South African Weather Service
ISO 9001 Certified Organisation

Seasonal Climate Watch – New Display System

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1. Overview

The South African Weather Service has been testing new ways of displaying seasonal forecasts to the public, so that the interpretation may become easier for users to understand. The initial phase may be difficult as this is a new way to interpret, however we believe in future that these style of map display would be easier to ingest in user management planning for the next few seasons. This document aims to introduce the new style of maps and why we believe they provide important information for the seasonal forecast. It is important to note that the forecasting system remains exactly the same as before, it is only the display of the results that has changed.

2. Discussion

2.1. Old vs New

The previous display system indicated the probabilities for the two outer category forecasts (above- and below-normal) made by the forecasting system. This generated two maps for each seasons forecast to be interpreted by the user. Added to this each season and category had an accompanying skill map, which needed to be consulted with the probability forecasts in order to relate some confidence in the newest forecast. This was a bit cumbersome for most users, especially the ones not experienced with the details and inner workings of the forecasting system.

It was decided that a new display system needed to be developed, in order for the forecast to be interpreted easier and quicker than the previous system. The new display system firstly combines all the probabilistic category forecasts in one map, showing Blue (Red) colours for higher chances of above-normal rainfall (temperatures) as compared with the other two categories and Red (Blue) colours for higher chances of below-normal rainfall (temperatures) as compared with the other two categories. This type of a display is expected to be efficient, especially in helping to determine the correct likely conditions for the area of interest. White areas indicate one of the two possibilities .i.e. either there is no significant difference between the category forecasts (basically indicating an uncertain forecast) or the area does not have sufficient skill (explained below in the document) to make a decent forecast.

Added to the new display system is the incorporation of skill levels from the forecasting system. We believe this is one area that has always been ignored as a result of issues of technical knowledge about the forecasting system, which most users don't have. The decision was made to eliminate (mask out) these forecasts from the display and replace the areas with white space, as this has the same effect of an uncertain forecast. The figure below illustrates the very basic concept. The new display is for the only the top probability forecast plus forecast system skill.

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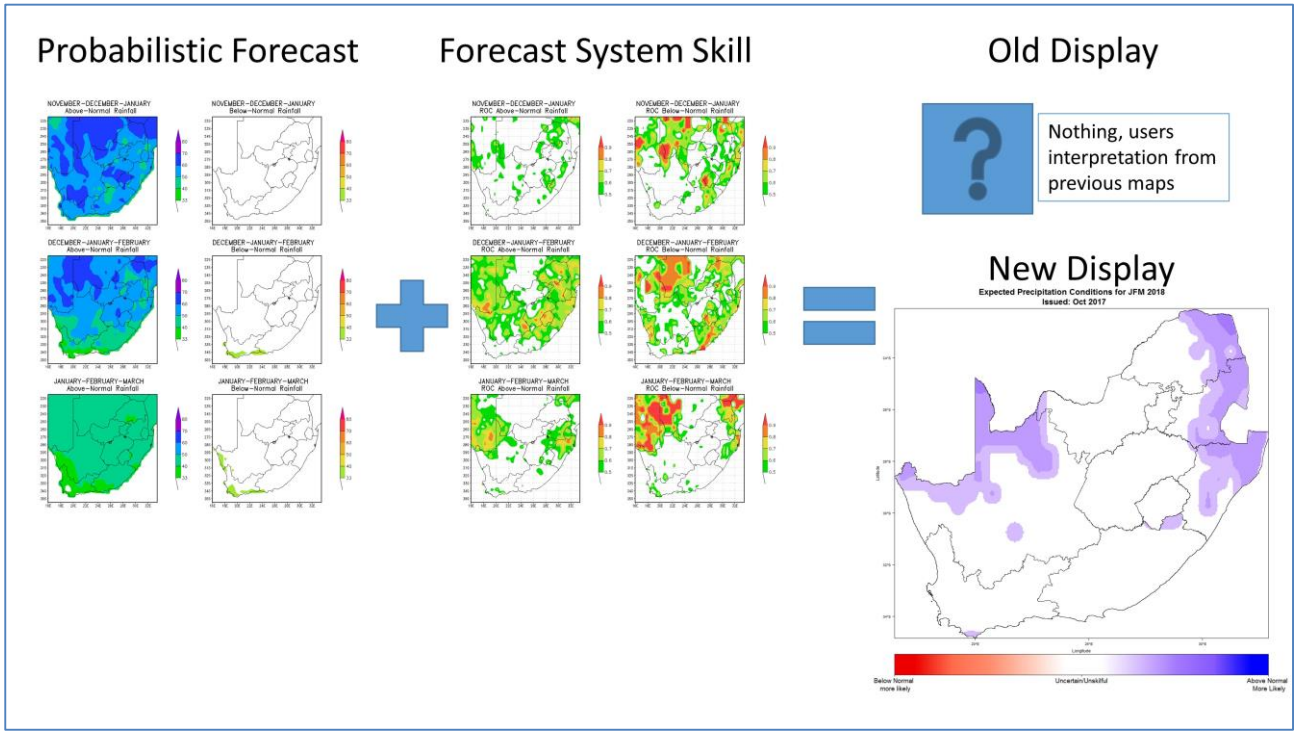

In future it is also expected that areas that are not inside the rainfall season, i.e. they do not receive significant rainfall, also be masked out from the final product. This is however still under consideration and experimentation, and is not included yet.

2.2. Technical details

For those that would like to know the finer details of the calculations, as it may affect the use for more advanced users, it is indicated in this section.

Firstly the calculation of the probabilities. In this display system use is made of the odds rather than the percentage probabilities. They still essentially transfer the same information, however it is easier to use in the following calculations. The relative odds are then subsequently calculated:

$$\text{Relative Odds} = \frac{Above\ Normal\ Odds}{Below\ Normal\ Odds}$$

However, due to the fact that the near-normal category odds may in some cases be dominant, which can create situations that the relative odds may not be significant, the near-normal odds are added to each category:

$$\text{Relative Odds} = \frac{(Above\ Normal\ Odds + Near\ Normal\ Odds)}{(Below\ Normal\ Odds + Near\ Normal\ Odds)}$$

The new display system's legend then represents "increased chances of below-normal" as 100 times (at the limit) more likely than above-normal chances and "increased chances of above-normal" as 100 times (at the limit) more likely than below-normal chances. Relative odds less than 50% increased chance from the other category is assumed insignificant and masked out as a white colour.

The skill measure used for the purposes of masking out forecasts with insufficient skill is the Two-Alternative Forced Choice (2AFC; Mason and Weigel 2009). This measure is used due to its generic evaluation of the probabilistic forecasting system as a whole which considering the method above, a "combined look" at the forecasting system's forecast, is assumed to fit well.

3. References

Mason, S.J. and Weigel, A.P., 2009. A generic forecast verification framework for administrative purposes. *Monthly Weather Review*, *137*(1), pp.331-349.

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