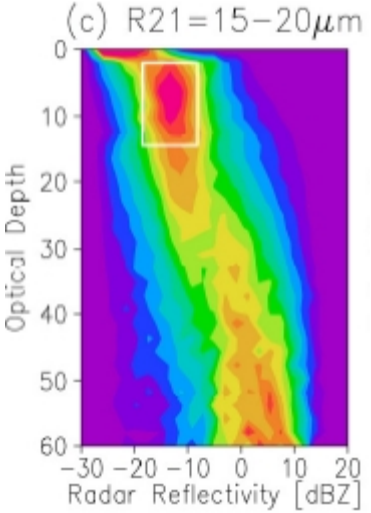
Doutriaux-Boucher et al.., 2004
Doutriaux-Boucher & Quaas., 2012

Critical humidity AIRS & CALIPSO



Quaas. 2012

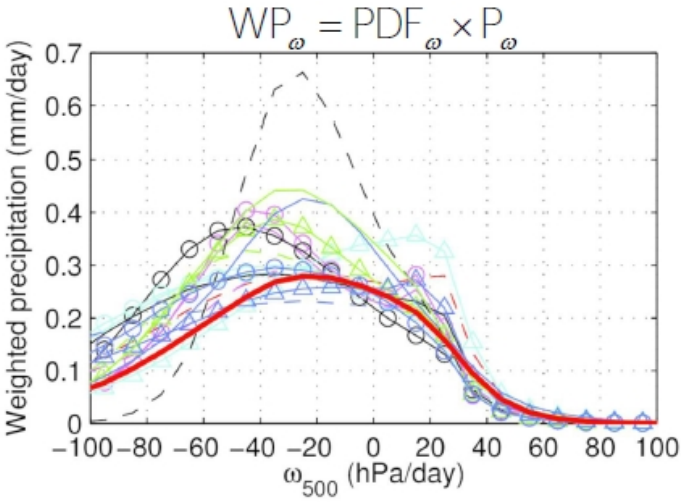
Microphysics CloudSat/MODIS



Suzuki et al., 2010

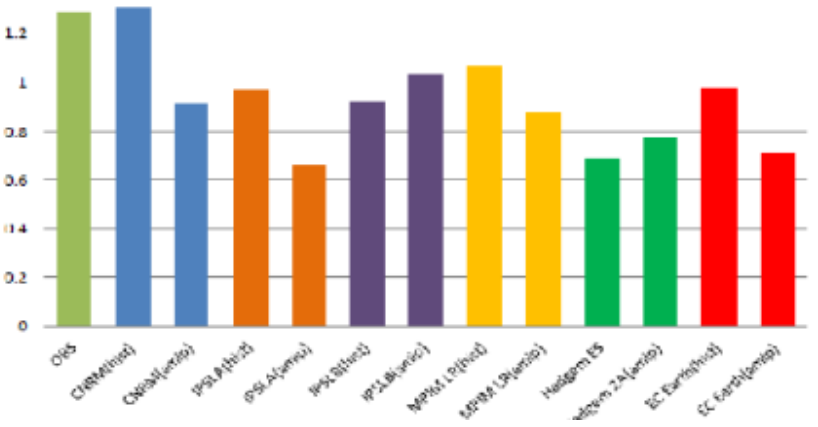
but also to evaluate many other aspects of the climate system :

Double ITCZ syndrome



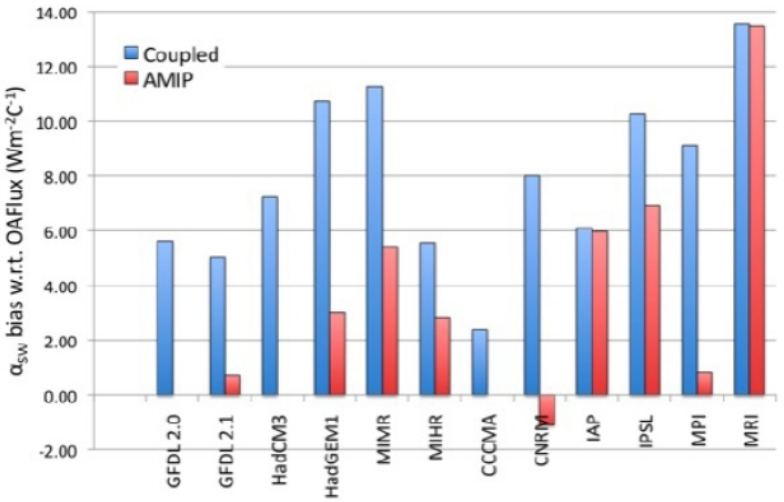
Oueslati and Bellon 2013

Eastward vs Westward propagation in MJO



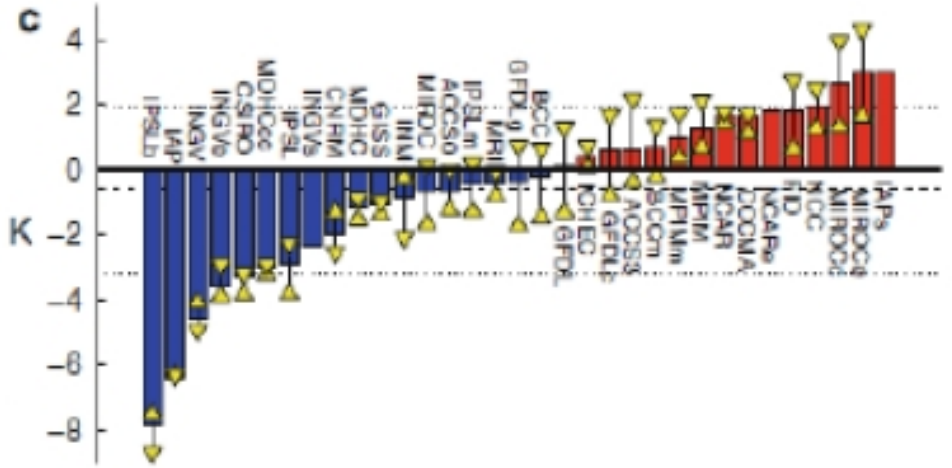
Bellon et al in prep

Cloud-SST feedbacks during ENSO



Lloyd et al. 2011

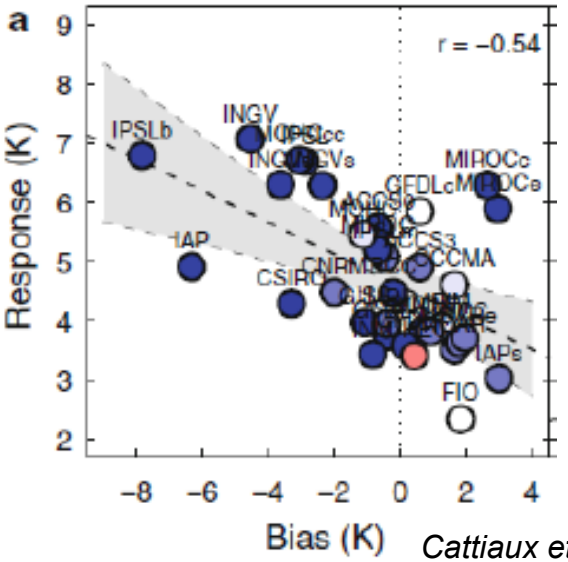
European temperatures



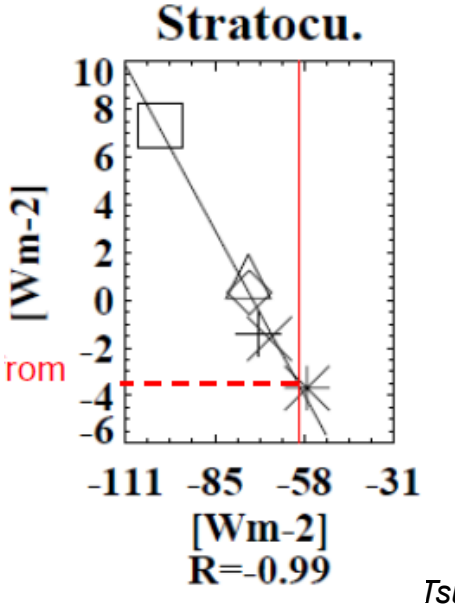
Cattiaux et al., 2013

Plus emerging constraints than may help constrain aspects of climate projections

European temperatures

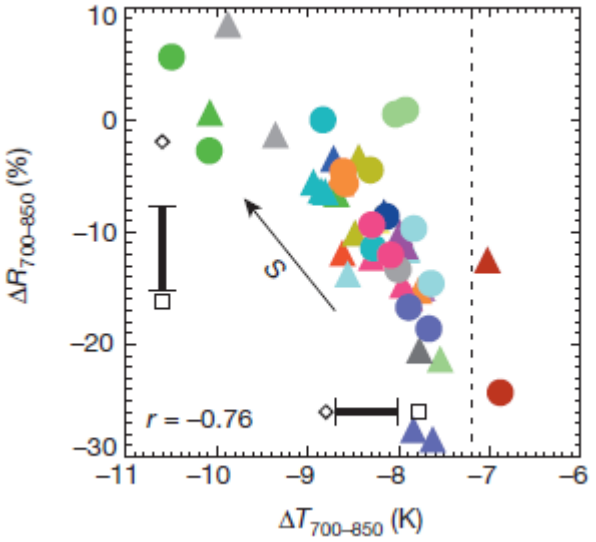


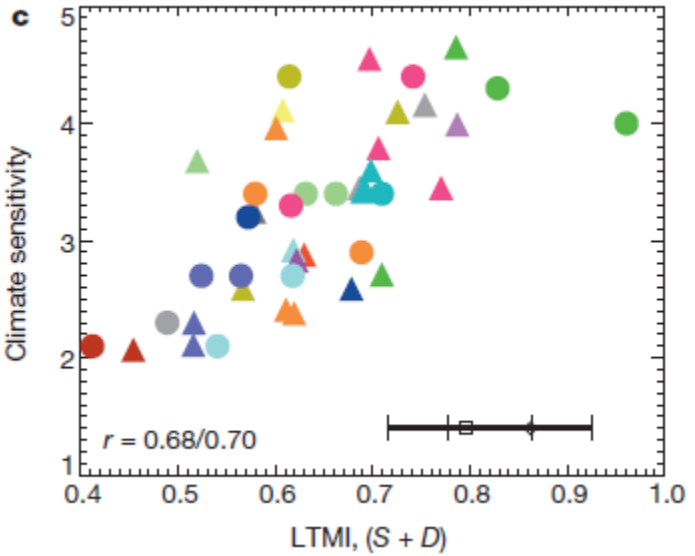
Cattiaux et al. 2013



Tsushima et al 2013

Low-tropospheric mixing and Climate Sensitivity





Sherwood et al., 2014

1. Evaluation & Metrics

2. Understanding of cloud-circulation couplings

3. Understanding of cloud feedbacks, climate sensitivity and precipitation changes

cf afternoon talks

What went (very) well :

- Exciting science, major results and input to the IPCC AR5
- Active participation of all centers: KNMI, Met Office, MPI, IPSL, MISU, Athens, DKRZ
- Development of strong collaborations across EUCLIPSE partners
- Tens of papers (more than 30) published on WP2 activities
- A substantial number of papers published with different EUCLIPSE partners
- All deliverables were fulfilled
- Good interaction of WP2 with
  - WP1 (simulators and diagnostics, CFMIP experiments),
  - WP3 (processes, NWP approaches)
  - WP4 (hypothesis testing, COOKIE, SPOOKIE)
- Legacy : analysis frameworks, idealized configurations,
  guidance for model development, WCRP Grand Challenge

What could have been better

Lessons for the future...

- Plenty of metrics developed, but their distribution to the community is only partial (thanks Yoko!)
- Cloud-Aerosol analyses were delayed (Thanks Johannes!)
- No formal publication policy for the analysis of coordinated experiments (COOKIE, SPOOKIE)

What could have been better

Lessons for the future...

- Plenty of metrics developed, but their distribution to the community is only partial (thanks Yoko!)
- Cloud-Aerosol analyses were delayed (Thanks Johannes!)
- No formal publication policy for the analysis of coordinated experiments (COOKIE, SPOOKIE)
- *EUCLIPSE finishes too early....*