



CNRM, UMR 3589

SEMINAIRE CNRM **N° 2016_20**

mercredi 9 novembre 2016 à 10h30

ASSESSING THE 1.5-DEGREE TARGET IN LIGHT OF RECENT CLIMATE CHANGE

par Chris FOREST

(Pennsylvania University)

en salle Joël Noilhan

Abstract

Future climate change depends on many climate system properties, future forcing scenarios, and policy decisions. In this study, we assess the 1.5-degree target set forth in the Paris Agreement in the absence of policies to reduce future warming. Using the MIT Earth System Model (MESM) and 20th century climate records, we calibrate the joint probability distributions for model parameters that set the equilibrium climate sensitivity (ECS), the rate at which heat is mixed into the deep ocean (set by the ocean diffusivity in the model), and the net anthropogenic forcing on the planet. Together, ECS and ocean diffusivity set the transient climate response (TCR) of the climate system. Like ECS, TCR is an emergent property of the model and is assessed on a shorter timescale than the equilibrium climate sensitivity. Thus, TCR represents a more policy-relevant metric of climate change in the coming decades. To estimate TCR, we first derive joint probability distributions for the three model parameters by running a large ensemble of the MESM and comparing the model output to historical temperature patterns. From these joint distributions, we calculate probability distributions for TCR by matching climate sensitivity-ocean diffusivity pairs drawn from the distributions to emergent behavior from the model with those parameter settings.

We find that the inclusion of recent temperature trends in the derivation of model parameters leads to a decreasing likelihood of staying below the 1.5-degree target set forth in the Paris agreement.

When using a single estimate of internal climate variability and data ending in 1990, 2000, and 2010, we estimate 90-percent confidence interval for TCR to be 1.1-2.5 C, 1.4-2.7 C, and 1.6-2.3 C, respectively. Further, we find the 1.5-degree target to be in the 21st percentile of the TCR distribution when including unforced variability estimates from multiple CMIP5 models. In light of these changes, we are unlikely to achieve the goals set forth in Paris without implementing stronger measures to combat climate change.

Visiting: Laboratoire des Sciences du Climat et de l'Environnement, IPSL, Gif-sur-Yvette.
Author team: Alex G. Libardoni (PSU), Andrei P. Sokolov (MIT), Erwan Monier (MIT).