Implementation of Seasonal Forecast System 3

ECMWF upgraded its operational seasonal forecasts from System 2 to System 3. The change to operational status took place in March 2007, when System 2 ceased to be operational, and System 3 became the new operational forecast system.

This page gives a brief description of System 3 and provides technical details about access to the data during the pre−operational test phase both from MARS and through dissemination

The page will be updated as required. It was last changed on 21.09.2007.

For a record of changes made to this page please refer to Document versions.

A printable version of this page is available.

Further information and advice regarding the upgrade can be obtained from User Support .

News

16 March 2007

The first operational forecast from System 3 was released on ***15 March at 12 UTC***.

9 February 2007

The upgrade of the operational seasonal forecasts from System 2 to System 3 will be implemented in ***March***, when System 3 will become the operational seasonal forecast. All products, including dissemination, web plots and multi−model products will be based on System 3. The first operational forecast from System 3 will be released on ***15 March at 12 UTC***, following the normal operational schedule.

Pre−operational data from System 3 is available for test purposes, including test dissemination.

Note that these pre−operational products are considered as test products and will be disseminated as *EXPVER=0011* both in GRIB headers and dissemination file names.

ECMWF can assist in setting up the test dissemination requests for the System 3 products: the contact point at ECMWF is Dragan Jokic .

7 November 2006

Initial announcement of the implementation of Seasonal Forecasting System 3 to Member State representatives.

Timetable

The planned timetable for implementation of Seasonal Forecasting System 3 is as follows.

7 November 2006

- Detailed information about the System 3 implementation sent to Member State representatives.

February 2007

- Test data from the pre−operational suite to be made available through dissemination.

15 March 2007

- Implementation of System 3.

The timetable given here represents our current expectations and may have to be reviewed in light of the actual progress made.

Technical description of System 3

A description of the technical aspects of System 3 is provided in the Technical description of Seasonal Forecasting System 3.

Test data sets from pre−operational e−suite

Production of the re−forecasts is now complete, and the data are available in MARS. Pre−operational real−time forecast data has been generated from September 2006 onwards, and the data are available in MARS.

All data are stored in MARS and can be retrieved from the ***new multi−model streams*** with *ORIGIN=ECMWF*:

- *STREAM=MMSF*: Multi−model Seasonal Forecast
- *STREAM=MMSA*: Multi−model Seasonal Forecast Monthly Anomalies.

For the real time forecasts only (2006 onwards):

- *STREAM=MSMM*: Multi−model seasonal forecast atmospheric monthly means.

Note that the multi−model streams contain data from Met Office and Météo−France seasonal forecasts, as well as ECMWF System 3. For the standard (up to month 7) forecasts, request *METHOD=1*. For the longer range forecasts (up to month 13) , request *METHOD=3* (see the Technical description for details).

Data from the experimental 13−month long "ENSO outlook" (re−)forecasts, archived in MARS as method=3, will shortly be re−archived to correct a small bug affecting the last three months of the (re−)forecasts. This may lead to temporary disruption of access to the 13−month data, and once the re−archive is complete we recommend that the revised dataset is downloaded by anyone working with the 13−month data. This does not affect the main 7−month long seasonal forecasts.

Access to pre−operational data from System 3 is also available via test dissemination. Availability of System 3 products for dissemination can be found at:

- http://www.ecmwf.int/services/dissemination/3.1/

Note that these pre−operational products are considered as test products and will be disseminated as *EXPVER=0011* both in GRIB headers and dissemination file names.

Only registered users of ECMWF computing systems will be able to access the test data sets in MARS.

The quality of these data sets is not guaranteed. Please report any problems you find with this data to User Support . The data sets are intended for testing technical aspects the System 3 implementation and to enable users to configure and test their processing and application software.

Availability of System 3 products for dissemination

Availability of System 3 products for dissemination can be found at:

- http://www.ecmwf.int/services/dissemination/3.1/

ECMWF can assist in setting up the test dissemination requests for the System 3 products: the contact point at ECMWF is Dragan Jokic .

Further reading

- Development of the ECMWF Seasonal Forecast System 3.
  ECMWF Technical Memorandum No. 503 (April 2007)

- The ECMWF System 3 ocean analysis system.
  ECMWF Technical Memorandum No. 508 (Februaryl 2007)

- Seasonal Forecast System 3.
  ECMWF Newsletter No. 110 (pp19−25) − Winter 2006/07

- New web products for the ECMWF Seasonal Forecast System 3.
  ECMWF Newsletter No. 111 (pp28−33) − Spring 2007

- Seasonal Forecast User Guide (System 3).
  http://www.ecmwf.int/products/forecasts/seasonal/documentation/

- Full information on the forecast skill, including the WMO SVS scores is available at:
  http://www.ecmwf.int/products/forecasts/d/charts/seasonal/verification/

Document versions

Date	***Reason for update***
24.11.2006	Initial Version.
09.02.2007	Announced change of the operational implementation date from February to March 2007 and availability of pre−operational data.
16.03.2007	Announced implementation of System 3 in operations. See News.
21.09.2007	Added links to additional information. See Further reading.

Technical description of Seasonal Forecasting System 3

ECMWF upgraded its operational seasonal forecasts from System 2 to System 3. The change to operational status took place in March 2007, when System 2 ceased to be operational, and System 3 became the new operational forecast system.

This page gives a brief description of System 3 and provides technical details about access to the data during the pre−operational test phase both from MARS and through dissemination.

Description of System 3

The resolution of the atmosphere model is increased from TL95 with 40 vertical levels to TL159 with 62 vertical levels.

The resolution of the ocean model is unchanged. The horizontal zonal resolution is 1.4 degrees and the horizontal meridional resolution smoothly varies from 0.3 degrees in the equatorial region (within 10 degrees of the equator), to 1.4 degrees polewards of 30 degrees. There are 29 vertical levels.

The ensemble sizes are changed. The real−time forecasts will now have 41 members (previously 40). The re−forecasts will have 11 members uniformly for all start months (previously 5 members, with 40 members for May and November starts only).

The period of the re−forecasts have been extended, and covers the 25 years from 1981 to 2005. This is significantly longer than the 1987−2001 15 year period of the previous system, and should allow better calibration of the forecasts and better assessment of their skill.

The standard forecast length (for both forecasts and back integrations) is increased from 6 to 7 months. This gives a forecast range of 6.5 months from the release date of the forecasts.

Four times a year, from the Feb, May, Aug and Nov starts, 11 members (out of 41) of the forecast ensemble will run to 13 months. This will allow an "ENSO outlook" to be given. The re−forecasts for these start months have 5 ensemble members (out of 11) that extend to 13 months. (The November starts are actually 14 months long in all cases, so they extend to the end of the following calendar year.) Note that, at least initially, these extended runs will be classed as experimental rather than operational, and data from them ***will not*** be available via dissemination.

Scientifically, there have been many enhancements to the ocean analysis system used to prepare ocean initial conditions. The atmosphere model has been upgraded to IFS cycle 31r1, which is the latest version for medium−range forecasting at ECMWF (introduced on 12 September 2006). There have also been significant revisions to the perturbation methods used to generate the forecast ensemble.

Tests show that the prediction skill for Pacific equatorial SSTs (i.e. El Niño variability) is measurably improved in the new system. Changes in skill for atmospheric variables are less clear cut with the limited test sample presently available. Overall, improvements in predictive skill are expected to be more evident during the Northern Hemisphere summer season, and in tropical regions throughout the year. Full information on the forecast skill,

including the WMO SVS scores, is available from:

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/verification/.

Re−forecasts and pre−operational data

Production of the re−forecasts is now complete and covers the period January 1981 to December 2005. The re−forecasts have also been created for January to August 2006 to bridge the gap to the start of the real−time forecasts.

Pre−operational real−time forecast data has been generated since September 2006. The pre−operational system runs a few days behind the operational schedule, and we aim to make the data available by the 20th of each month at the latest. Pre−operational data is now available via the dissemination system. Note that pre−operational data is not intended for operational use, but is to enable users to configure and test their processing and application software.

For the March 2007 forecast, we expect to change the status of Systems 2 and 3 such that System 3 becomes the operational forecast system. When this change occurs, MARS access to the data from Systems 2 and 3 will remain unchanged. However, System 3 will be the official ECMWF forecast, and will be produced on the operational schedule (release on the 15th, 12 UTC). System 3 data will be disseminated as *EXPVER=0001*, and dissemination of System 2 data will cease. ECMWF derived products, such as the web plots and the multi−model combinations, will all be based on the operational forecast system only.

We intend to continue to run System 2 for another 3 months in a post−operational mode, whereby the data will become available in MARS some days behind the operational schedule. This is to ease the transition process for non−operational users who need more time to adjust their experimental applications to the new data. However, such users are cautioned that the post−operational system will have a reduced level of support, and the availability of System 2 data is not guaranteed. Data from the old system will not be available via dissemination or the GTS. Experimental applications should be migrated to System 3 as soon as practicable. Operational applications should only ever use the operational system.

Data access

Data are archived in the new multi−model streams, with *ORIGIN=ECMF:*

- *STREAM=MMSF* for the direct model output;
- *STREAM=MSMM* for the monthly means.

and for the real time forecasts only (2006 onwards):

- *STREAM=MMSA* for the monthly mean anomalies.

Data structures are otherwise unchanged from those of System 2, and the wave model data streams have not been modified. All production data (re−forecasts, pre−operational and operational real−time forecasts) are archived as *EXPVER=0001, SYSTEM=3*. If atmosphere data is retrieved on the archived grid, then the resolution will differ from that of System 2.

An example showing how to modify a MARS request for System 2 data according to the details given above (and for the new definition of Tmax − see later) in order to retrieve the equivalent System 3 data is given in the table:

MARS request − System 2	***MARS request − System 3***

RETRIEVE,
  STREAM = SFMM,
 	
  SYSTEM = 2,
  METHOD = 1,
  NUMBER = 0/TO/39,
  CLASS   = OD,
  EXPVER = 1,
  DATE   = 20061001,
  TIME   = 00,
  TYPE   = FCMEAN,
  LEVTYPE = SFC,
  PARAM   = 201,
  FCMONTH = 1/2/3/4/5/6,
  TARGET = 2m_tmax_monthly
 	
RETRIEVE,
  NUMBER = 0/TO/4,
  DATE   =
 	
  19871001/19881001/
  19891001/19901001/
  19911001/19921001/
  19931001/19941010/
  19951001/19961001/
  19971001/19981001/
  19991001/20001001/
  20011001,
 	
  TARGET = 2m_tmax_monthly_climate
	RETRIEVE,
	  STREAM = ***MSMM***,
	  ORIGIN = ECMF,
	  SYSTEM = ***3***,
	  METHOD = 1,
	  NUMBER = 0/TO/***40***,
	  CLASS = OD,
	  EXPVER = 1,
	  DATE = 20061001,
	  TIME = 00,
	  TYPE = FCMEAN,
	  LEVTYPE = SFC,
	  PARAM = ***51***,
	  FCMONTH = 1/2/3/4/5/6/***7***,
	  TARGET = 2m_tmax_monthly
	
	RETRIEVE,
	  NUMBER = 0/TO/***10***,
	  DATE = ***19811001/19821001/***
	  19831001/19841001/
	  19851001/19861001/
	  19871001/19881001/
	  19891001/19901001/
	  19911001/19921001/
	  19931001/19941010/
	  19951001/19961001/
	  19971001/19981001/
	  19991001/20001001/
	  20011001/***20021001/***
	  20031001/20041001/
	  20051001,
	  TARGET = 2m_tmax_monthly_climate

The longer range integrations (out to 13 months) are archived separately from the 7 month integrations, and are accessed by specifying *METHOD=3* instead of *METHOD=1*. The first 7 months of *METHOD=3* data for each extended integration is a simple copy of the corresponding *METHOD=1* data. System 2 provided 3 ensemble members which were "control" forecasts (i.e. initialized without ocean data assimilation), and archived as *METHOD=0*. These *METHOD=0* forecasts will be discontinued, and do not exist in the System 3 data archive.

A small number of additional surface fields are archived, together with output from a few additional pressure levels. Limited model level data is provided for a subset of integrations, for use as forcing for dynamical downscaling of the seasonal forecasts. The MSLP variable is now output every 6 hours rather than every 12 hours. This impacts the

monthly means of MSLP, which are now based on 6−hourly sampled data. Also, Tmax and Tmin are now archived using parameter numbers 51 and 52 instead of 201 and 202. Other changes in the output are simple additions to what is available. Full details of the System 3 output is available on the ECMWF website at:

http://www.ecmwf.int/products/forecasts/seasonal/documentation/.