Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

U01-06 会場:国際会議室 時間:5 月 26 日 15:35-15:55

気候モデルによる全球気候変化の研究：現状と将来
Model-based climate research on global change: Challenges for the future

渡部 雅浩 [1*]
WATANABE, Masahiro[1*]

[1] 東京大学大気海洋研究所
[1]Atmosphere and Ocean Research Institute, University of Tokyo

Climate sciences have evolved rapidly during the past decades as observations suggest gradual changes in weather and climate due to increasing anthropogenic radiative forcing. General circulation models (GCMs) have also been developed and improved, though incrementally, for attributing the past climate change signals as well as for future climate projection. International efforts of coordinating the GCM experiments, called the Coupled Model Intercomparison Project (CMIP), have provided information on climate changes imperative to the IPCC Assessment Reports.

We, a joint climate modeling group among the University of Tokyo, National Institute for Environmental Science, and Japan Agency for Marine-Earth Science and Technology, has developed a state of the art GCM, called MIROC, which participated in past CMIPs. Using MIROC and simulations with other CMIP models, we have carried out several attribution studies, including increasing frequencies of Northern Hemisphere heat waves, Indonesian drought, and Eurasian cold winters over the last decades. I present those examples of the climate change attribution in this presentation, followed by a recent issue of the global warming 'hiatus'. Despite climate change signals being apparent from observations and model simulations, global mean surface air temperature has increased little over the past 15 years, which is contrasting to a rapid increase during the late 20th century. This stall in temperature increase has attracted attention from both climate science community and society. In order to explore the mechanism of the warming hiatus, we performed ensemble historical simulations using MIROC with prescribed surface wind stresses over the tropical oceans. Unlike conventional CMIP simulations, our simulation well reproduced the warming hiatus, suggesting a vital role of the tropical wind changes associated with decadal-scale natural fluctuations. A combined analysis to the MIROC ensemble simulations enabled us to assess relative contribution of the human induced external component and natural variability to the past decadal temperature changes.

Current debate on the warming hiatus indicates that our understanding of the climate system, such as the energy budgets, ocean heat uptake, climate feedbacks, and global mean temperature change, is not yet sufficient. I outline these challenging issues for global change, and introduce possible ways for further progress, which include the coming 6th phase of CMIP, ultra-high-resolution global simulation, new measurements with satellites, and use of palaeo records.

キーワード: 気候科学, 大循環モデル, 気候変化, CMIP
Keywords: Climate science, General circulation model, Climate change, CMIP