Introduction to WMO/GDPFS LRF and SSF Infrastructure

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WEATHER CLIMATE WATER
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WMO/GDPFS infrastructure for extended-range forecasts

- Global numerical sub-seasonal forecasts
  - Global Producing Centers Sub-seasonal Forecasts (GPCs-SSF).
  - Lead Center for Sub-seasonal Forecast Multi-model Ensemble (LC-SSFMME).

- Global numerical long-range predictions (i.e., seasonal)
  - Global Producing Centers for Long-range Forecasts (GPCs-LRF).
  - Lead Center for Long-range Forecast Multi-model Ensemble (LC-LRFMME).

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Global numerical long-range predictions

Global Producing Centers for Long-range Forecasts (GPCs-LRF): Mandatory functions

- Generate LRF products with global coverage (once a month)

- Make available on WIS a range of mandatory and highly recommended products.

- Produce verification statistics.

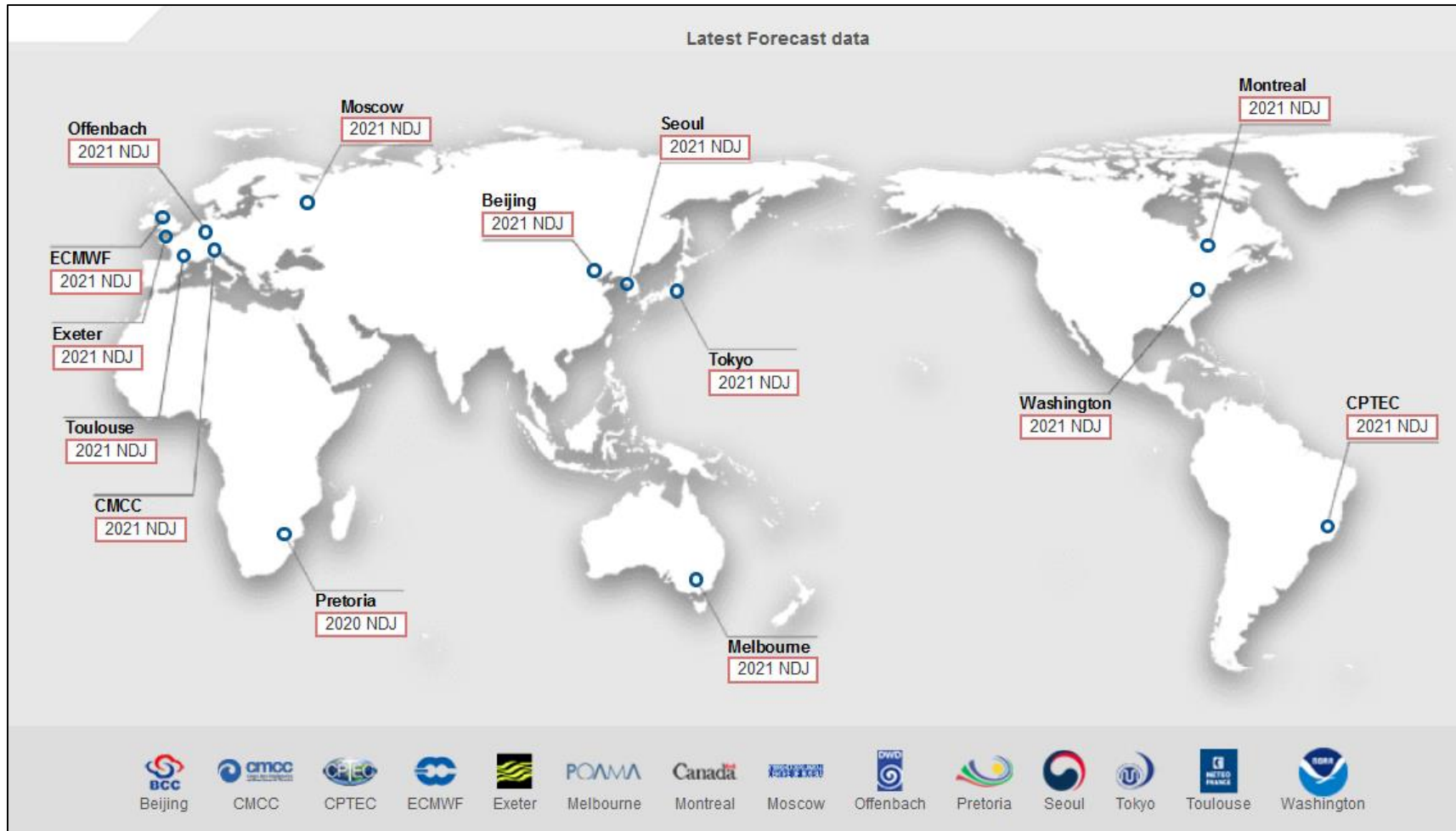- Provide an agreed set of forecast and hindcast variables to LC-LRFMME.

Manual on the Global Data-processing and Forecasting System

Annex IV to the WMO Technical Regulations

2017 edition

GPCs-LRF: 14 designated centers

Global Producing Centers Long-range Forecasts (GPCs-LRF): Products

Global Producing Centre mandatory products (maps)

Variable	Coverage	Forecast range or lead time	Temporal resolution	Output type	Issuance frequency
2-m temperature	Global	Any forecast range (lead time) between zero and four months	Averages over one month or longer periods (seasons)	(1) Ensemble mean anomaly (2) Probabilities for tercile forecast categories (where applicable)	Monthly
SST	Global oceans				
Total precipitation	Global				

Global Producing Centre highly recommended products (maps)

Variable	Coverage	Forecast range or lead time	Temporal resolution	Output type	Issuance frequency
500 hPa height	Global	Any forecast range (lead time) between zero and four months	Averages over one month or longer periods (seasons)	(1) Ensemble mean anomaly (2) Probabilities for tercile forecast categories	Monthly
MSLP					
850 hPa temperature					
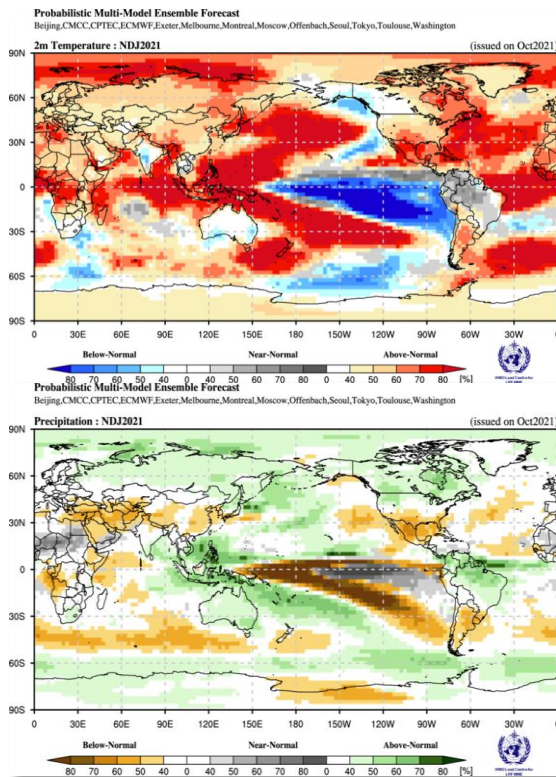
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Global Producing Centers Long-range Forecasts (GPCs-LRF): Products

Global Producing Centre highly recommended products (SST indices)

Index	Description	Coordinates
Pacific Ocean		
Niño 1+2	Region off coasts of Peru and Chile	90°W–80°W, 10°S–0°
Niño 3	Eastern/central tropical Pacific	150°W–90°W, 5°S–5°N
Niño 3.4	Central tropical Pacific	170°W–120°W, 5°S–5°N
Niño 4	Western/central tropical Pacific	160°E–150°W, 5°S–5°N
Atlantic Ocean		
TNA	Tropical North Atlantic	55°W–15°W, 5°N–25°N
TSA	Tropical South Atlantic	30°W–10°E, 20°S–0°
TAD	Tropical Atlantic Dipole	TNA-TSA
Indian Ocean		
WTIO	Western tropical Indian Ocean	50°E–70°E, 10°S–10°N
SETIO	South-eastern tropical Indian Ocean	90°E–110°E, 10°S–0°
IOD (DMI)	Indian Ocean Dipole (Dipole Mode Index)	WTIO–SETIO
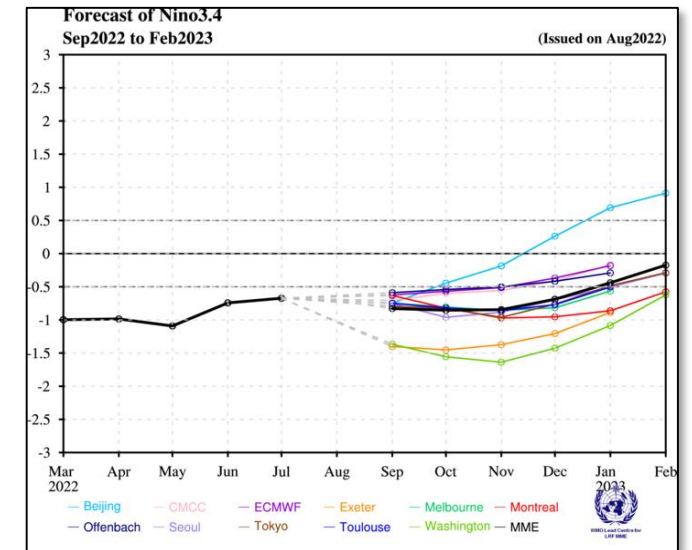
Lead Center for Long-range Forecast Multi-model Ensemble (LC-LRFMME): Mandatory functions

- Collect an agreed set of forecast data from GPCs-LRF participating in numerical long-range forecasting.
- Make available on a website appropriate minimum set of products.
- Redistribute digital forecast data for those GPCs-LRF that allow it.
- Maintain an archive of real-time GPC-LRF and multi-model ensemble forecasts.
- Verify the products.
- Make the Global Seasonal Climate Update (GSCU) available on a website and maintain its archive.
- LC-LRFMME is hosted by the Korean Meteorological Agency (KMA) (https://wmolc.org/).

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Lead Center for Long-range Forecast Multi-model Ensemble (LC-LRFMME): Products

- Digital data for variables collected from GPCs-LRF

(a)   Surface (2-m) temperature;
(b)   SST;
(c)   Total precipitation rate;
(d)   MSLP;
(e)   850 hPa temperature;
(f)   500 hPa geopotential height;
(g)   850 hPa zonal and meridional velocity;
(h)   Sea ice extent.

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Lead Center for Long-range Forecast Multi-model Ensemble (LC-LRFMME): Products

- Graphical products

Plots and maps for each GPC-LRF forecast displayed in common format on the Lead Centre(s) website(s), for the variables listed in Appendix 2.1.2 section 3.1 and for selectable regions where appropriate, showing for three-month means or accumulations:
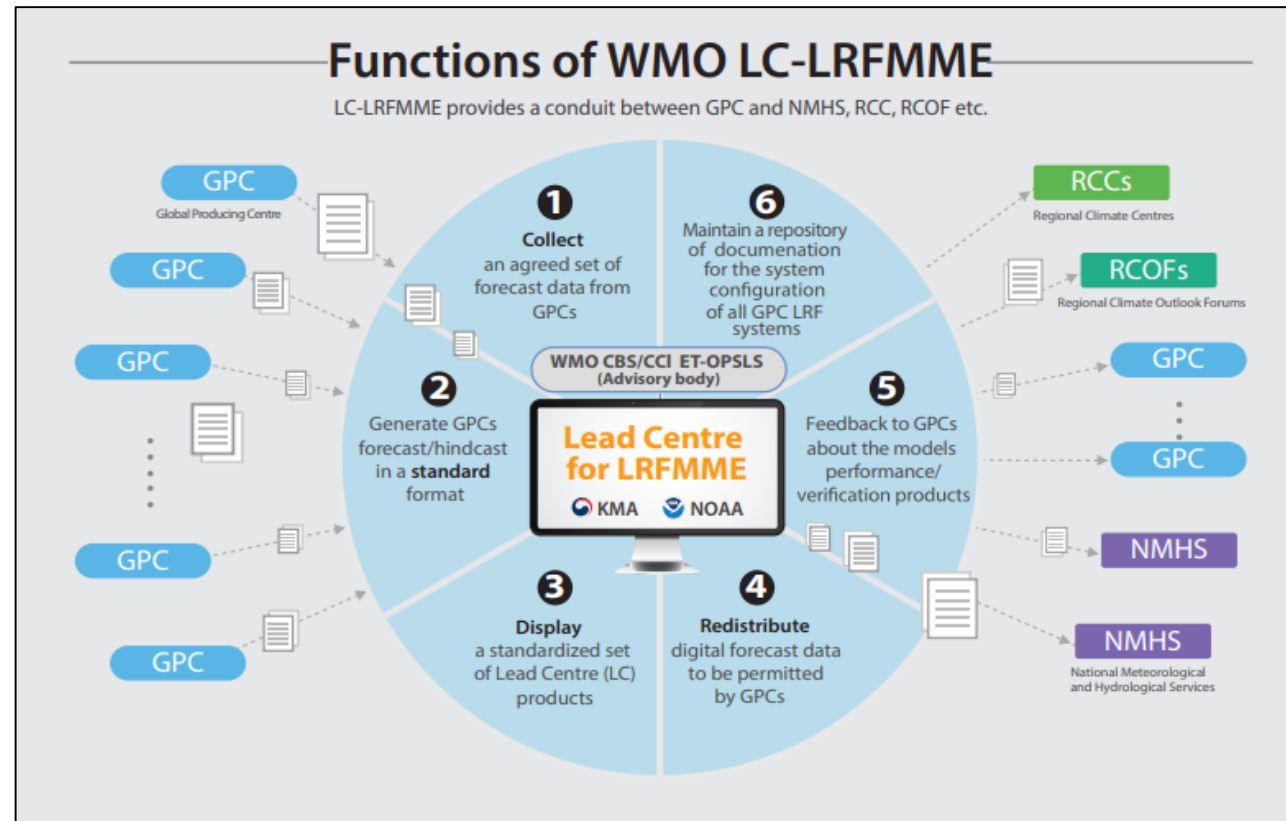
(a)   Ensemble "plumes" of Niño indices (one-month means);

(b)   Ensemble mean anomalies;

(c)   Probabilities of above/below median;

(d)   Model consistency plots, that is, maps showing the proportion of models predicting the same sign anomaly;

(e)   Multi-model probabilities of above/below median.
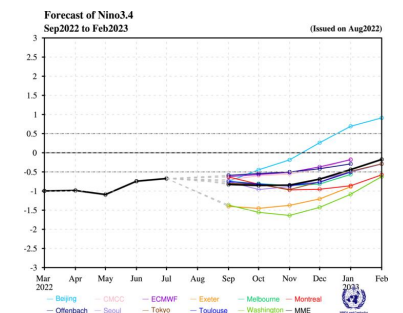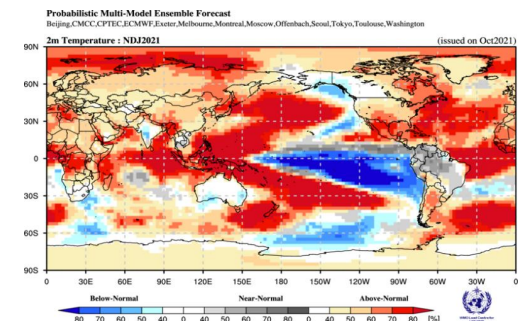
Seasonal forecast data characteristics collected by LC-LRFMME

- Ensemble of hindcast and real-time forecasts.
- Forecast frequency – Once a month.
- Temporal resolution – monthly mean.
- Horizontal resolution – 2.5x2.5 lat/lon.
- Archival of Individual forecasts.

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What is the need for LC-LRFMME?

Functions of WMO LC-LRFMME

LC-LRFMME provides a conduit between GPC and NMHS, RCC, RCOF etc.

GPCs-LRF and LC-LRFMMEs, together, provide an operational infrastructure for global seasonal forecasts.

Global Seasonal Climate Update (GSCU)

- Released every month.
- GSCU provides a summary of observed anomalies for the previous season.
- Includes outlook for the next season
  - Surface temperature.
  - Rainfall
  - Indices (e.g., ENSO)

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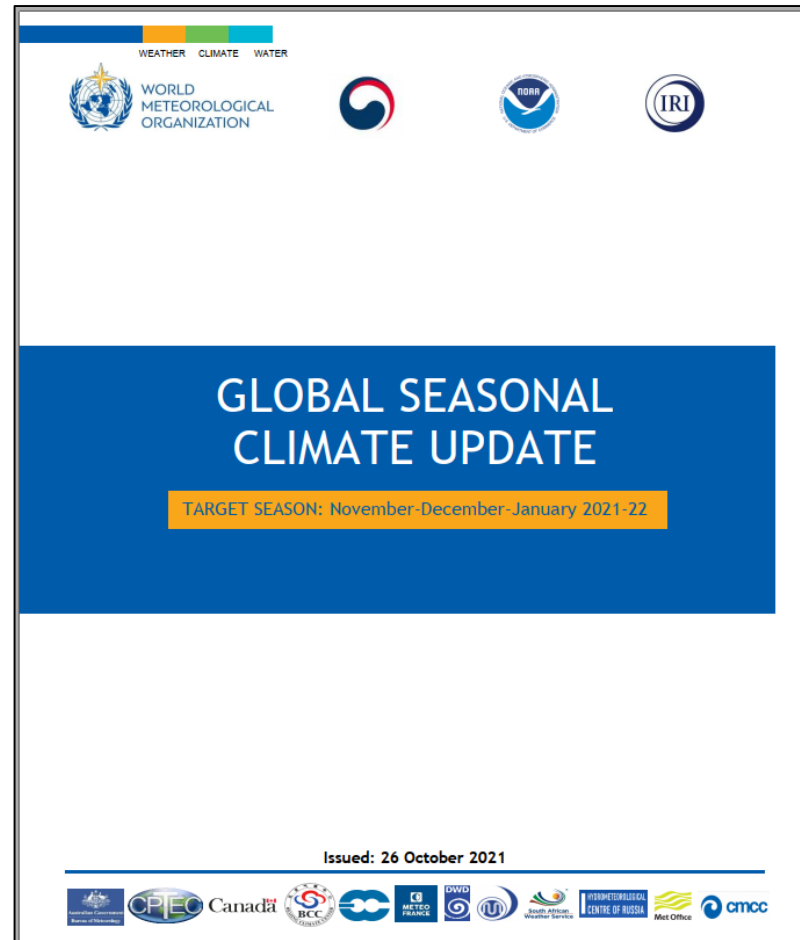
Global numerical sub-seasonal forecasts

Global Producing Centers for Sub-seasonal Forecasts (GPCs-SSF): Mandatory functions

- With at least weekly frequency, generate SSF products with global coverage.

- Make available on WIS a range of mandatory and highly recommended products.

- Produce verification statistics.

- Provide an agreed set of forecast and hindcast variables to LC-SSFMME.

Global Producing Centers Sub-seasonal Forecasts (GPCs-SSF): Products

Mandatory products (maps) of Global Producing Centres for Sub-Seasonal Forecasts (GPCs-SSF)

Variable	Coverage	Forecast range or lead time	Temporal resolution	Output type	Issuance frequency
2-m temperature	Global	Any forecast range (lead time) between zero and four weeks	Averages over periods (one day-four weeks)	(1) Ensemble mean anomaly (2) Probabilities for tercile forecast categories (where applicable)	Weekly
SST	Global oceans				
Total precipitation	Global				

Highly recommended products (maps) of GPCs-SSF

Variable	Coverage	Forecast range or lead time	Temporal resolution	Output type	Issuance frequency
500 hPa height	Global	Any forecast range (lead time) between zero and four weeks	Averages over periods (one day-four weeks)	(1) Ensemble mean anomaly (2) Probabilities for tercile forecast categories	Weekly
MSLP					
850 hPa temperature					

Lead Center for Sub-seasonal Forecast Multi-model Ensemble (LC-SSFMME): Mandatory functions

- Collect an agreed set of forecast data from GPCs-SSF participating in numerical sub-seasonal forecasting.
- Make available on a website appropriate minimum set of products.
- Redistribute digital forecast data for those GPCs-SSF that allow it.
- Maintain an archive of real-time GPC-SSF and multi-model ensemble forecasts.
- Verify the products.

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Lead Center for Sub-seasonal Forecast Multi-model Ensemble (LC-SSFMME): Products

- Digital data for variables collected from GPCs-SSF

    (a)   Surface (2-m) temperature;
    (b)   SST;
    (c)   Total precipitation rate;
    (d)   MSLP;
    (e)   850 hPa temperature;
    (f)   500 hPa geopotential height;
    (g)   850 and 200 hPa wind (zonal and meridional);
    (h)   Outgoing long-wave radiation at the top of the atmosphere;
    (i)   10 hPa zonal wind.

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Lead Center for Sub-seasonal Forecast Multi-model Ensemble (LC-SSFMME): Products

- Graphical products

for weeks 1, 2, 3–4 and 1–4:

(a) Ensemble mean anomalies;

(b) Probabilities for the tercile forecast categories;

(c) Model consistency plots, that is, maps showing the proportion of models predicting the same sign anomaly;

(d) Multi-model probabilities for tercile forecast categories.

for intraseasonal variability:

(a) Diagrams presenting each GPC forecast of the tropical intraseasonal variability such as the Madden–Julian Oscillation.

Sub-seasonal forecast data characteristics collected by LC-SSFMME

- Ensemble of hindcast and real-time forecasts.
- Forecast frequency – Once a week.
- Temporal resolution – Weekly mean.
- Horizontal resolution – 1.5x1.5 lat/lon.
- Archival of Individual forecasts.

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Thank you

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