

|  |   |                                  |
|--|---|----------------------------------|
|  <p><b>Earth Sciences Department</b></p> | <p><b>BSC-ES</b></p> <p><b>MISSION REPORT</b></p> | Date: April, 26-27, 2016         |
|  |   | Page 1 of 4                      |
|  |   | Reference: BSC_20160426_Japan-EU |
| <p><b>Subject: 7<sup>th</sup> Japan-EU Workshop on Climate Change Research (Tokyo, Japan, April 26-27 2016)</b></p>      |   |                                  |

**From:** Louis-Philippe Caron

**To:** BSC-ES

**Copy:** -

## Introduction

- Objective: Present the SPECS project to the Japanese scientific community and investigate potential collaboration with Japan
- Funding: SPECS
- Attendants: 40 scientist from various research centres in Japan and project coordinators from the EU

## Results

The 7th Japan - European Union (EU) Workshop on Climate Change Research was held in Tokyo on the 26-27th of April 2016. The Workshop was hosted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, which organized the event in collaboration with the European Commission, Directorate General for Research and Innovation (DGRTD). The main objective of the workshop was to discuss the latest scientific results and promote enhanced links and collaboration in the field of climate change research between Japanese and European agencies and institutes. There were about 40 participants in the workshop, consisting of researchers from Japanese and European institutions and research policy makers from the European Commission and Japanese ministries and agencies.

The workshop was organized in four sessions under the headings:

- 1) *Long-term climate change: monitoring, attribution, projections and irreversibility;*
- 2) *Seasonal-to-decadal climate change: monitoring, attribution, projections and predictability;*
- 3) *Regional climate projections for impact assessment studies and supporting climate services;*
- 4) *Climate change impacts (global & regional scale) and related issues;*

While European scientists presented FP7 or Horizon 2020 projects, Japanese scientists presented results derived from the research initiative entitled "Program for Risk Information on Climate Change". The project is also referred to as the SOUSEI Program and was started in 2012 and is due to end at the end of this year.

The aim of the SOUSEI program is to evaluate the risk of disasters, damage, etc, that are expected to occur as a result of climate change based on the assumption of certain climate scenarios and to generate information that aids risk management. The project is divided into 4 research lines:

- A) Prediction and diagnostic of imminent global climate change
- B) Climate change projection contributing to stabilization target setting
- C) Development of basic technology for risk information on climate change
- D) Precise impact assessment on climate change

Theme A focuses on the development of the basic model used in this project. Topic addressed in this research theme covers the predictability of climate variability from interannual to decadal time scales,

reducing uncertainty in model-based estimation of climate sensitivity, the development of a seamless prediction system for seasonal-to-decadal time scales, and the development of data assimilation technology for optimizing initial and boundary conditions.

Theme B is focused on adding elements such as the environmental biogeochemical cycles and biological activity to the climate model and on the socio-economic scenarios that form the preconditions on which the projection experiments are based on. Specific issues addressed are the development of an ESM which incorporate the carbon cycle, nitrogen cycle and land use change, investigation of tipping points and irreversible environmental changes (e.g. ice sheets) and integrated assessments on climate projection experiments and socio-economic scenarios.

Theme C focuses on generating more detailed climate information to contribute to impact assessment research and to describe conceivable worst-case scenario. This is done through large ensemble generation of high-resolution (20 km) RCM simulations. This section studies changes in probability of both high-frequency phenomena and low-frequency phenomena (typhoons, heavy rainfall, etc).

Finally, Theme D aims to provide adaptation to natural disasters and measures to minimize their impacts. Some issues addressed include climate change impact on natural hazards, on water resources and on ecosystem and biodiversity.

The meeting was loosely divided along those four themes, starting with Theme B.

#### Session 1 – Long-term climate change: monitoring, attribution, projections and irreversibility

A large ensemble of global 60 km simulations (atmosphere only) was presented from SOUSEI. These simulations sample 60 years of the recent past (1951-2010) and 60 years in the future, centred on 4°C global warming. The simulations were subsequently dynamically downscaled over Japan at 20km resolution. High resolution allowed for a robust analysis of future changes in tropical cyclone activity, daily precipitation intensity and return periods of extreme precipitation, as well as extreme warm and cold days. This was presented next to PRIMAVERA. These two projects indicate a common interest in the EU and Japan to continue investigating the benefits of increased model resolution for improved representation of coupled climate variability. Other topics discussed in this sessions were the development of an ice-sheet model, the EarthCARE satellite due to be launched in 2018 to replace CloudSat and Callipso and equilibrium climate sensitivity. Colin Jones also presented the European project CRESCENDO, which aims to integrate biogeochemical components to ESMs.

#### Session 2 – Seasonal-to-decadal climate change: monitoring, attribution, projections and predictability

Masahiro Watanabe (Univ Tokyo) and Masato Mori (Univ Tokyo) presented results of two attribution studies using the MIROC climate model. One study focuses on the tropical Pacific wind and sea surface temperature, which they use to explain the warming hiatus, and the other focused on the mid-latitude cold winters observed in the 2000s. They emphasized that both the natural variability and human-induced radiative forcing have played a role for generating the decadal-scale climate changes.

Masayoshi Ishii (MRI) described the Japanese effort to create a 150-year climate reanalysis, with the aim of using this dataset in the context of the upcoming DCPD experiments. In that context, it was noted that the skill to predict ENSO was higher in the earlier period than in the later period. Given the fewer number of observations in the earlier period, it was suggested that the increase in skill was due to the model predicting itself in the earlier part of that period. The product is still being developed.

I presented an overview of the SPECS project, some of the issues it addresses and some results. The presentation generated some discussion on the attribution of extreme events and the use of the model drift to investigate possible improvements in climate models. Unfortunately, there was no one on the Japanese side from climate services attending the meeting and very few people from the climate forecasting community. That limited the amount of discussion to be had. The absence of these scientists was also lamented by Chris Hewitt. I was told that in Japan, climate services are, for the moment at least, the exclusivity of JMA and while there were a few JMA scientists presents, none were working on climate services.

### Session 3 – Regional climate projections for impact assessment studies and supporting climate services

Talks in this session focused on the regional scale, particularly over Japan and over Europe. From Japan, Kei Yoshimura presented results from a regional atmosphere-ocean coupled model centered over the western U.S. and over East Asia. In particular, he is interested in the regional impact of freshwater input from rivers on sea surface salinity around Japan and their effects on local ocean circulation. Kazuhisa Tsuboki showed improved simulations of typhoon intensity using a regional atmosphere-wave-ocean coupled model. The model will be used to make projections of future typhoon intensity where the warmer SSTs are likely to lead to more intense super-typhoons. Robert Vautard presented a part of results of the IMPACT2C project, studying the impacts of a 2°C global warming for Europe for a range of sectors/applications. These impacts are mostly negative, especially in Southern Europe, although Northern Europe does have a number of potentially positive impacts (e.g. hydropower production).

### Session 4 – Climate change impacts and related issues

In this session, the likely impacts of climate change on water resources, biodiversity and natural disasters on Japan were discussed. For water resources, it was emphasized that the impact of climate change on river discharge is expected to be large in the snowy regions of Japan. In spite of the increase in available water resources, the shift of seasonal cycle might have an overall negative influence on the water availability for agriculture and hydropower. The impacts and risks on biodiversity and ecosystems in Japan and Asia are projected to be high in the future. Other than temperature, change in snowfall regime is important for the ecosystems in northern and higher elevation, while acidification and change in current may play important role in Japan coastal ecosystems. Future typhoons are expected to be more intense but less frequent and the associated risk of flooding for both river and coastal regions are expected to increase in the future.

Three European projects were presented. The HELIX and IMPRESSIONS projects assess climate change impacts and adaptation under high-end scenarios, specifically above global warming of 2°C. HELIX explores scenarios of climate change and its impacts at global scales and also in key focus regions of Europe, South Asia and northern hemisphere sub-Saharan Africa, with a particular interest in water resources, crop productivity and land ecosystems.

IMPRESSIONS focuses on adaptation and socio-economic scenarios. The future socio-economics influence the potential impacts of climate change, societal vulnerability to those impacts and the ability to adapt. Because of the broad range of socio-economic scenarios, these can lead to important uncertainty in impacts and vulnerability, similar to or greater than that due to the climate scenarios. As a consequence, it is argued that there is a need to improve the means by which people and society is represented in climate change impacts, adaptation and vulnerability studies.

Research conducted in the context of the Enhance project aimed at developing new risk scenarios and contributed to development of multi-sector partnerships to reduce, prepare for or redistribute risk.

-----  
Like I mentioned earlier, there was no Japanese representative who were working in climate services and very few (two I think) working on climate forecasting, so there were very few obvious prospects for collaboration.

I had a discussion with Shuichi Inoue (JAMSTEC) who told me he was impressed by how SPECS made an effort to make all the data/tools publicly available and easily accessible. This seemed to have been an issue with the SOUSEI project. This prompted me to investigate the availability of the SOUSEI data that were presented at this workshop. It turns out they are available on a Japanese server. I was given instructions on how to access them. The limitation in this case would be the fact that most of the documentation is in Japanese, although I was told there is also some amount of English documentation, but I don't know to what extent. The amount of data currently available is considerable (1.5 Peta bytes), and is divided into the following atmosphere-only experiments (if I understood correctly):

- Global runs of present climate (1961-2010) at 60 km (100 members)
- Global runs of future climate based on SST derived from CGCMs at 60km (100 members)
- Regional runs performed at 20km centered over Japan and including part of East and South Asia (60 members)

Other outcomes from various discussions I had:

- I might have found another tropical cyclone tracking option in the case where the GFDL tracker turns out to be inappropriate for EC-Earth data
- I talked with Masahiro Watanabe about decadal predictions and he is fairly pessimistic about the skill to be found over the Western North Pacific region and was asking about the problems we were currently investigating at that timescale. I suspect he would be interested in a collaborative study if presented with an interesting problem, as he didn't seem to know what to investigate next in that context.
- I found out that JMA is now performing dynamical forecasts of TC over the Western North Pacific. They are still at the experimental stage and not publicly available yet. Furthermore, they are investigating using Kerry Emanuel's downscaling technique in conjunction with seasonal hindcasts to estimate upcoming TC seasonal activity in the Western North Pacific. Both are good candidates to be included on our forecasting website when/if we decide to expand to that region.

It was decided to continue joint meetings and that the eighth EU-Japan Workshop on Climate Change Research would be held in Brussels in 2019.