8.3 Long Range Output - Seasonal, System5, SEAS

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**Long Range Output - Seasonal**

**Long-Range (Seasonal) Structure**

The latest ECMWF seasonal forecast system, SEAS5, has its own detailed SEAS5 user guide. Here we discuss a few of the products and some of the verification material that are available for forecasters and briefly discuss some ways in which they might best be used.

The long-range forecast tries to provide a broad overview of the atmospheric evolution for the 7-month or 13-month period. It is an attempt to provide useful information about the "climate" that can be expected in the coming months. The standard ECMWF output products generally are presented in chart form in terms of probabilities of anomalies or differences relative to a Seasonal model climate (S-M-climate) (e.g. periods potentially warmer or colder than average for the time of year). Other charts show the user how reliable the forecast information was during the re-forecast period.

The long-range (seasonal) forecast uses a slightly different model physics and is based on an older version of the IFS (currently, for SEAS5 which was introduced in Nov 2017, it is Cycle 43r1 released in 2016). It runs at a lower resolution (currently 36km) as a 51 member ensemble, each member globally perturbed using Singular Vectors (SV), stochastic physics, an Ensemble of Data Assimilations (EDA) and some initial condition surface perturbations (e.g. to soil moisture). The seasonal forecast run is extended four times per year (in Feb, May, Aug, Nov) to 13 months as a 15-member ensemble. There is land-atmosphere coupling. But also, and very importantly, ocean-atmosphere coupling (using the Dynamic Ocean model (NEMO) with resolution ~111km) throughout the forecast period. Sea ice is modelled using LIM2. The influence of sea-surface temperatures upon the atmospheric model is critical, and the two-way coupling provides this.

An important aspect of long-range forecasts is the identification of major influences on global weather patterns (e.g. El Niño Southern Oscillation (ENSO) cycle). Chart products give an assessment of the probability of development and intensity of such features.

The long-range (seasonal) forecast is run on the 1st of each month and the forecast products are released on the 5th of each month.

**Re-forecasts** provide a Seasonal model climate (S-M-climate) against which to compare the actual forecasts. The re-forecasts for a given system (now SEAS5) are all created before the System comes into operation. In this sense the re-forecast strategy differs from the update-in-real-time approach used for shorter ranges (ER-M-climate and M-climate). The distributions of the seasonal ENS forecasts can be compared with the corresponding S-M-Climate distributions to give information regarding forecast anomalies.

**Use of the Long-Range (Seasonal) Output**

Seasonal forecasting is the attempt to provide useful information about the "climate" that can be expected in the coming months, or a "statistical summary" of the weather events possible in a given season. It is not and can never be a weather forecast, though long-range forecasts have proved very useful for El Niño predictions. Seasonal predictions, particularly over mid-latitudes, should never be used without some reference to the expected forecast skill, which includes the reliability (i.e. typically there is over-confidence) in the forecasts, and the ability of the forecast system to discriminate when certain categories of event are more likely. The forecasts themselves and the supporting verification information are all available as web-based products.

**Additional Sources of Information**

(Note: In older material there may be references to issues that have subsequently been addressed)

- ECMWF SEASS User Guide
- ECMWF Seasonal Forecast Graphical Products (Forecast products and Verification measures).