

Minutes of the Sub-seasonal to seasonal Prediction Meeting

Geneva 2-3 December

The kick-off meeting of the sub-seasonal to seasonal prediction planning group took place at WMO in Geneva the 2nd and 3rd December 2011. The list of people present at this meeting is given in an appendix. The agenda is also included in an appendix.

Day 1:

After the introduction by Gilbert Brunet and David Anderson, the meeting started with a series of presentations on ongoing and planned activities on subseasonal forecast activities at various operational weather centres. Gilbert Brunet mentioned the importance of tropical-extratropical interactions (in both hemispheres) for predictability in the subseasonal band, and noted the important role that advances in data assimilation have made in advancing forecast skill of NWP. He also mentioned the objective of closer ties between weather and climate research, and the ultimate goal of socio-economic benefits that the project should strive to promote through research in applications. David Anderson set the scene from the previous Exeter meeting (Dec 2010), and the proposed next steps of extending the TIGGE multi-model database out to 30–45 days, and the additional potential importance of land initialization, the stratosphere, and ocean-atmosphere coupling. The reviews from the operational centres drew attention to various differing configurations and emphases, including start dates (eg. daily vs weekly vs 10-daily), lengths and treatment of hindcasts (e.g. on-the-fly vs. one-off), verification measures, metrics such as extreme event indices, averaging intervals of forecasts (e.g. weekly vs daily), ability of the models to reproduce observed characteristics of the MJO, and interactions with user communities. The potential importance of interannual signals like ENSO and IOD for skill in the 15–30 day range was pointed out, together with the potential for interannual modulations of intraseasonal skill and the potential for more skilful sub-monthly “forecasts of opportunity”, conditional on lower frequency modes. This was followed by presentations about several ongoing projects relevant to the sub-seasonal project (TIGGE, ET-ELRF, ISV Hindcast Experiment, CHFP and MJO Task Force), the later two given by teleconference. Richard Graham pointed out in his presentation on the WMO ET-ELRF that its activities include the password-protected exchange between the GPCs of operational seasonal climate forecasts, and that it is planned to extend this in future to the archiving of real-time sub-seasonal forecasts on the KMA server. A first step could be to archive daily anomalies of a few selected fields. It would therefore be important to coordinate our research efforts with the operationally conceived ET-ELRF to maximize the complementarity. June-Yi Lee’s presentation pointed out many parallels between the proposed activity and the ISVH, which consists of 6-member hindcasts from 12 models initialized every 10 days from 1989–2008. She also drew attention to the importance of ENSO modulation of intraseasonal skill; while data access is currently limited to participating groups it is planned to open access next year. Ben Kirtman mentioned in his talk on CHFP that daily archiving was not done yet by CHFP and that it was a very big technical issue mostly,

because of the difficulty of finding a server capable of dealing with such a large volume of data. He also mentioned that CHFP is organized around three major research themes, namely the treatment of sea ice, the stratosphere, and the land surface, each of which has relevance to prediction on the sub-seasonal time scale. WGSIP and CHFP are eager to collaborate with the sub-seasonal planning group on these issues. An issue highlighted was the emphasis of seasonal forecast systems on extensive sets of hindcasts, while TIGGE has focussed on getting the forecasts done with little attention to hindcasts; it is presumed that the sub-seasonal activity would fall somewhere in-between. The importance of creating linkages with the MJO Task Force and GASS was agreed upon, especially with regard to establishing process-oriented scores of MJO fidelity, and possibly in identifying case studies. All the talks will be put on the sub-seasonal website:

http://www.wmo.int/pages/prog/arep/wwrp/new/documentation_plan_subseasonal_meeting_2011.html.

The talks were followed by a first discussion on the potential sub-seasonal dataset. A straw man proposal was presented by Frederic Vitart (this will be also put on the website). According to this document, at least 9 GPCs have a sub-seasonal forecasting system. These systems have very different configurations (starting date, frequency, resolution, ensemble size, re-forecasts...). However, most of these models share enough common points to make model intercomparison, and multi-model products feasible. The straw man proposal suggested extending the TIGGE dataset to sub-seasonal prediction using the same GRIB2 protocol as TIGGE. This would have the advantage of using the extensive work and experience used to build the TIGGE database and this would encourage the current TIGGE users to extend their research interest to subseasonal, in addition to the sub-seasonal research community. The size of the archived dataset should be reasonable, probably less than 10% of TIGGE (about 10TB per year) for a TIGGE archiving centre like ECMWF to agree to archive this dataset.

This proposal was discussed at length and the following points were agreed:

- The dataset should include all the 12 GPCs, both to maximise the scope as well as to increase the potential level of community support. For the GPCs which do not have a specific sub-seasonal forecasting system, the first 2 months of their seasonal forecasts could be used.
- The possibility of using the TIGGE protocol was agreed
- Archiving of daily forecast and hindcast data was agreed. For surface fields daily data should be computed from at least 4 times a day to avoid aliasing the diurnal cycle. For upper-air fields, instantaneous fields should be used, e.g. 00Z. The archiving of hindcasts in GRIB2 needs to be well defined.
- Access to real-time forecast data was discussed. It would of course be desirable to release forecasts as close as possible to real-time to attract a maximum of application users but this conflicts with the data policy of some centres. After some debate, it was proposed to start with a forecast release date that is at least 3 weeks behind real-time. This issue will be revisited after 1 year. For some special cases, the 3-week delay could be removed and near real-time access allowed for a limited amount of time.
- Archiving should be done on a lat-lon grid (1.5x1.5 or close to the native resolution for low-resolution models).

- We agreed to take the TIGGE list of variables as a starting point. A few variables will be removed (e.g. sunshine duration, field capacity, wilting point...) and a few pressure levels could also be removed (700 hPa and 250 hPa pressure levels). Some levels will be added to resolve the stratosphere (to be decided), some variables will be added (e.g. 2-meter temperature, surface wind stress, additional stratospheric levels), including a few upper ocean fields (sea surface salinity, sea surface temperature, 300 m heat content, 300 m salinity content and possibly surface currents).
It was decided to circulate the updated list of variables between us to agree on a recommended list and to agree on a minimum list that all the operational centres could provide.
- It was mentioned that archiving calibrated fields in addition could be very useful for some application users. However, it was decided not to archive calibrated fields in the first stage, and coordinate with ET-ELRF on this issue of calibration.
- Andrew Robertson suggested the use of the IRI infrastructure (Data Library) to act as a second server of this database, provided the OpenDAP protocol can be exploited so as to obviate the need to physically store the dataset at IRI. It would have the advantage of making access to this data easier to non-GRIB users, including some of the climate community. The potential to use the IRI Data Library would be contingent on adequate additional resourcing through the project.

Day 2:

The morning of the second day was dedicated to discussion of applications and research activities. Andrew Robertson gave a presentation on applications, how they could benefit from sub-seasonal prediction, and the central role of tailoring forecasts to user-relevant quantities and decision-making needs. On the seasonal timescale, hindcasts have typically been used for regression-model based tailoring, while it will be equally important to draw on extensive experience in weather services on the shorter timescales. He also documented the main applications on sub-seasonal prediction in some of the operational centres, based on their solicited input. The main applications are flood forecasting, hydrology, heat wave prediction, related to health (Malaria, meningitis...). Agriculture and energy sector are currently among the main users of sub-seasonal prediction. The sub-seasonal group should liaise with the WMO hydrology, agriculture and climate commissions, the Red Cross, the WHO. Gilbert Brunet and Tetsuo Nakazawa also mentioned collaborations with the Severe Weather Forecasting Demonstration Project (SWFDP). Although they have focussed so far mostly on short-range, they may be interested in sub-seasonal prediction. In addition, a crucial aspect of the sub-seasonal to seasonal prediction project should be as a significant contribution of WCRP and WWRP to the Global Framework for Climate Services (GFCS).

An issue that was discussed was the size of the hindcasts (length and ensemble size). Some applications need at least 30 years to train and test their application models. Such a long hindcast will not be possible for some of the GPCs particularly for those running their sub-seasonal forecasts at very high resolution. The same issue appears for the skill assessment. Most sub-seasonal hindcasts have too few ensemble members. It was argued that the real-time forecasts could be used for skill assessment, provided that there are enough cases to verify (at least a season, if geographical specificity is not required). However, this would make it difficult to assess the conditionality to low frequency variability (window of opportunity) such as ENSO or IOD. This is a difficult issue and there

is no clear answer at this stage. Long hindcasts with a large number of ensembles is incompatible with high resolution forecasting: in current practice, in most centres, the quality of the real-time forecasts is the main concern and the hindcasts are used only to do a simple calibration of the real-time forecasts.

As a demonstration project, it was agreed to focus on 2 cases:

- A past case: The Pakistan floods (2010), concurrent with the Russian heat wave, and which exhibited associations with tropical-extratropical interactions, MJO events, and La Niña, and which was forecasted quite successfully by the ECMWF medium-range as well as monthly systems
- A new case: To be defined as it arises

A number of research topics were discussed and are listed in the implementation plan (see below).

A few talks presented the verification of sub-seasonal forecasts in several centres. The verification of extreme events will be a difficult problem. The size of the hindcast, as noted earlier, is generally too small to allow verification beyond tercile verification. It will be important to liaise with Lead centres for standard verification of Long Range Forecasts (LC-SVSLRF) and the Joint Working Group on Verification.

Tony Busalacchi raised a few issues: importance of the engagement with WGSIP and WGNE. He highlighted the role of the ocean. He said that it was an important issue for the climate community to know when the ocean-atmosphere coupling plays an important role. He also mentioned the importance of understanding the modulation of extreme events by low-frequency variability. This is particularly important both for identifying potential “windows of opportunity” for more-skillful subseasonal forecasts, as well as for the attribution of extreme events to global warming or natural low frequency variability such as ENSO. He also emphasized the importance of engagement with the user communities, forecast tailoring for applications, and the importance of identifying examples of going beyond meteorological forecasts for GFCS. The following discussion stressed that the WWRP Working Group on Societal and Economic Research and Applications (SERA) should be an integral part of the project.

At the end of the meeting we discussing the structure of the implementation plan. This plan will be submitted to the WWRP JSC in April and the WCRP JSC in July. Therefore a first draft of the implementation plan should be ready by the end of February. Various writing assignment were agreed. The inputs of these assignments are required by the end of January. The outline of the implementation plan (including assignments) is attached.