Monthly and seasonal forecast at ECMWF

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ECMWF provides the users with probabilistic forecasts from the medium-range to seasonal time scales. Monthly forecasts are produced every Thursday and they extend up to 31 days. Seasonal forecasts are issued every month and are up to seven months long. Recent weather events are used to illustrate the current range of products available from the monthly and seasonal forecast systems. The performance of both forecast systems is discussed.

Fig.1 is an example of a past forecast for the week starting on the 15 of January 2007. The top panel shows the observed air temperature anomalies and the four panels represent four different forecasts for the same week initiated 5 days, 12 days 19 days and 26 days earlier. The forecast is for 2m temperature and it is expressed in terms of ensemble mean anomalies. The ensemble mean is the average of the 51 forecasts. The anomalies are defined as departures from the 12 years of background statistics. It is worth to notice that the general distribution of warm conditions (representing by red shading) and cold conditions (blue shading) are quite consistent among the panels. It's also interesting to note that the amplitude of the anomalies decreases with the forecast range.

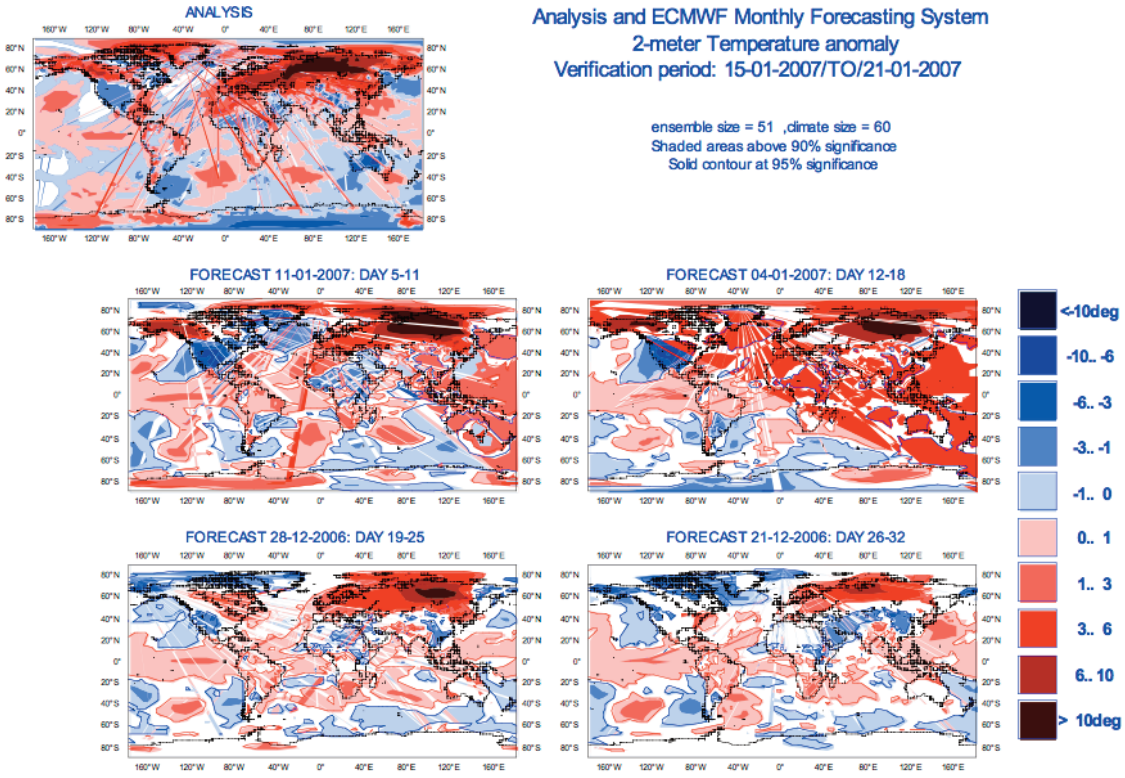

Fig. 1

Observations exhibit very warm conditions over a large area covering Russia. Those warm conditions persisted for several weeks from mid-December 2007 up to late January 2008. Even the forecast up to 26-32 days shows the warm conditions over a similar area although with a much reduced amplitude. During this week very cold conditions occurred over most of USA. The forecasts up to 19-25 days manage to represent those cold conditions.

The overall performance of the monthly forecast is estimated by using different objective methods (scores) and at http://www.ecmwf.int/products/forecasts/d/charts/mofc/verification/ some of these scores are made available. Fig.2, for example, shows an estimate of the forecast skill in predicting air temperature anomalies above normal (above the upper tercile) over the Northern Extra-tropical region. Fig. 2a represents the skill of the monthly forecast at 12-18 days (red dots). The skill is accumulated over a season and the diagram show the skill estimates relative to (September October November) SON 2002 up to (June July August) JJA 2007. The higher the values are in the diagram the larger is the skill. The blue line is the skill obtained by persisting the anomalies of the previous weeks. Forecasts based on persistence and/or climatology can be a valid alternative so it's important to measure the monthly forecast skill in reference to them. Fig. 2b shows the skill for the forecast day 19-32 (last 2 weeks of the forecasts). For both forecast ranges the skill is generally higher than the persistence and climatology (the skill of the climatology is 0.5) It is also important to note that the skill varies with seasons. For the Northern extra-tropics winter forecasts have larger skill values than the summer ones.

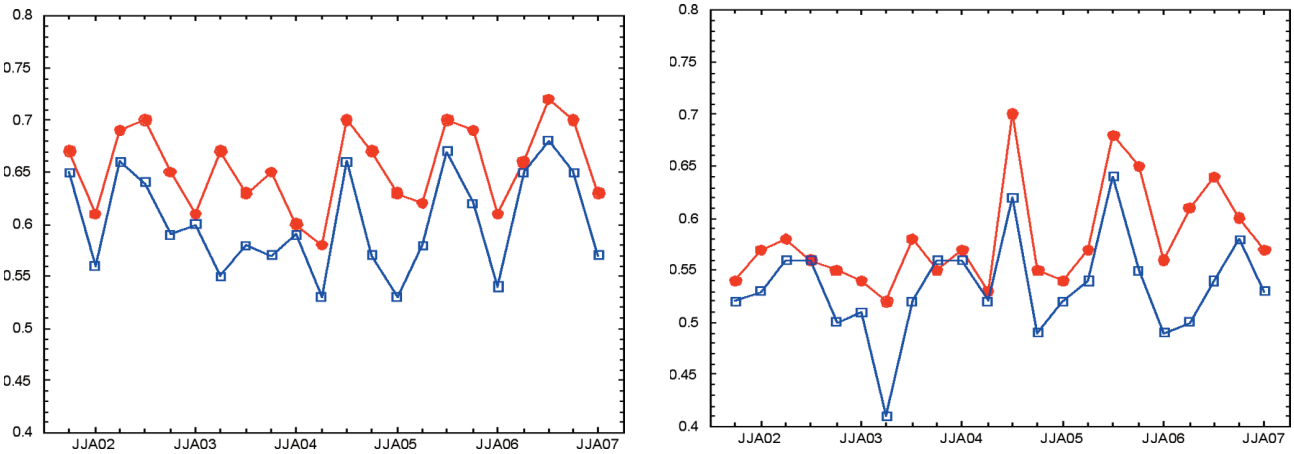

Fig. 2

In March 2007, with the implementation of the new seasonal forecast, the graphical products have been expanded. Fig.3 shows 4 different predictions of Sea Surface Temperature (SST) anomalies over the NINO 3.4 (170E-120W 5N-5S). Forecasts started respectively in November 2006, January, March and May 2007.

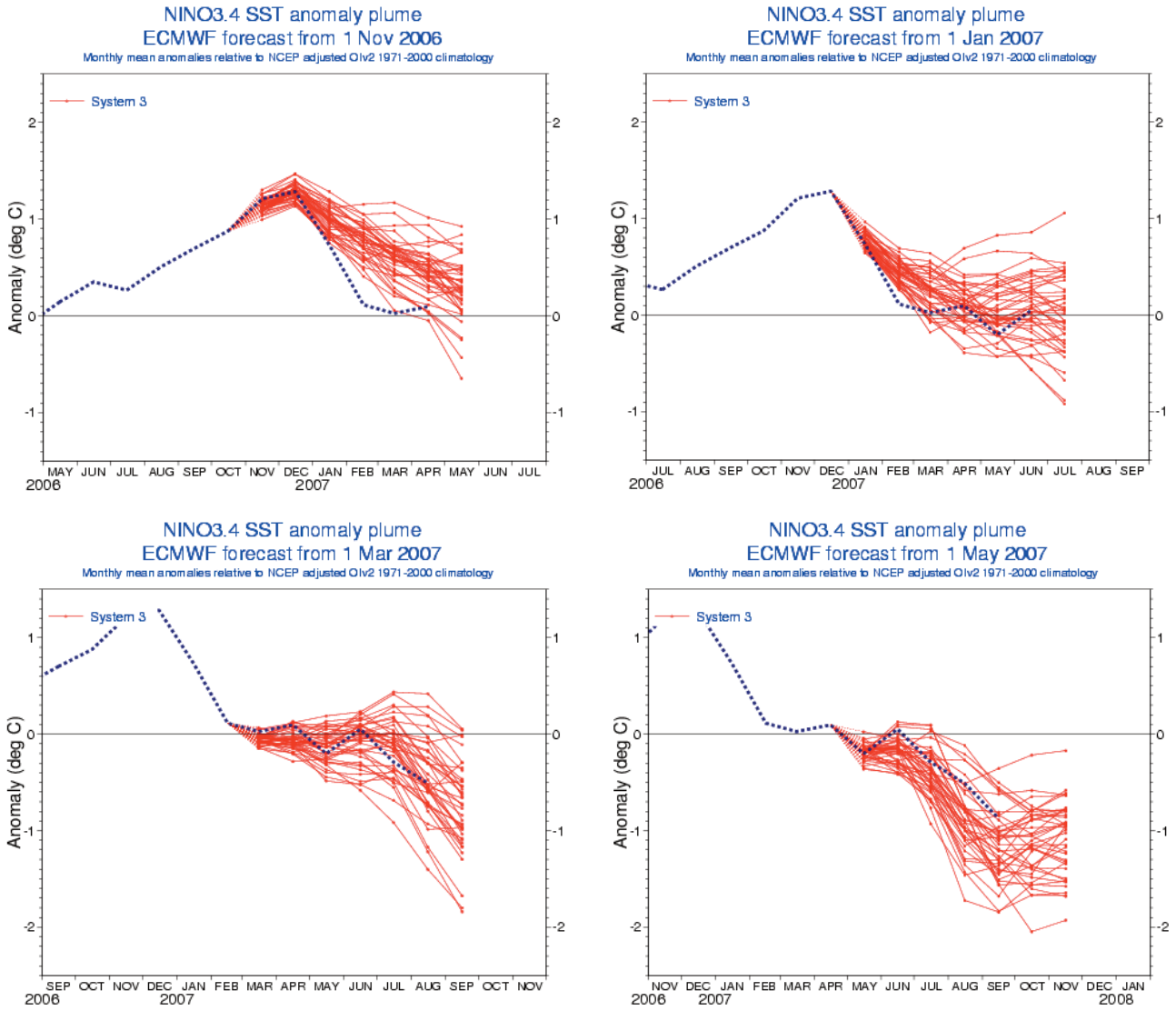

Fig. 3

The dashed line represents the analysis and the red lines are the individual members of the ensemble. Looking at the dashed line we can see that in December 2006 the SST anomalies reached a relative maximum quickly cooling down after that. This was a very fast transition from an El Nino to la Nina conditions and the forecast gave a good indication of this fast change. The seasonal forecast skill in predicting the SST over the tropical Pacific is rather high particularly during the spring and NH summer. However the skill is not better than the persistence during the NH summer months over the Tropical Atlantic and Eastern Indian Ocean.

A set of real-time forecast products is released to the public on the ECMWF website at 12Z on the 22nd of each month - look for the "seasonal forecast" section under www.ecmwf.int/products/forecasts. Among the revised products is included the "tercile summary" plots which show, in a single plot, probabilities of the most likely tercile category if (a) it is one of the outer categories (above upper tercile or below lower tercile) and (b) the probability of the category exceeds 40%. Wider sets of products are available to European and WMO Met Services, and these now include "climagrams", which show in graphical form the predicted evolution of the pdf of area-averaged quantities on a month by month basis. A fuller description of the new seasonal forecast products is available in *Molteni et al* 2007.

The ECMWF seasonal forecast system is part of the EUROSIP multi-model seasonal forecasting system. Currently, the participants in EUROSIP are ECMWF, the UK Met Office and Météo-France, but other members are expected to join in the future. A common operational schedule is followed, and data is held in a common archive at ECMWF, which facilitates production of multi-model forecast products.

As an example of multi-model products Fig 4 shows EUROSIP predictions of tropical storms frequency from a forecast initiated in June 2007. Green bars indicate the frequency from the multi- model forecast and orange bars indicate the frequency of the model climate. The forecast predicted 9 storms (less than the climate) while in reality 12 storms but all with a rather short life and limited intensity were observed. This forecast is an interesting case because it gave a very different outlook comparing with statistical forecasts. In fact, statistical forecasts, based on the typical relation with La Nina, predicted rather intense tropical storm activity over the Atlantic. Eurosip multi-model predictions of tropical storm frequency have been evaluated for the period 1993-2006 and they show a consistent good skill.

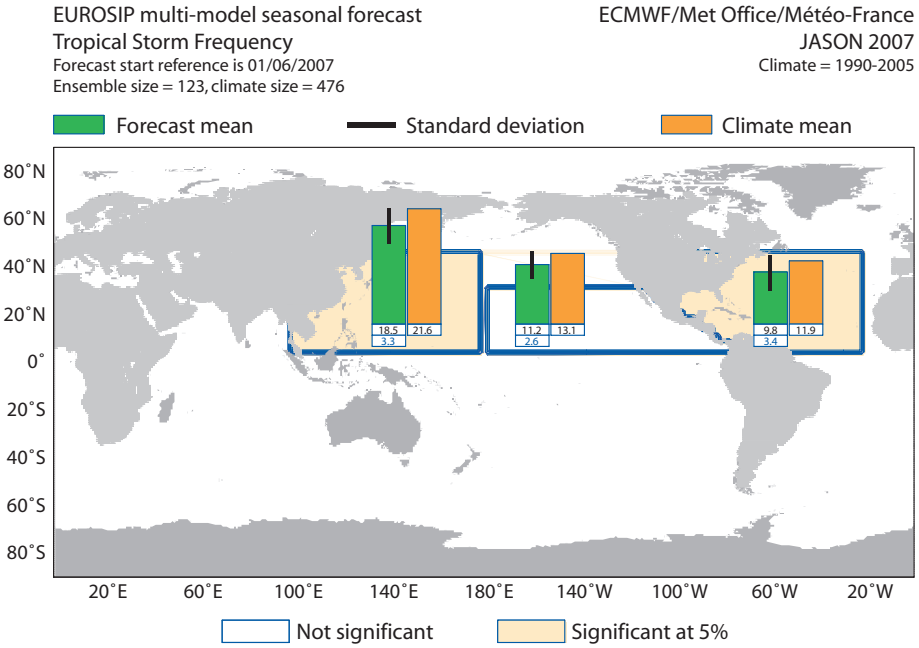

Fig. 4

References

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