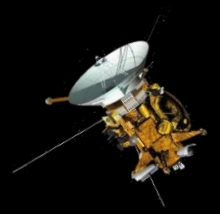
LMDZ Training session 2019

Who are you ?

Audrey Chatain

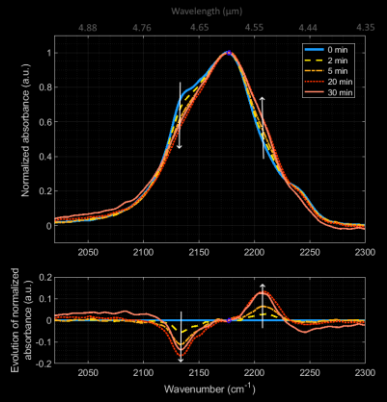
PhD at LATMOS



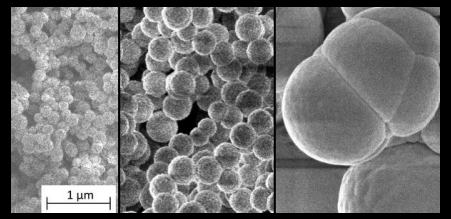
Cassini data:

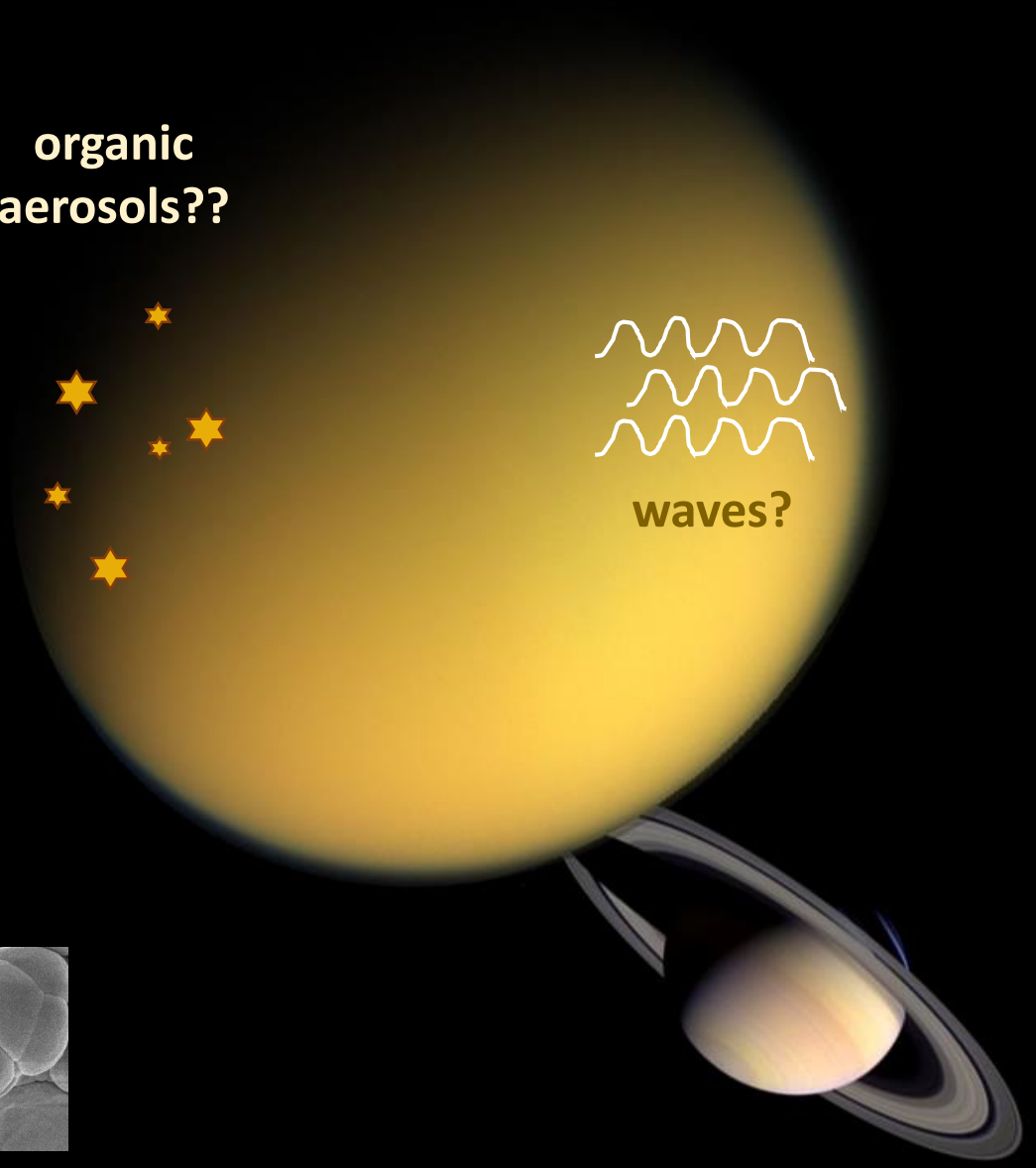
study of the ionosphere (electrons)

Lab simulation:



-plasma
-IR absorption
-mass spectrometry
-microscopy

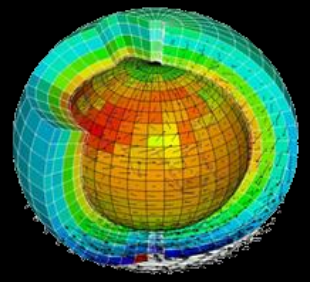




Postdoc at LMD?

Cassini data:

detection of waves in the stratosphere?



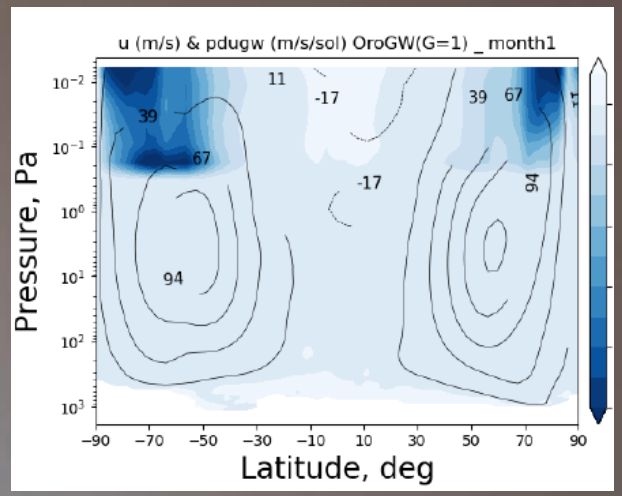
GCM Titan:

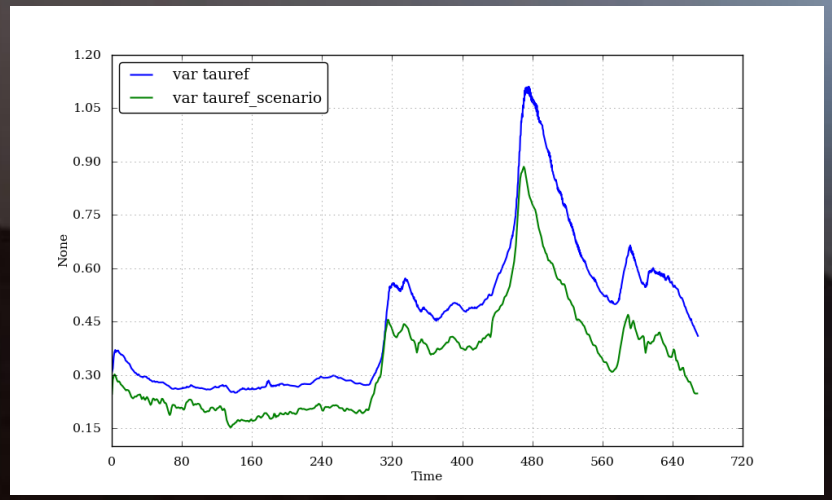
also waves?
source?
...

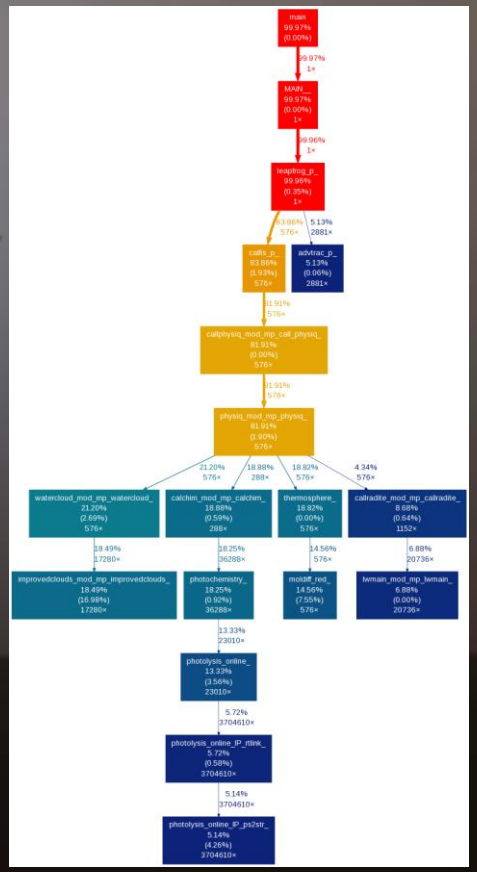
Antoine BIERJON_

Research Engineer at LMD since 01/12/19_
Intern at LMD (06/19-11/19)_

Mars GCM v6+ and comparison to observations_
Mars Climate Database_







Christophe Genthon

Laboratoire de Météorologie Dynamique - Jussieu

Instable lent :
LMD => LGGE (maintenant IGE) en 1991
IGE => LMD en 2018

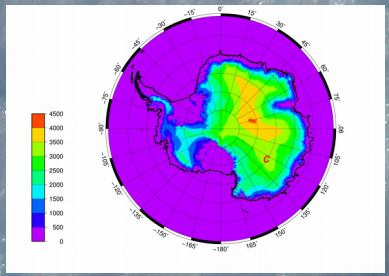
Objets d'étude actuels : atmosphère, météorologie et climat antarctiques

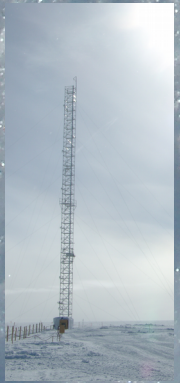
-observations in situ, télédétection

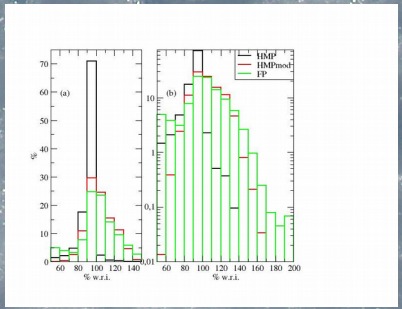
- processus, paramétrisations physiques

- modélisation météorologique et climatique

LMDZ : Le modèle multi-échelle, du processus à la prévision climatique
Et sa future déclinaison DYNAMICO







Artem Feofilov

1990-2000: St. Petersburg State University, Ph.D. in physics with specialization in photonics.
2001-2016: scientific researcher at IAA, NASA GSFC, LMD
2016-now: research engineer at LMD

Specialization:
radiative transfer in planetary atmospheres, which includes
(a) developing the models of radiation formation;
(b) estimating the energetic effects of the interaction between the radiative field and the matter;
(c) developing the methods of atmospheric properties retrieval using the data from remote sensing.

Interest in the present course:
1. Advance with the understanding of LMDZ and with the role of radiation in its energetics including its interactions with clouds and aerosols;
2. Practice in running various scenarios;
3. Learn the debugging logic when it comes to installations on new machines.

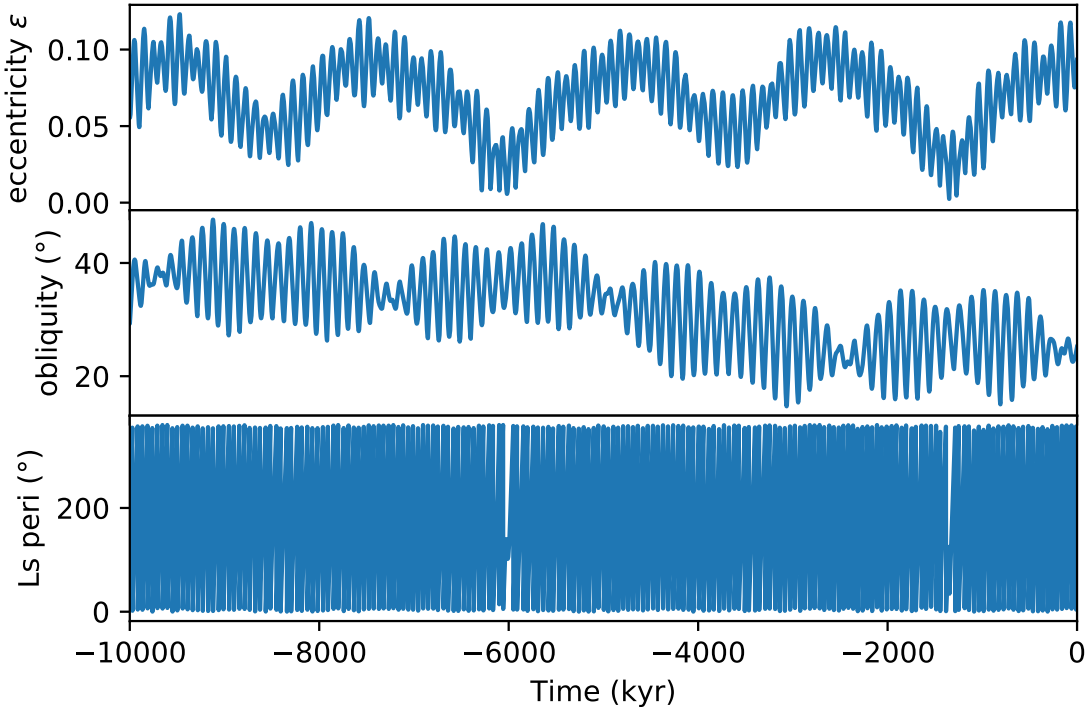
Christophe Mathé : post-doctorant (LATMOS)

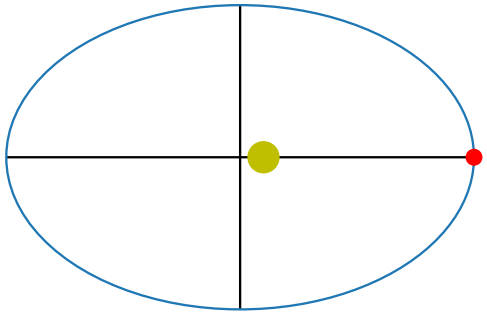
- Axe de recherche :
  - Atmosphères planétaires
- Compétences :
  - Expérience de laboratoire pour synthétiser des analogues d'aérosols planétaires (M2)
  - Analyse de données spatiales de l'émission thermique de Titan (thèse)
  - Programmation : Fortran, C, Python
- Travaux actuels :
  - Couplage d'un modèle de microphysique de nuage de CO_2 au GCM-IPSL de Mars
  - Etude des rapports isotopiques en C et N dans HCN et HC_3N dans l'atmosphère de Titan
- Futur :
  - Carrière d'IR en calcul scientifique et développement logiciel

Joseph Naar

1st year PhD student (2019-2022)
Laboratoire de Météorologie Dynamique (LMD-Jussieu)
Advisor : François Forget

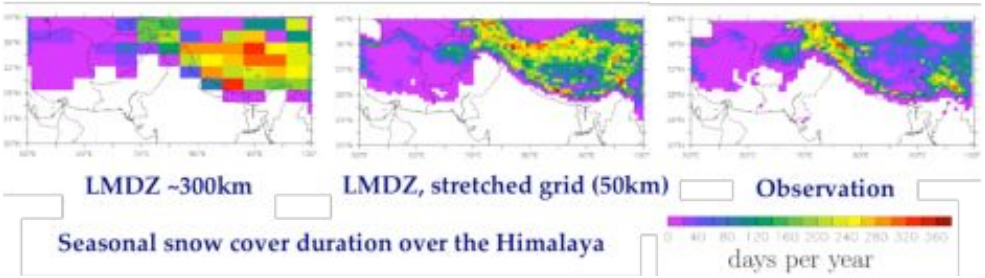
PhD : Martian recent paleoclimates & Mars Evolution Model (coupled evolution of Mars' surface and climate)
Other interests : Earth paleoclimates, exoplanets, astrobiology...





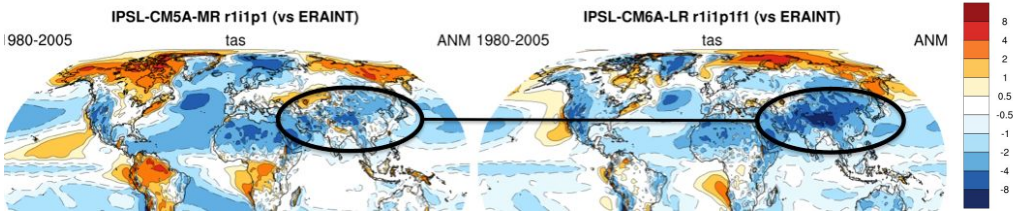
Modeling climate trends and variability in the Himalaya to understand cryosphere changes

Mickaël Lalande / PhD supervisors: Gerhard Krinner (HDR) and Martin Ménégoz (2019-2022)
Institute of Environmental Geosciences (IGE)



Highlight climate variability and trends in the Himalaya using the global atmospheric model LMDZ with a variable resolution grid centered on this region.

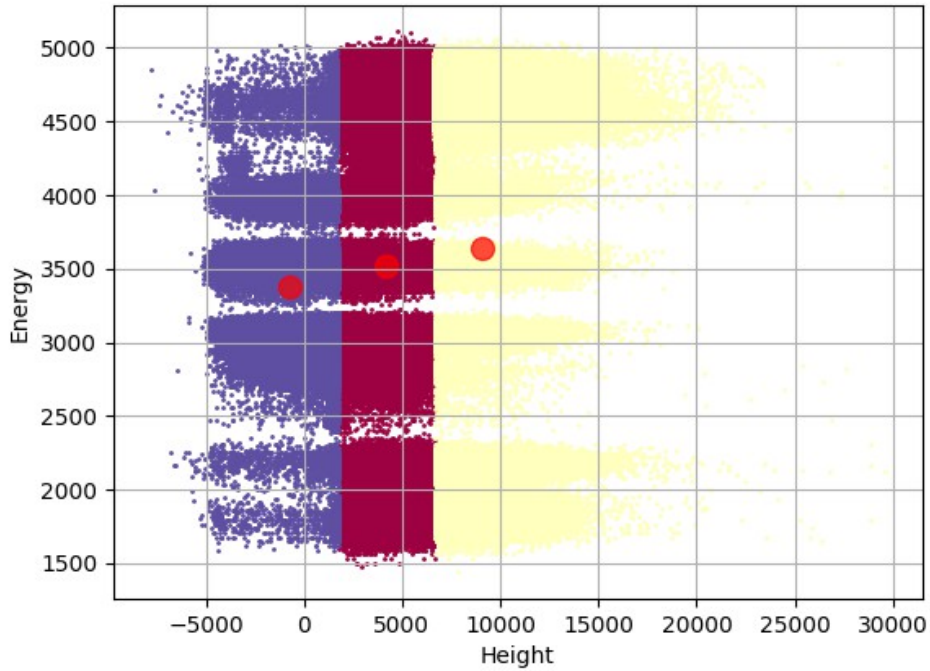
Subgrid parameterization of the surface energy balance computation in the LMDZ or Orchidée? (snow-covered or not + elevation)



Vincent CAILLÉ
Thésard

<u>Sujet de thèse</u> : Modélisation méso-échelle des nuages de CO_2 dans les nuits polaires martiennes

<u>Travail actuel</u> : Analyse des données MOLA par des méthodes de clustering



Répartition des retours « nuages » des données MOLA

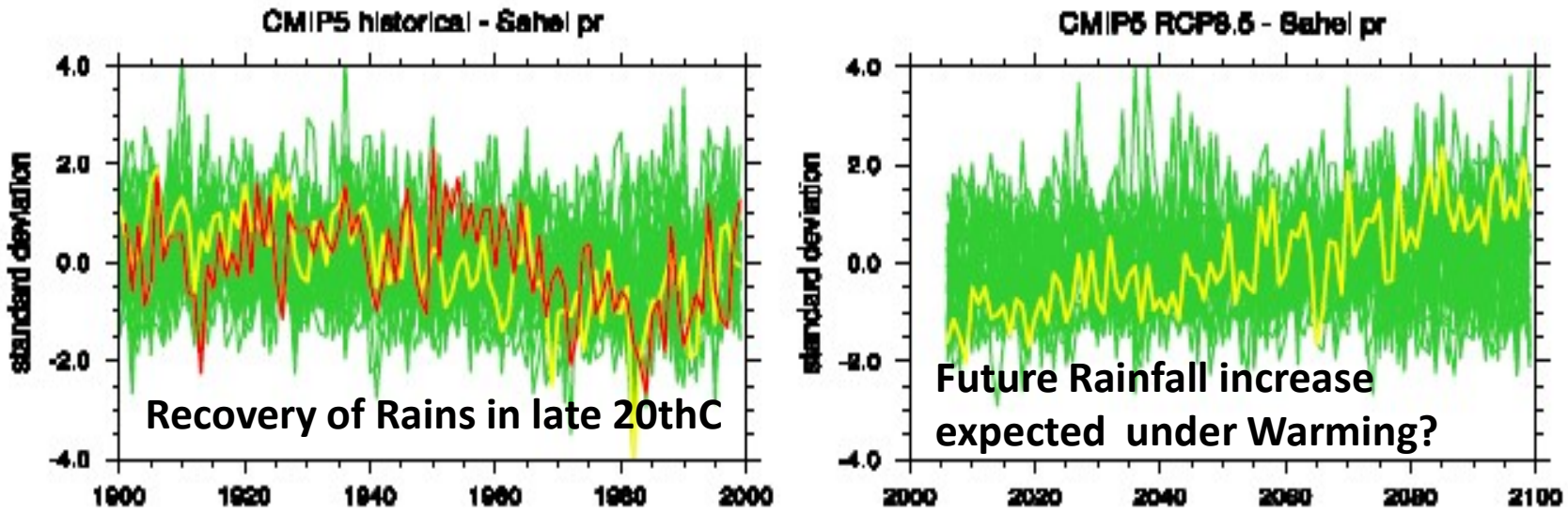
Claudine WENHAJI NDOMENI

Postdoctoral Researcher
CNRS-LMD – ENS
Groupe: DPAO

Superviseur: Dr. Alessandra Giannini

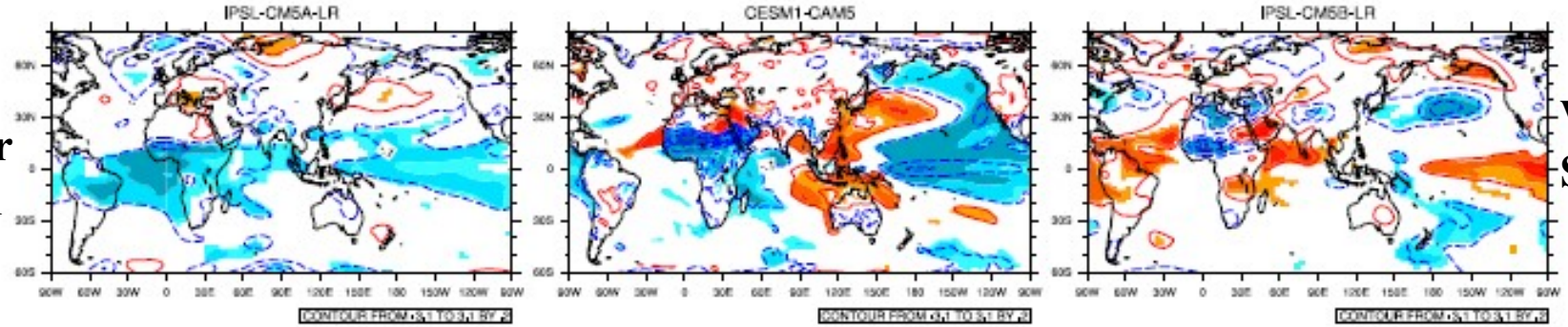
WHAT's NEXT?
UNCERTAINTY OF MODEL FUTURE PROJECTIONS?
THERMODYNAMICS or DYNAMICS ?

Giannini et Kaplan 2018



Dynamics (large-scale circulation) vs Thermodynamics (Local Moisture Supply)?

Dryer Sahel



Wetter Sahel

Regressions of a Sahel rainfall index with 1900-1999 CMIP5 historical simulations air surface temperature

GOAL: 1- Reduce uncertainty in projections of tropical precipitation change (mainly SAHEL)
2- Explain the differences in model behavior

StratoClim

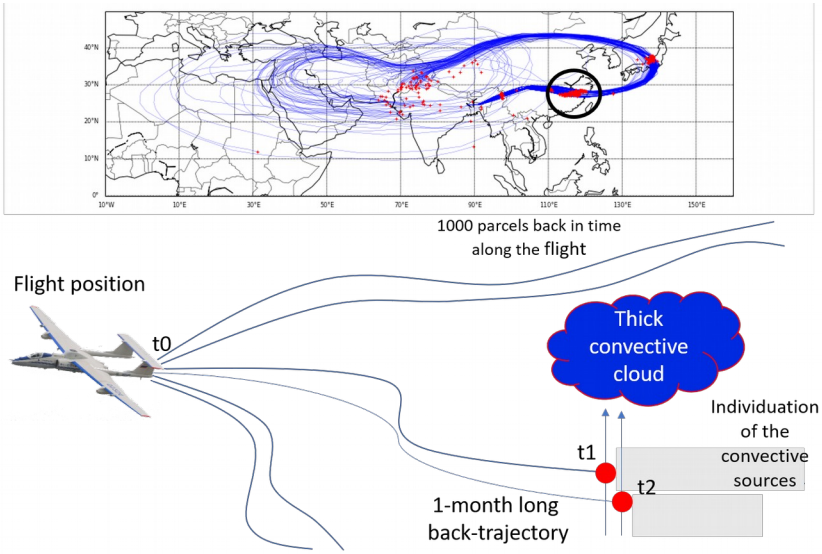
Stratospheric and upper tropospheric processes for better climate predictions

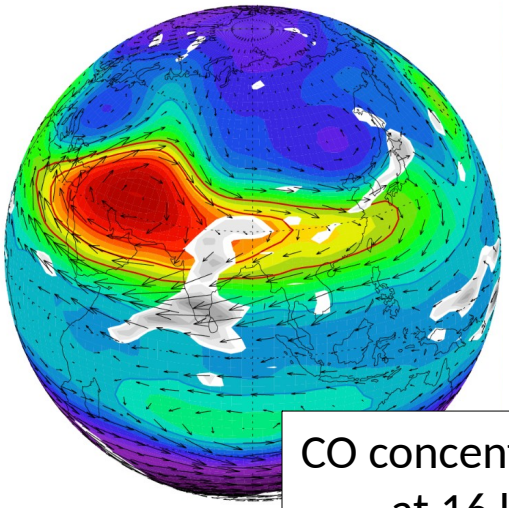
Silvia Bucci

PostDoc, LMD

General background of atmospheric Physics.
Specialization in transport dynamics
at tropospheric and stratospheric level on
highly polluted regions.
Linking emissions and atmospheric compositon

Currently working on:
the StratoClim project
Focus on the Asian Summer Monsoon
Anticyclone and the transport
from deep convection





CO concentration
at 16 km

Omar Gutierrez

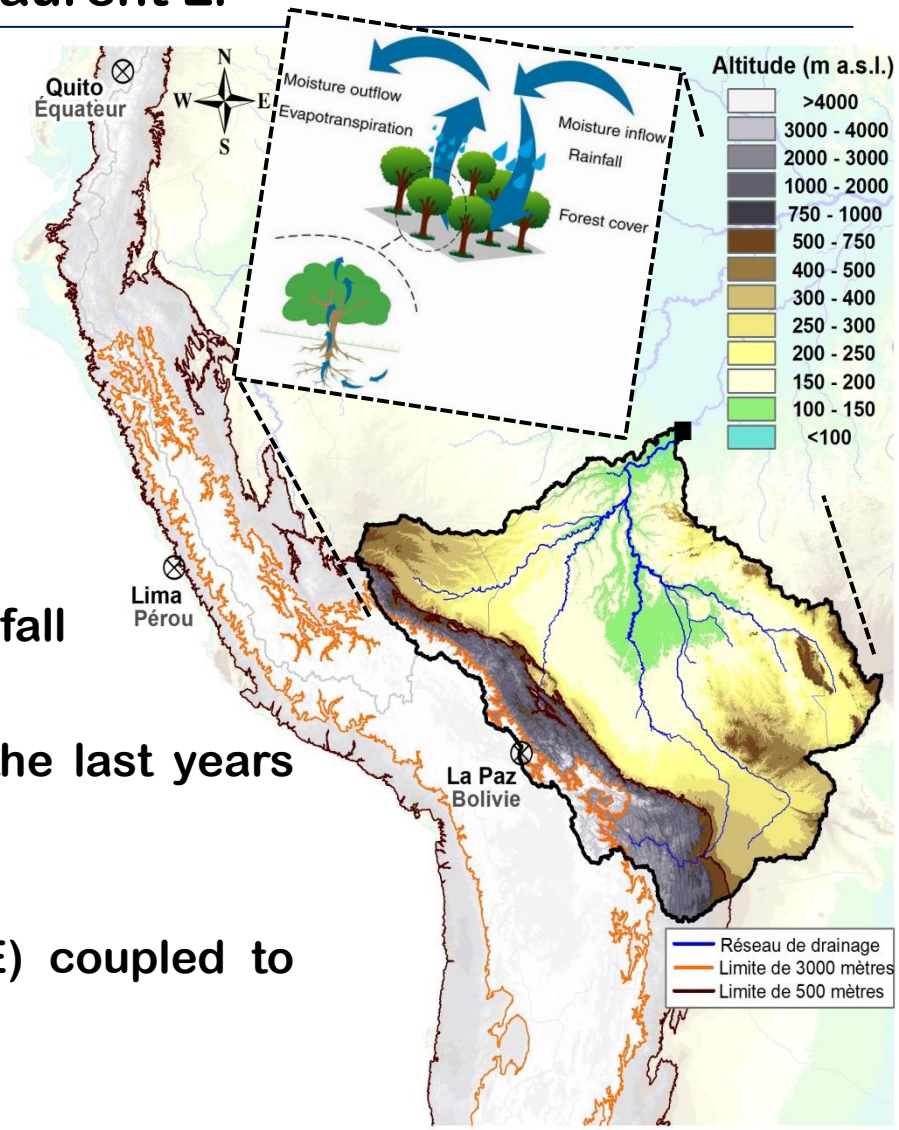
Ph.D student

Laboratoire de Météorologie Dynamique (LMD)

Advisor: Laurent Li

Research:

Biophysical feedbacks between land cover changes and climate variability in the western Amazon



Study area:

- High spatio-temporal variability in rainfall regimes.
- Significant changes in land cover during the last years (deforestation, forest fires, agriculture, etc).

Modeling of surface processes (ORCHIDEE) coupled to atmospheric circulation Model (LMDZ)

Big picture

- Study the **possible climates** of rocky exoplanets with advanced models such as the LMDZ
- **Constrain the orbital parameters** allowing the presence of **liquid water** at the surface of the planet

PhD thesis : Climate of rocky planets around low mass stars

Guillaume Chaverot

Supervised by : Emeline Bolmont & Martin Turbet

Laboratory : Observatory of Geneva

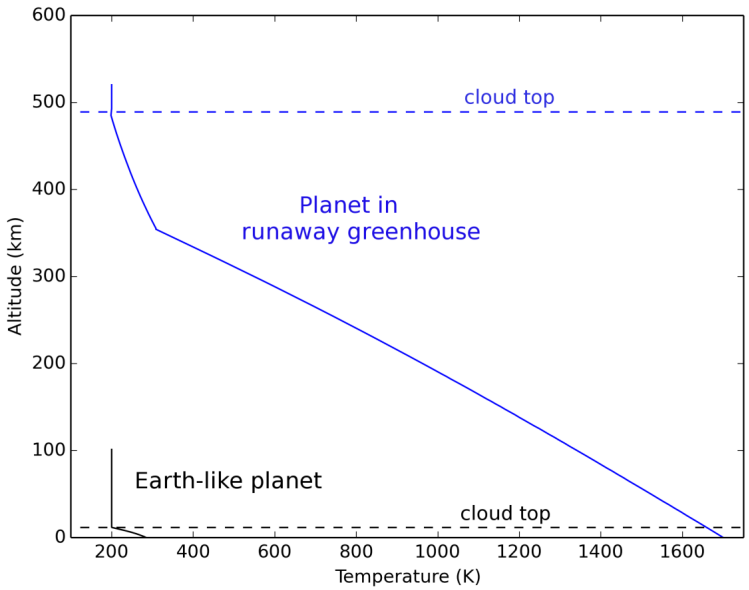
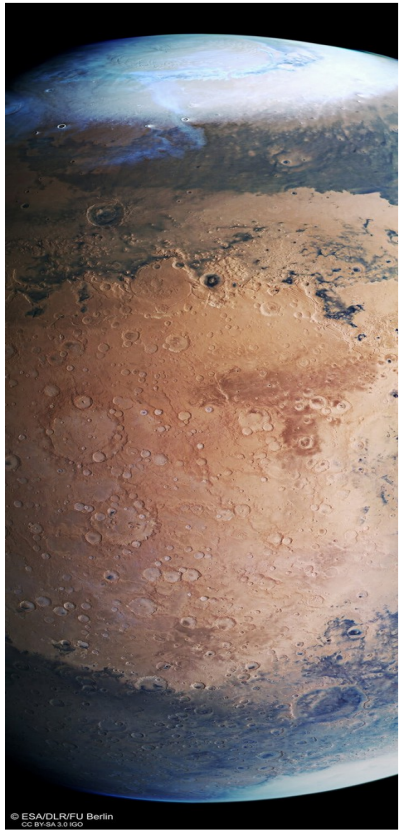


Figure from Turbet et al. 2019

Work in progress

- Use a **1D reverse model** to explore the runaway greenhouse transition
- Study the **evolution of the height of the atmosphere** (Turbet et al. 2019) for different water and **background gases** pressures
- Take into account **water loss** (by photo-dissociating and escaping) and the **coupling atmosphere/rocky interior** in the 1D model

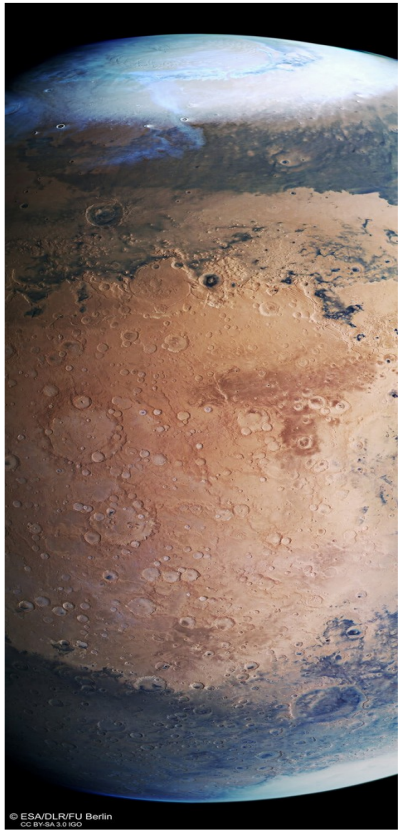


Antony Delavois

LMD

Engineer

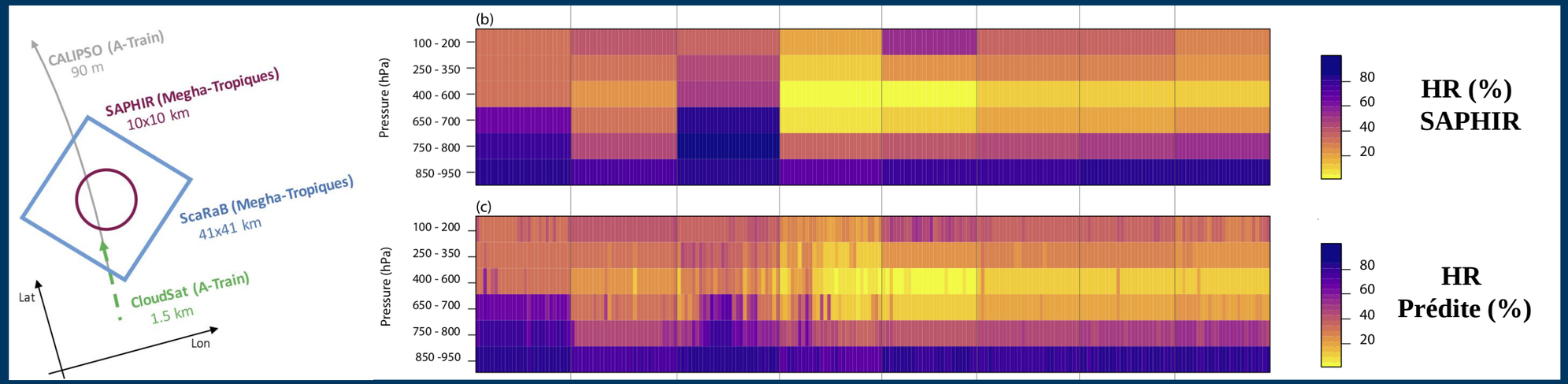
New dynamical core DYNAMICO for the martian GCM



Observation de l’eau atmosphérique à différentes échelles spatiales

V. MICHOT

-> cycle de l’eau atmosphérique
-> liens vapeur d’eau et nuages à différentes échelles spatiales



Présentation Mounia Mostefaoui

- Sujet de thèse : le rôle de la France dans le respect de l'Accord de Paris pour le climat.

- Encadrants: Fabio d'Andrea (LMD, ENS) et Anouk Barberousse (SND, Sorbonne).

- Intérêt de la formation: comprendre le fonctionnement du LMDz en particulier sous l'angle épistémologie de la gestion de l'incertitude et du décompte des émissions de CO_2.

Saloua BALHANE

1st year PhD Student

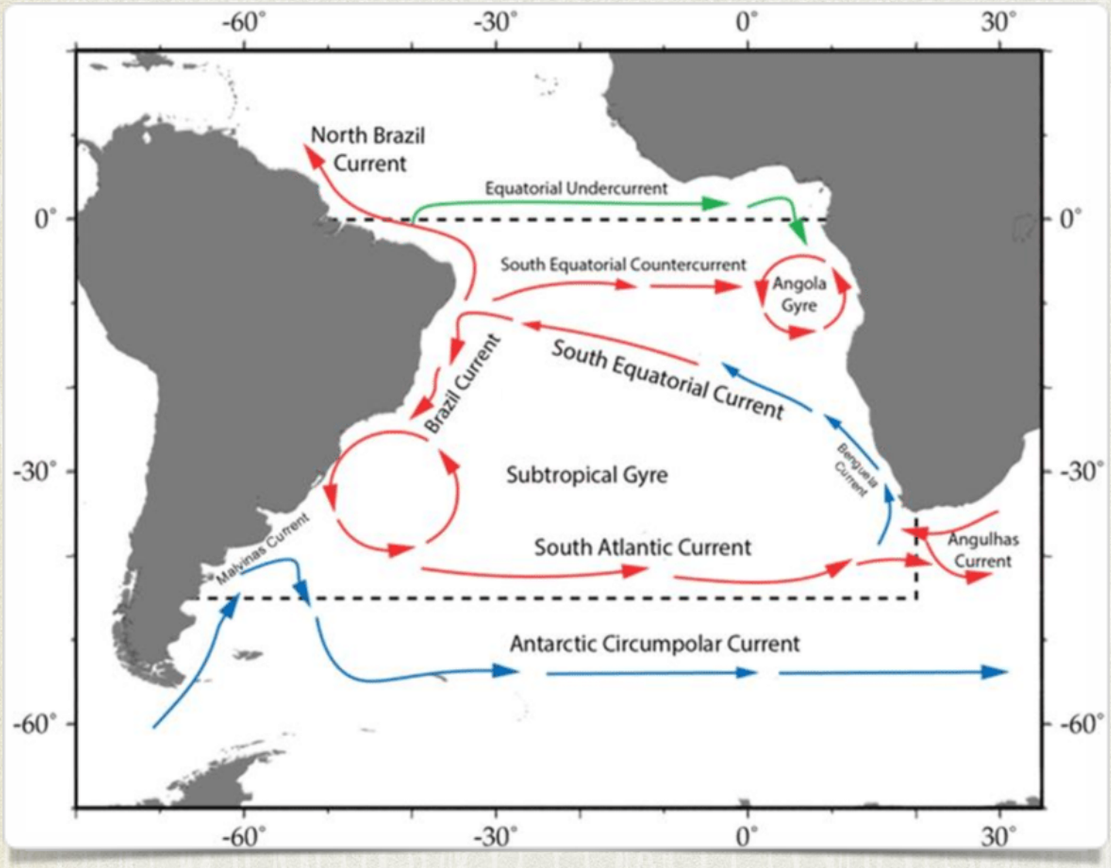
PhD supervisors: LMD: Philippe Drobinski and Frédérique Cheruy
IWRI: Fatima Driouech

Background? Engineer-meteorologist

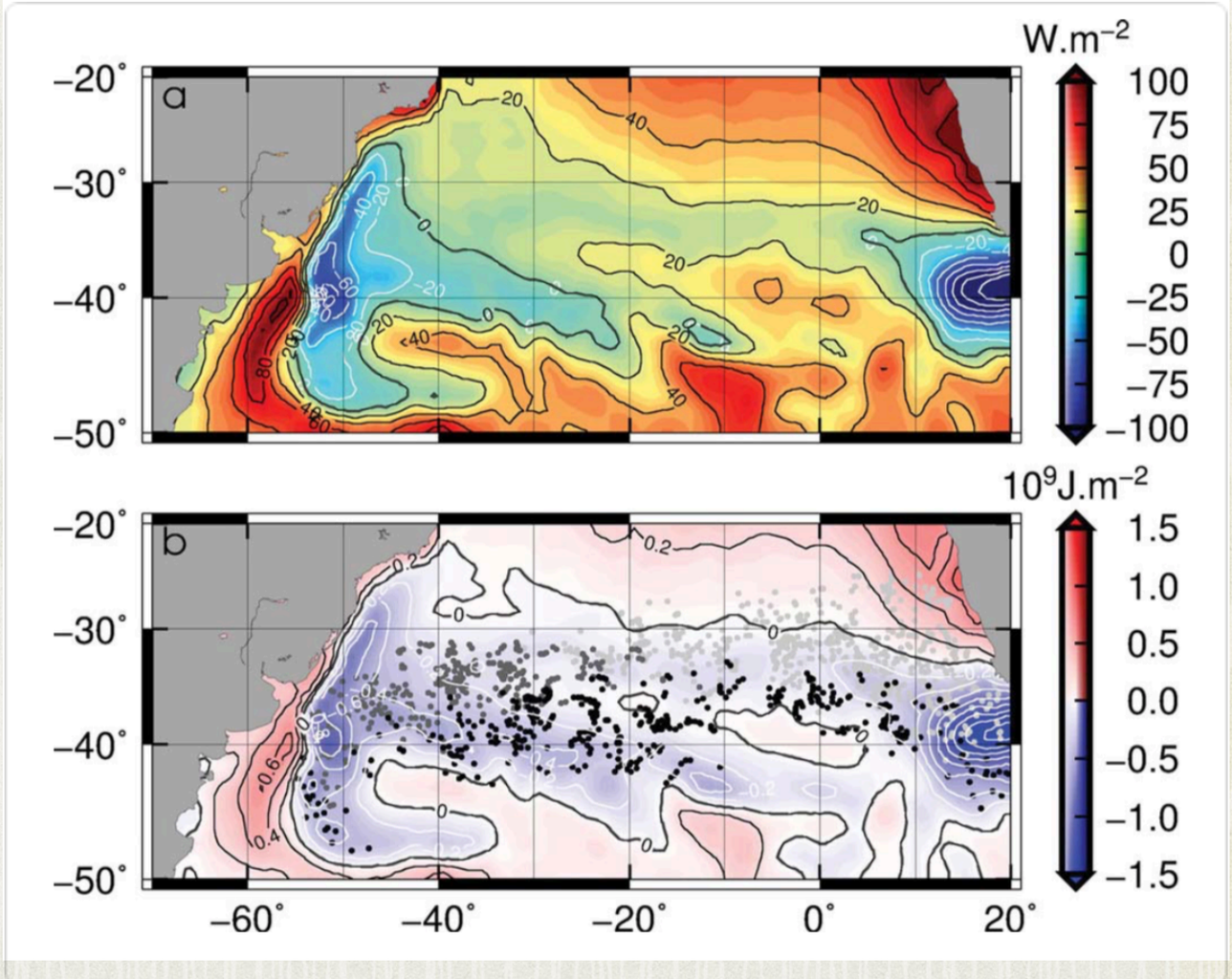
Thesis? Modeling of the hydrological cycle in Morocco in the context of Climate Change

Expectations?

- A first contact with the model
- Running different configurations and scenarios
- Coupling with other models like ORCHIDEE



South Atlantic circulation



Heat flux vs. mode waters

Yanxu Chen

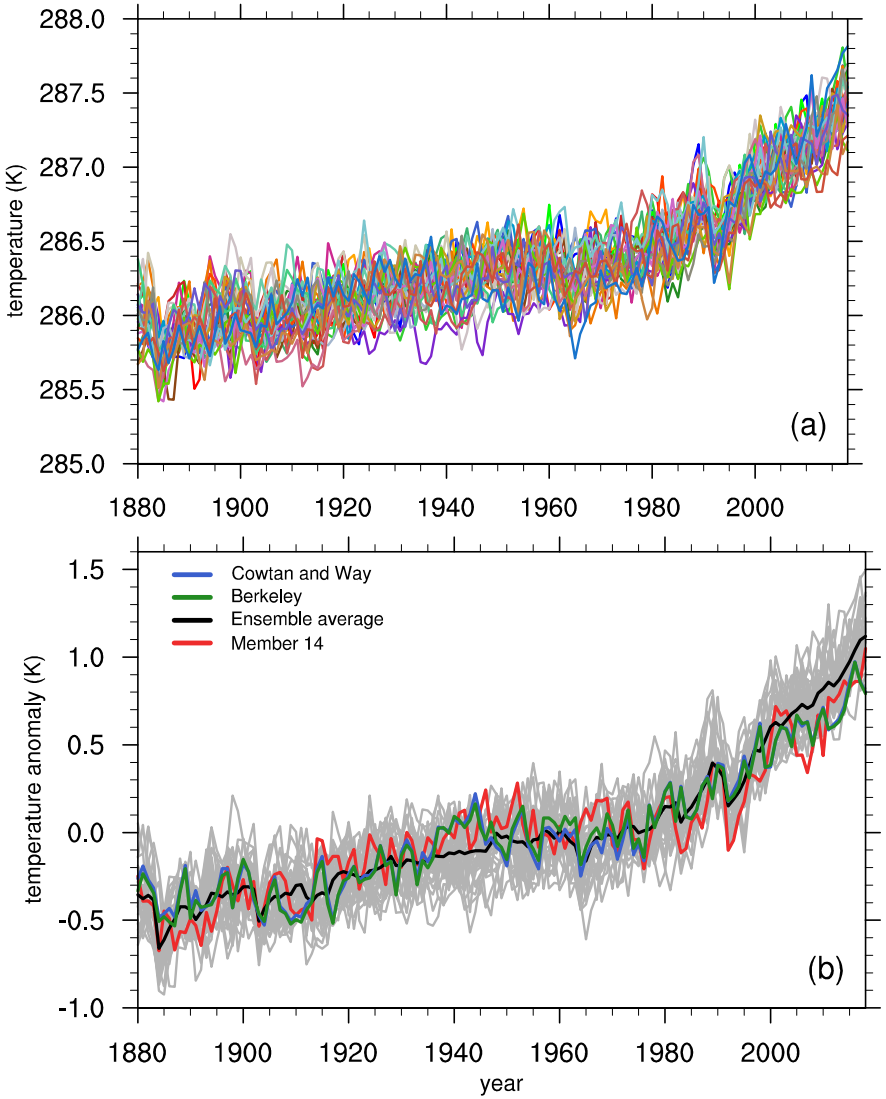
LMD-ENS

Supervised by: Dr. Sabrina Speich and Dr. Laurent Bopp

Research: The role of mesoscale eddies in ocean heat and carbon uptake

Rémy Bonnet (IPSL)
Projet européen Constrain

Analyse des simulations historiques du modèle IPSL-CM6A-LR



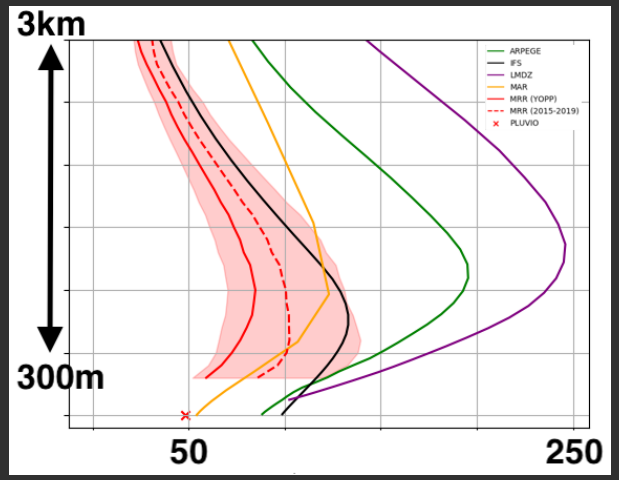
(a) Évolution de la température moyenne globale (GMST) des différentes simulations historiques IPSL-CM6A-LR (b) Anomalies de la GMST, période de référence : 1880-2018

- Évaluation des simulations historiques (variabilité de la température)
- Simulations historiques ayant une représentation « réaliste » de la température moyenne globale = meilleure représentation de la variabilité interne basse fréquence ?
- Influence des conditions initiales sur le « réalisme » des simulations historiques ?
- Influence des forçages externes sur la variabilité interne ?

The water and atmosphere above the Antarctic ice sheet

- What ? Precipitations and clouds
- Where ? Antarctica
- How ? Simulations for synoptic meteorology and climate study (evaluations/observations + parametrisations)

1^{st}year PhD student



⋆ Total snowfall during YOPP campaign (mm)

Marion Saint-Lu

Post-doc au LMD

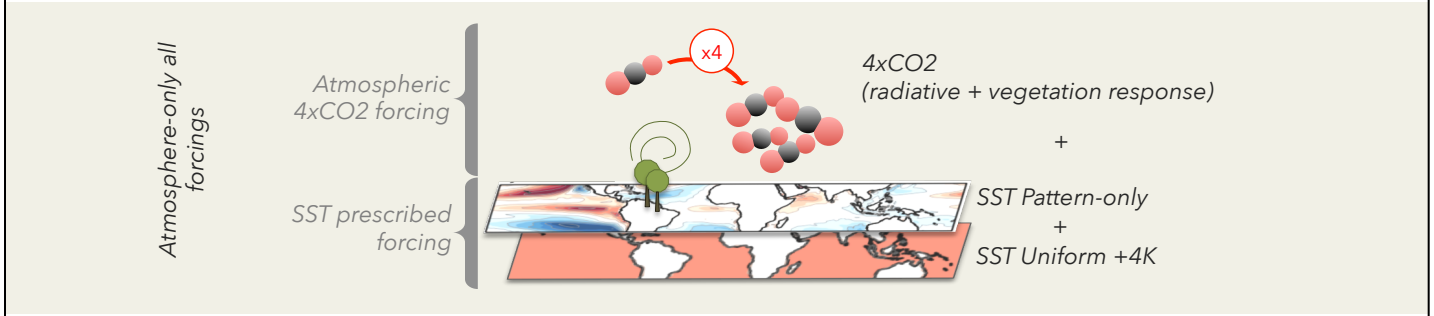
-

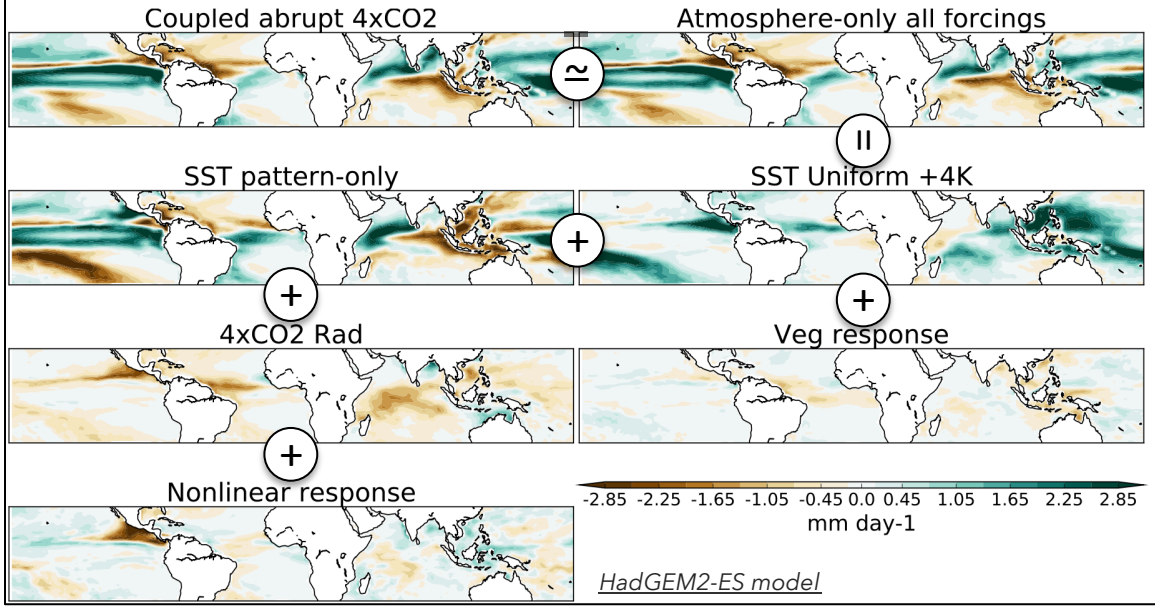
Utilisation d'LMDZ:

Faire tourner des simus 'timeslice' du protocole CMIP6 (tier 2)

(Mon post-doc actuel au LMD, avec Jean-Louis Dufresne & Sandrine Bony, porte sur l'effet d'Iris des nuages enclumes tropicaux)

Chadwick et al. 2017 – 'timeslice' experiments:
Decomposition of the coupled rainfall response to abrupt 4xCO2 forcing





Xiaoyi SHI (xiaoyi.shi@lmd.jussieu.fr)

Ph. D (Supervisor: Camille RISI)
Laboratoire de Météorologie Dynamique (LMD)

Motivation:

To understand how the convective activity affect the isotopic variability of precipitation and vapor in the southeast margin of the Tibetan Plateau based on LMDZ-iso model

Assessing long-term simulations using airborne observations
Current model: LMDz-OR-INCA

Yann Cohen

Postdoc position in atmospheric chemistry

supervised by D. Hauglustaine

Weizhe CHEN

Nationality: Chinese

Email: wzchen@cug.edu.cn; wzchen2014@foxmail.com

Address: No. 388 Lumo Road, 430074 Wuhan, P.R. China; LSCE, CEA/Saclay Orme des Merisiers, 91191 Gif sur Yvette, France

Websites: https://sites.google.com/view/weizhe-chen; https://www.researchgate.net/profile/Weizhe_Chen2; https://orcid.org/0000-0001-5126-3810;

Education

2017/11 – present, **Visiting student**, Earth System Modelling, Laboratorie des Sciences du Climat et de l'Environnement (LSCE), CEA-CNRS-UVSQ, Université Paris-Saclay, France

2015/10 – present, **Ph.D in Quaternary Geology**, China University of Geosciences, Wuhan

Dissertation title: Response of terrestrial vegetation distribution and productivity to climate change during Last Glacial Maximum, mid-Holocene and present-day period (expected in 05/2020)

2011/09 – 2015/05, **B.S. in Geology**, China University of Geosciences, Wuhan, China

Research interest

My research mainly focuses on interactions between **climate change** and **global carbon and water cycles** on a broad range of timescales, with the application of meteorological observation, remote-sensing images, paleorecords and land surface models. I am especially interested in critical zone evolution (soil-land surface-atmosphere interactions) during **Quaternary**.

- Currently, I am studying the land cover changes during the Green Sahara period with compiled pollen and wetland data, and a land surface model - ORCHIDEE.
- I expect to study feedbacks of land surface processes to climate change with coupled atmosphere-land model.

- Bierjon Antoine
- Bigot Lionel
- Bolmont Emeline
- BOSSON Kouacou
- Dupont Eliott
- GUERMAZI HENDA
- Nguyen Sebastien
- Villefranque Najda