

 Barcelona Supercomputing Center <small>Centro Nacional de Supercomputación</small> Earth Sciences Department	BSC-ES MISSION REPORT	Date:22/9/2017
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Subject: 16th CTWF International Symposium on Advances in Seasonal to Decadal Prediction (Beijing, China, 18-20 September 2017)		

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To: BSC-ES

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Introduction

- Objective: A regular international forum "CAS-TWAS-WMO Forum" (CTWF, with CAS for Chinese Academy of Sciences, TWAS for the World Academy of Sciences for the advancement of science in developing countries and WMO for the World Meteorological Organization) for physico-mathematical problems related to climate modelling and prediction takes place to facilitate the study and solve important scientific problems in climate modelling and prediction. The CAS-TWAS-WMO Forum does not only strengthen the relationship between CAS, TWAS, and WMO, to the benefit of developing countries, but also make its valuable contributions to science. A symposium for different topics regarding CTWF will be held every year. Major challenges remain in reducing uncertainties in the initial conditions and errors in forecast models and external forcing, and in assessing predictability limit associated with multi-scale climate processes and nonlinearity. In this context, advances in seasonal to decadal prediction have been selected as the topic for this year's international conference of CAS-TWAS-WMO Forum on Climate Science (CTWF).
- Funding: CTWF and QA4Seas
- Agenda: <http://2017ctwf.csp.escience.cn/dct/page/65580>
- Attendants: Around 100 people, with experts from Europe, America and Asia

The meeting

The symposium consisted of invited lectures followed by plenary discussions. There were also sessions with contributed papers and poster presentations. The symposium was organised in ten different sessions around the following topics:

- Mechanisms for atmosphere-ocean variability
- Understanding of the fundamental limits of predictability
- Model development and its applications
- Seasonal-to-decadal prediction
- Applications of data assimilation
- Impact of model systematic error on forecasts

There was time at the end of the presentations for numerous questions that at times triggered interesting discussions.

Comments

Some useful ideas from the meeting are listed below:

- ENSO is the main process responsible for predictability on seasonal time scales, while the trend (for temperature) and other processes are slowly proving as useful for this time scale. A description of both sources of skill seems needed when assessing new forecast systems.
- Several presentations insisted in the links between the Pacific and Atlantic basins at seasonal and interannual time scales. Partial coupling experiments are a must when trying to understand the processes involved and the robustness of the link.
- Higher resolution systems are being implemented in many places, but the benefits of increased resolution beyond the improved precipitation climatology are not clearly laid out nor documented.
- There were not many results presented describing the forecast drift or the impact of the model bias on the skill. However, the issue was raised as a critical one. Attendants recognised the importance of reducing model bias and increase the quality of the initialisation.
- The importance of a balanced initialisation was often raised, with claims for the implementation of coupled data assimilation, although this implies important scientific and technical challenges. Even coupled nudging seems to be a standard practice in most institutions developing a climate forecast system, which suggests that the department should make an effort in this front.
- The attendants showed an increasing interest in the role of the observational uncertainty in the forecast quality assessment. However, this aspect is rarely taken into account when interpreting forecast quality results.
- Bias adjustment and calibration were also often mentioned, with methods that go well beyond the typical mean-bias removal already available (good examples from MiKlip were presented, with Jens Grieger's review being mentioned as a fundamental reference).
- There were several examples of forecast improvement in Asia using circulation indices (e.g. the West Pacific Anticyclone Index) that led to substantial increases in skill, particularly for precipitation. They follow a similar idea as what ESS is following to improve the wind-speed predictions using perfect-prog (e.g. using the predicted Niño3.4 or NAO indices).
- There were discussions about to what measure the skill estimated from hindcasts represents the skill of the forecasts given the different ensemble sizes and about the decadal variations of the skill, which at least for ENSO seems to change from one decade to the next one (probably due to the intrinsic variability of ENSO). The question behind this is how to estimate the true level of predictability.
- Tei Zheng (IAP) showed that stochastic perturbations in the coupled model based on statistics of the model error improve substantially the ENSO skill. An encouraging result to revisit the impact of the stochastic physics and dynamics.

It was a very good opportunity to see the climate forecasting developments in Asian countries, which are not usually presented in European venues. In that sense, important links have been established over the years between Asian scientists in the US and those in their countries, which has been strengthened with the recent return of many scientists. As a result, Chinese and Korean institutions are reaching the level of their Japanese peers. A curious aspect is the proliferation of climate forecast systems without specific coordination between them. Many institutions take models developed in the US and add components to them creating different forecast systems. Systematic comparisons of forecast quality are also missing, most of the comparisons being made with the seasonal predictions performed 10-15 years ago by the DEMETER and ENSEMBLES projects. It was very interesting to see how many resources they are putting into developing data assimilation sys-

tems, in many cases coupled, to take control of the model initialisation. Most of the presentations ignored the relevance of climate services in our field, there does not seem to be anything equivalent to the drive present in the European countries.

I took advantage to visit the LASG of the Institute of Atmospheric Physics in Beijing, where I described the activity of our department in a presentation. LASG is a hub for young Chinese scientists that might be interested in spending time at the BSC. One of them, Dr Mirong Song, already spent some time at IC3 a few years ago.