

1. Header

Title: “Recalibrating and Combining Ensemble Predictions”

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Progress Report

2. Research Progress

We have developed a prototype system to statistically recalibrate dynamical models. This prototype system acts to correct spatial biases in the medians of ensemble forecasts for individual models. Initially, this system has been based on several of the atmospheric general circulation models (AGCMs) that IRI uses in its “Net Assessment” seasonal forecast. The correction parameters in the new prototype system are estimated from retrospective forecasts that use forecast SST thereby explicitly incorporating SST forecast error and lead-time dependence. Once the individual models are corrected, the recalibrated medians are averaged together. The forecast uncertainty about the multi-model median – or the spread of the distribution – is provided by the standard error in the corrected forecasts using a cross-validation procedure. Currently, the forecast uncertainty is approximately the same from year to year (with some adjustment on precipitation to ensure dry tail of distribution does not become negative).

Methodologically, and in terms of information content, the new prototype system improves upon the forecast format of many real-time forecasts, including that of the IRI and of operational centers such as CPC. Most importantly, the system produces a complete probability distribution, not just tercile probabilities so that probabilities for user-defined categories (based on user-defined climatology) are possible. Related to that, the distribution is quantitative so that, for example, probabilities of threshold exceedances can be queried. An experimental version interactive map room has been developed for the new prototype forecasts, as shown in Figures 1 & 2, where maps and point graphs are generated at user request through the IRI Data Library.

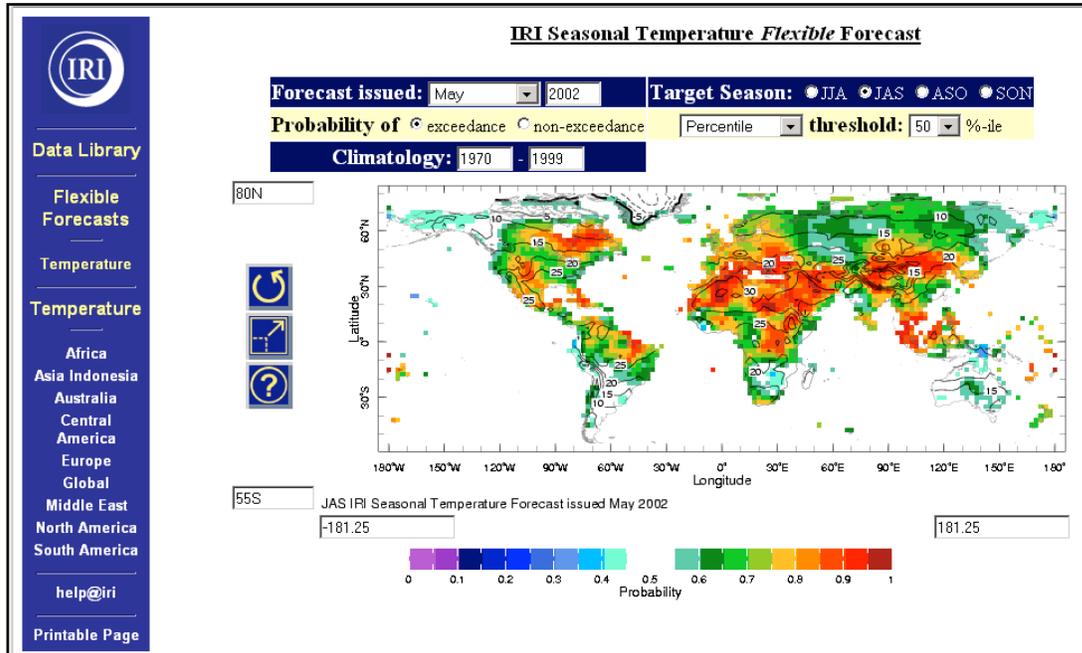


Figure 1. Example of default view of flexible format for seasonal temperature showing the probability (colors) of exceeding the 50th percentile of the distribution from historical climatology (here chosen as 1970-1999). The quantitative value of the median is indicated by the contours. Underlying the default map is the full probability distribution for the forecast and climatology, so the user can specify the historical percentile for probability of exceedance or non-exceedance. Alternatively he can choose the probability of exceeding (or not exceeding) a quantitative value.

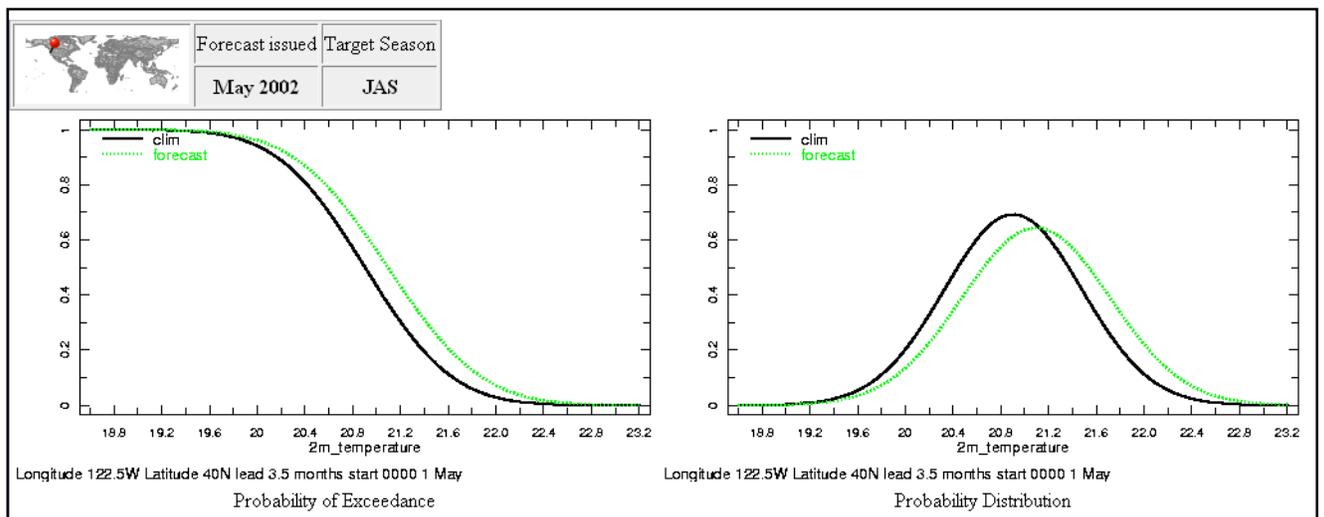


Figure 2. Cumulative distribution (left) and probability distribution (right) functions for a point over southern California from the map in Figure 1, showing the forecast (green) together with the climatological distribution (black) for reference.

We have completed some initial comparisons between the IRI Net Assessment forecast and the prototype system for 2004-2008, which is independent of the recalibration period. Moreover, the observed data set available for that period is different from the one used to estimate the correction parameters. Maps of the ranked probability skill score for tercile forecasts, considering 1-mo lead forecasts for all seasons shows improvement overall, with notable gains over the northern tier of the US, over much of Africa, China and SE Asia, and Brazil. There are some regions of slight skill degradation, however, and we are looking into this. In the coming years of the project, refinements of the current methodology - as described in the project proposal – will be undertaken, including the incorporation of the CFS and other coupled models.

3. Highlights of Accomplishments

- Developed prototype recalibrated, PDF-based, multi-model seasonal forecast system, using atmosphere-only models with 40+ year retrospective forecasts
- Developed experimental version of a map room where probabilistic forecasts can be created based on the interests of the users, in terms of desired categories or thresholds, climatological reference, and map versus graphical delivery of information. These graphics are produced on the fly through the IRI's Data Library.

4. Publication(s)

Tippett, M.K., L. Goddard and R. Cousin, 2010: “A more flexible format for seasonal climate forecasts based on recalibrated multi-model ensembles”, *in preparation for Climate Dynamics*

5. PI's Contact Information

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