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For a practitioner navigating the world of climate data, the vast amount of information can be challenging and overwhelming. Challenges relate to both accessing the most useful data and, when accessed, understanding how to interpret it.

Forecasts

A great deal of weather and climate data is (to varying degrees) available globally. Most common are weather forecasts, which predict the weather features for the coming days for regions or countries. Weather forecasts are generally fairly accurate when predicting features for the coming day or two, but as the lead time increases to 3, 4, 5 or more days the accuracy inevitably decreases.

Less well known are seasonal forecasts, which predict anomalies in the weather’s seasonal average. While the seasonal forecast cannot predict the weather for a specific day, or the exact locality of significant weather events, it has some level of accuracy in predicting the likelihood of, for example, temperatures being higher or lower than average or rainfall being greater or less than average over the course of the season. Seasonal forecasters generally release predicted temperature and precipitation anomalies four times a year, each for three month periods. The way in which different climate centres present their forecasts differs, and can cause some confusion. Below are some examples of the way in which the different seasonal forecasts are presented:

IGAD Climate Prediction and Applications Centre (ICPAC):

ICPAC’s approach is to present a map that shows the probability of rainfall being above normal, near normal or normal. The map above reflects a greater chance of Southern Sudan experiencing above normal rainfall (45%) than near normal (35%) or below normal (20%) rainfall. On the other hand, the Ethiopian highlands and the adjacent Ogaden to the east have a slightly greater probability of experiencing near normal rainfall (40%).

To access ICPAC’s forecasts see http://www.icpac.net/Forecasts/forecasts.html
(they only seem to forecast rainfall)

The Climate Systems Analysis Group (CSAG) at the University of Cape Town:

![Figure 2: Precipitation forecast for November, December and January 2012 (NDJ)](image)

Figure 1: Predicted rainfall September to December 2012
CSAG presents their precipitation forecast in terms of the forecasted percentage of normal (i.e. historical) rainfall for that period. This forecast quantifies how much less or how much more rainfall than normal the forecast indicates. In the above illustration the indication for Mozambique is that rainfall will be around normal (90-110% of the historical average), but with some areas expecting slightly below normal (in the south) and some above normal (central and north).

To access CSAG’s forecasts see http://www.gfcsa.net/csag.html

The Australian Government Bureau of Meteorology:

Figure 4: The probability of rainfall exceeding the long-term median rainfall in the period from November 2012 to January 2013.

As illustrated in figure 4 above and figure 5 below, the Australian Bureau of Meteorology use a probabilistic approach, yet their presentation of it looks very different from that of ICPAC. They present the probability of rainfall exceeding the historical median rainfall or temperatures for that period.

Using seasonal forecasts with land users
Seasonal forecasts can be useful for land users if they are communicated clearly and form part of a larger integrated monitoring and learning process.

The seasonal forecast game is a creative way of exploring probabilities of seasonal forecasts. The game was first tried and tested in the Suid Bokkeveld, South Africa. Farmers explore the linkages between seasonal forecasts and planning of farm strategies while playing the game.

Figure 5: The probability of maximum temperatures exceeding the long-term median maximum temperature in the period from November 2012 to January 2013.

To access the Australian Government Bureau of Meteorology’s forecasts see http://www.bom.gov.au/climate/ahead/#tabs=0

As illustrated above, the different ways of presenting seasonal forecasts can make interpretation of the data very complicated for end users. It is thus illustrates the importance of focusing on the specific forecasts that one is able to access, and gaining insight into the logic that is used in drawing up and presenting the forecast so as to be able to understand and share the meaning with affected people. While the different bureaus, groups and units that produce the seasonal forecasts may argue that one approach is better than another, there does not seem to be any consensus on which is the best approach.

Generally, irrespective of the format used to present the data, it is important to bear in mind that seasonal forecasts are predictions, and should not be interpreted in a deterministic way. Indeed, if we were to present a seasonal forecast in a way that gave farmers the impression that we had accurate foresight into the weather of the future, we would be exposing them to great risk and undermining their own abilities to interpret the information available to them to make sound farming decisions.
Climate change projections
Global Circulation Models (GCMs), many of which are now coupled Atmosphere-Ocean General Circulation Models (AOGCMs), form the basis for climate change projections by simulating the global climate system. Future projections are produced by running the models with projected greenhouse gas (GHG) concentrations (linked to different scenarios of how the world will develop into the future), and comparing the results with results from running the models using actual measured 20th Century GHG concentrations.

The models have evolved over the years, and the considerable increase in both available data and global computational capacity has allowed for significant increases in model complexity, the length of the simulations and in the spatial resolution. Accordingly, different groups and institutions across the world have developed their own models, and there is no consensus on one model being a better than the rest.

Different models have different parameterisations, different approximations of processes that occur at scales that the models cannot resolve numerically, and their skill at simulating the weather in different regions varies. Instead, in order to account for the fact that climate models do not produce exactly the same projections it is necessary to look at multiple model outputs, and seek areas of agreement or similarity. Assuming that all models represent an equally likely response, it is thus necessary to consider an envelope of projections, thereby representing the range of responses produced by the different GCMs and thus the degree to which GCMs agree or disagree. For example, the projections presented by the Intergovernmental Panel on Climate Change (IPCC) are based on the outputs from 23 different AOGCMs. Below are examples of the global projections presented in the IPCC’s Fourth Assessment Report (AR4) (2007).

AOGCMs only produce projections at large spatial scales, and in order to get an understanding the projections at local scales climate modellers have developed an approach known as downscaling. There are two main approaches to downscaling: dynamical downscaling, which uses high-resolution climate models to represent global or regional sub-domains, and statistical downscaling, which couples local historical climate data with GCM outputs, using the quantitative relationships between local variations and the state of the larger scale climatic environment (Ziervogel and Ziermoglio, 2009).

While there is increasing focus on making downscaled climate change projections widely available to end users, they are currently somewhat difficult to access unless one commissions climate modellers to do the work. In Africa there is one open portal that provides downscaled climate change projections for end users, CSAG’s Climate Information Portal (http://cip.csag.uct.ac.za/webclient/login).

Below is an outline of the CSAG Climate Information Portal and the information that it can provide, illustrating some of the downscaled climate data that is available.
The portal presents the following projections:
- mean monthly daily maximum temperature projections
- mean monthly daily minimum temperature projections
- monthly rainfall projections
- monthly rain days projections
- projections of monthly rain days with over 10 mm of precipitation
- monthly dry spell duration projections

Below are a few examples of the projections provided by CSAG’s Climate Information Portal, using a station at Harar Meda, Ethiopia. All the scenarios below consider the near future, so 2046-2065, using the B1 climate emission scenario.

**Figure 8:** Top panel: 10th to 90th percentile multi-model range of monthly mean daily maximum temperatures for 20th Century (grey) and future period (red). Bottom panel: 10th to 90th percentile multi-model range of monthly mean daily maximum temperature anomalies between the future simulation period and the 20th Century simulation period.

**Figure 9:** Left hand panels: Top panel: 10th to 90th percentile multi-model range of monthly rainfall totals for 20th Century (grey) and future period (red). Bottom panel: 10th to 90th percentile multi-model range of monthly rainfall anomalies between the future simulation period and the 20th Century simulation period.

Right hand panels: Top panel: 10th to 90th percentile multi-model range of monthly dry spell length for 20th Century (grey) and future period (red). Bottom panel: 10th to 90th percentile multi-model range of monthly dry spell length anomalies between the future simulation period and the 20th Century simulation period.

**Additional links and information**


To read more about forecasting:

http://iri.columbia.edu/climate/forecast/tutorial2/

**References**


Ziervogel, G. and Zermoglio, F. 2009. Climate change scenarios and the development of adaptation strategies in Africa: challenges and opportunities. Climate Research, 40: 133-146