WORLD METEOROLOGICAL ORGANIZATION
Commission for Climatology

Global Seasonal Climate Update

(TRIAL PHASE)

Issued: February 2016 **Target Season: March-April-May 2016**

Summary

A strong El Niño episode has prevailed from the second half of 2015 through to the present, and it is predicted to continue, while slowly weakening, during March-May 2016 (see the WMO El Niño/La Niña Update, 18 February 2016). All models predict maintenance of the strong El Niño levels through March 2016, moderating during April and weakening further during May, not to return to neutral until after the March-May season. The model consensus for continuing El Niño conditions is reflected in some predicted large-scale seasonal anomalies for March-May, such as the strong tendency towards above-normal temperature over much of the globe and also precipitation effects in some regions (e.g. northeast Brazil, and the northwest and southwest tropical Pacific islands), which are consistent with canonical responses to a mature and weakening El Niño.

A tilt of the odds towards above-normal 2-metre temperature is forecast in virtually all of Africa, much of the tropical Pacific islands, nearly all of Asia and Europe, and large portions of Australia, North America and South America. Some of these areas also experienced above-normal temperature during November-January 2015-16, including most of Australia, southern and northwest Africa, northern South America, Central America, western Europe, and southwest Asia. Exceptions to this persistence of the observations in the December-February forecast are found in part of northern Africa, part of western North America and a substantial portion of Asia. While most of the globe shares a forecast tendency towards above-normal temperature, exceptions are noted in western Australia, southeastern South America and in southern North America, where there is mainly no forecast signal.

Probabilities tilt towards above-normal precipitation for southeast South America, the southern and parts of northern North America, eastern Europe, western and central Asia, southern and central Australia and eastern equatorial Africa. Below-normal precipitation is favoured in northeast South America, southeastern Africa and many of the South Pacific islands. Some of these regions experienced these same precipitation tendencies in November to January 2015, such as northeast South America (dry), southeast South America (wet), southeastern Africa (dry), part of eastern equatorial Africa (wet), tropical South Pacific and North Pacific islands (dry), and the western Caribbean (wet).

Surface Air Temperature, MAM 2016 **Precipitation, MAM 2016**

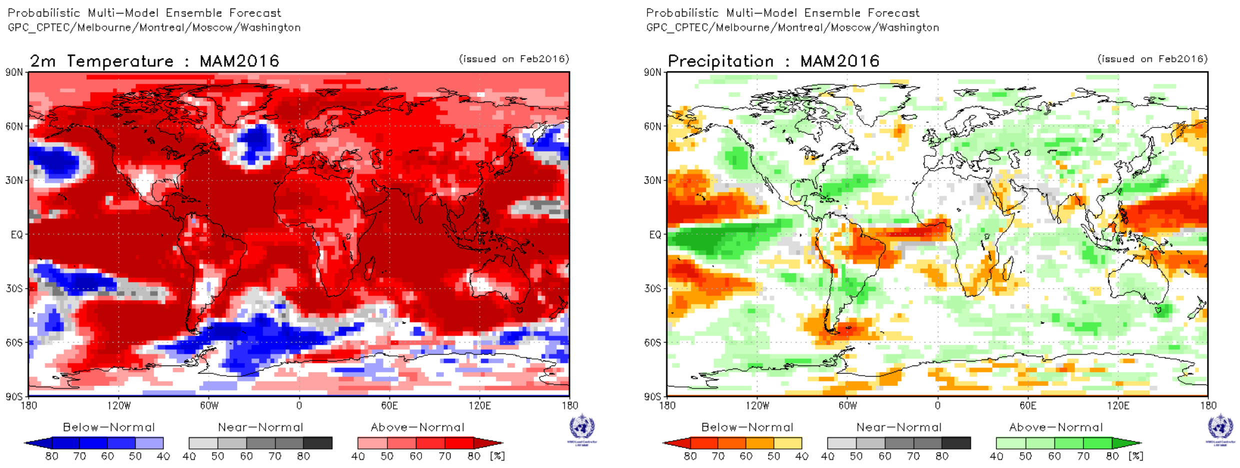


Figure 1: Probabilistic forecasts of surface air temperature and precipitation for the season March-April-May 2016. The tercile category with the highest forecast probability is indicated by shaded areas. The most likely category for below-normal, above-normal and near-normal is depicted in blue, red and grey shadings respectively for temperature, and orange, green and grey shadings respectively for precipitation. White areas indicate equal chances for all categories in both cases. The baseline period is 1983-2001.

1. Observations: November 2015 - January 2016

As expected continued warmer-than-normal temperatures dominated both global ocean and land surfaces during the three-month period of November 2015 – January 2016. Cooler-than-normal conditions in the Northern Hemisphere were mostly limited to the North Atlantic, portions of central and northeast Africa, the Middle East, east-central Asia and a small area of western North America. In the Southern Hemisphere, cooler-than-normal conditions were limited to the extreme southern Atlantic and portions of the Southern Ocean.

The positive El Niño-Southern Oscillation (ENSO) conditions (El Niño) finally peaked in November 2015) followed by a slow decrease in the Niño3.4 index through January 2016. Sea surface temperatures across much of the equatorial East Pacific Ocean during the period remained much warmer to extremely warm (Fig. 2). The Indian Ocean was also extremely warm as were large areas of the western North Atlantic. Smaller but significant areas of warmer-than-normal waters existed across the eastern North Pacific, central Atlantic and Arctic Oceans. The Mediterranean Sea measured mainly warmer to extremely warm compared to normal.

In the following sections observed temperature and precipitation patterns for the period November 2015 through January 2016 are briefly described. For more detailed information about regional climate anomalies, the reader is referred in the first instance to the concerned WMO Regional Climate Centres (RCCs), listed in Section 3.

1.1 Large-scale sea surface temperature (SST) indices

The ENSO state continued to show a highly amplified strongly positive condition through the period November 2015-January 2016. The Indian Ocean Dipole (IOD) continued to be positive but only marginally. In contrast to the November – January 2015 period the South Tropical Atlantic index switched signs to positive over the last three-months while the North Tropical Atlantic index remained positive.

Month	Niño1+2	Niño 3	Niño4	Niño3.4	IOD	NTA	STA
Nov 2015	2.24	2.93	1.67	2.95	0.8	0.25	0.12
Dec 2015	2.19	2.85	1.63	2.82	0.0	0.05	0.43
Jan 2016	2.52	2.57	1.35	2.60	-0.5	0.27	0.57
Nov-Jan 2015/2016	2.32	2.78	1.55	2.79	0.1	0.19	0.37

Table 1: Large-scale oceanic indices (°C). Anomalies are with respect to the 1981–2010 average, with the exception of the IOD which is with respect to the 1983–2005 average. (Source: U.S. Climate Prediction Center)

1.2 Observed temperature

The most notable warm (extreme) temperature anomalies continued across the equatorial East Pacific into northern South America and eastern and northern North America. Broad areas of extreme warmth were also found across all of southern Africa east through Southeast Asia and Oceania. In addition, the southeastern North Pacific, southern Europe and smaller portions of central Asia depicted extreme warmth compared to normal. Conversely, cold (extreme) temperature anomalies were confined to areas of the Southern Ocean near South America and New Zealand.

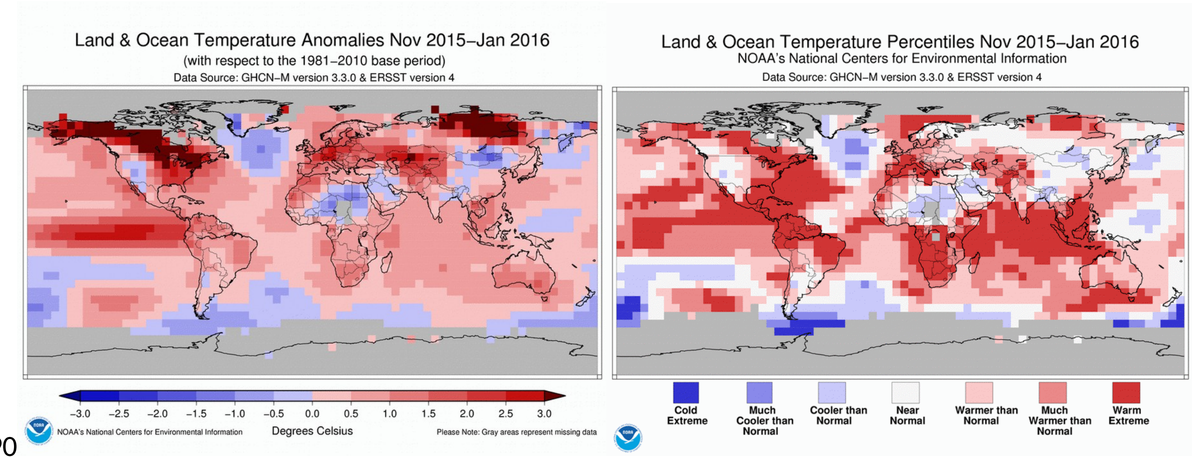


Figure 2: Observed November-January 2015/2016 near-surface temperature anomalies relative to 1981–2010 (left panel) and near-surface temperature percentiles relative to 1981–2010 base period (right panel). The *Cooler than Normal*, *Near Normal*, and *Warmer than Normal* shadings on the percentile map represent the bottom, middle, and upper tercile of the 1981–2010 distribution, respectively. The lowest and highest decile (or 10%) of the distribution are marked as *Much Cooler than Normal* and *Much Warmer than Normal*, respectively. The *Cold Extreme* and *Warm Extreme* shadings indicate that the November-January 2015 value exceeded the coldest and warmest values of the 1981–2010 period. Grey shading indicates areas where there are no observations. (Source: U.S. National Center for Environmental Information)

1.3 Observed precipitation

Precipitation patterns around the globe took on characteristic patterns of a typical positive ENSO signal from November 2015 through January 2016. Major areas of precipitation deficits (drier-than-normal conditions) appeared across most of the western equatorial Pacific including much of the southwestern North Pacific and northwestern to central South Pacific. In addition, much drier-than-normal conditions were noted across much of northern and central South America, southeast Africa, and the Mediterranean region. Wetter-than-normal conditions extended over the ocean along just north of the equator from South America past the International Date Line. Other areas seeing above-normal precipitation include south-central Africa, portions of Australia, extreme eastern Asia, eastern North America, the Caribbean, northwestern Europe through Eurasia and southeastern South America.

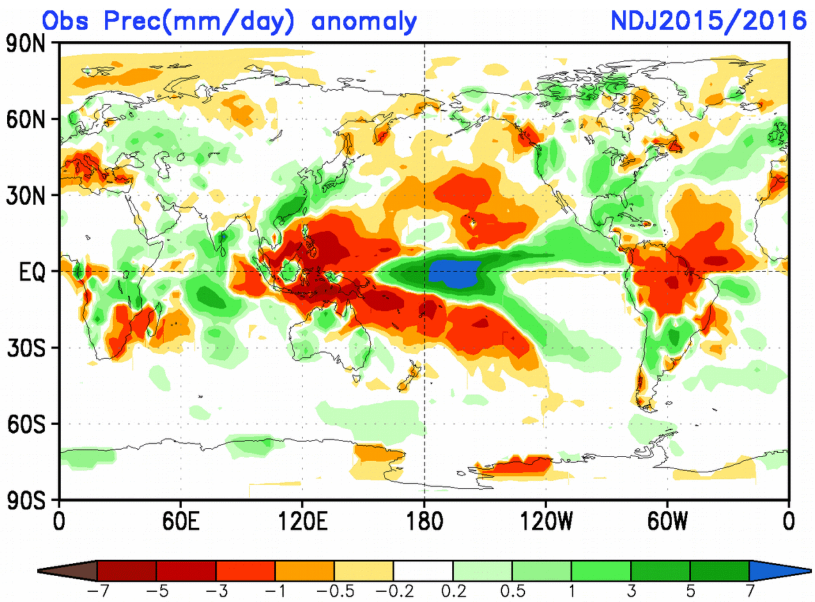


Figure 3: Observed precipitation anomalies for November 2015 - January 2016, relative to 1951–2000 base period. (Source: U.S. Climate Prediction Center) *This figure will be re-plotted to match the panels in Figure 2 in later issues of GSCU.*

2. Potential evolution of the state of the climate over the next three months (March-May 2016)

2.1 Large-scale SST-based indices, March-May 2016

Month	Niño 1+2	Niño 3	Niño 4	Niño3.4	IOD	NTA	STA
March 2016	1.02±0.28	1.96±0.38	1.25±0.19	2.06±0.40	-0.09±0.14	0.46±0.14	0.69±0.28
April 2016	1.04±0.31	1.70±0.47	1.02±0.25	1.71±0.45	0.04±0.12	0.65±0.16	0.49±0.29
May 2016	0.85±0.48	1.14±0.61	0.79±0.23	1.15±0.49	-0.01±0.25	0.70±0.14	0.28±0.39
March 2016-May2016	0.97±0.27	1.60±0.45	1.02±0.22	1.64±0.41	-0.02±0.15	0.60±0.14	0.49±0.31

Table 2: Multi-model forecasts for oceanic indices (°C), with standard deviation. Values are the equal-member-weighting average of those derived, using each GPC models own hindcast climate mean, from the 7 GPCs supplying SST forecasts (GPC ECMWF, Exeter, Melbourne, Montreal, Seoul, Toulouse, and Washington). The standard deviation is calculated on all ensemble members, except for GPC Toulouse (GPC Toulouse provides only ensemble mean anomaly). The latitude/longitude bounds of the regions are given in the supplementary information section.

As the El Niño episode weakens during the March-May period, the four Niño regions are still predicted to remain well above average, especially during March and likely also during April. The far eastern tropical Pacific Ocean (Niño1+2) is predicted to return to neutral (less than 0.5° C above average) by May, while the other Niño regions will likely still show El Niño conditions (at least 0.5° C above average) in May. The Indian Ocean Dipole (IOD) prediction calls for near-average conditions. Both the northern and southern equatorial Atlantic SST are predicted to be somewhat above average, with the northern equatorial Atlantic departure from normal increasing from March to May and the southern departure decreasing during the same period.

2.2 Predicted temperature, March-May 2016

For information on the construction of the multi-model forecast maps refer to the supplementary information section. (Note: Forecast maps indicating consistency over the 12 GPC models are available in the supplementary information).

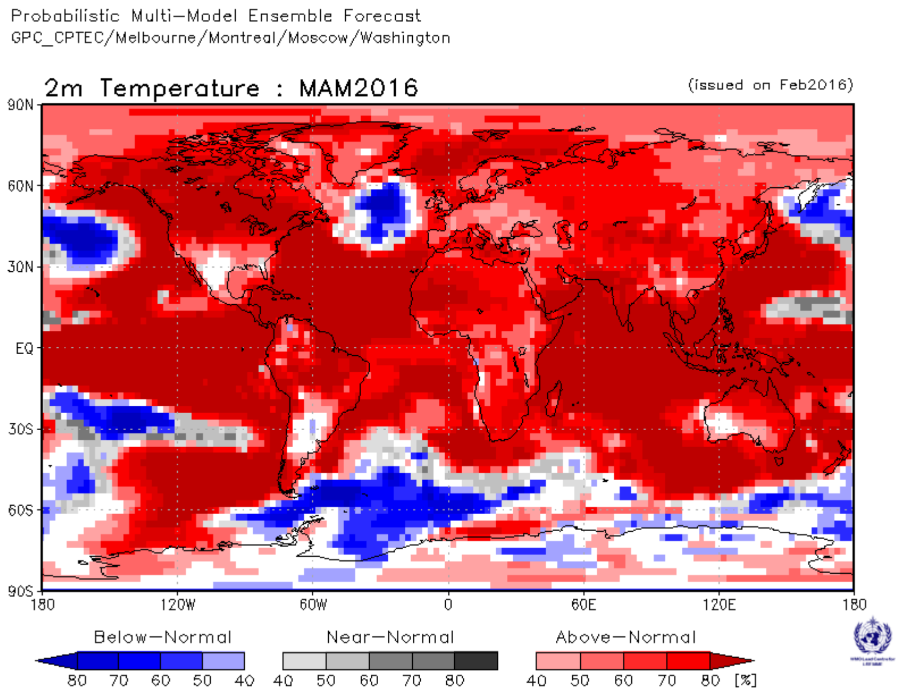


Figure 4: Probabilistic forecasts of surface air temperature for the season March-April-May 2016. The tercile category with the highest forecast probability is indicated by shaded areas. The most likely category for below-normal, above-normal and near-normal is depicted in blue, red and grey shadings respectively. White areas indicate equal chances for all categories in both cases. The baseline period is 1983-2001.

An influence from large-scale mainly positive sea surface temperature anomalies exists in the forecast for March-May 2016, particularly due to the expected continuation of initially strong El Niño conditions and the consequently warmed Indian Ocean and parts of the tropical Atlantic Ocean. Hence, an enhanced probability of above-normal temperature is predicted in most of the global tropics as well as in large portions of the extratropics. A global warming trend also has some effect on the forecast, contributing to a positive bias in anomalies defined using the climatological base period (1983-2001) centred in the past.

RA I (Africa): A strongly enhanced probability for above-normal temperature is predicted in most of Africa. This tendency towards above-normal temperature is slightly less strong along the Atlantic coast of equatorial central Africa and in much of equatorial eastern Africa. Enhanced probabilities for above-normal temperature are highly consistent across individual models in most of the continent, with slightly weaker consistency in part of northeast and eastern equatorial Africa. The strong forecast tendency for above-normal over much of Africa is consistent with the observations for November-January, especially in the southern one-third of Africa as well as in northwest Africa.

RA II (Asia): An enhanced probability for above-normal temperature is predicted in nearly all of Asia. The strongest tilts of the odds are along most of southern and part of eastern Asia, as well as the Arabian Peninsula. A warm tendency is lacking only in part of extreme northeast Asia, where there is a weak tendency towards below-normal temperature. Model consistency for above-normal temperature is very strong in most of Asia, but slightly less strong in southeast and northeast Asia. Consistency is only fair in the part of extreme northeast with the tendency towards below-normal. The tendency towards above-normal over most of Asia is consistent with the November-January observations only in parts of southern and southwest Asia, making up less than one-third of the continent.

RA III (South America): A strongly enhanced probability for above-normal temperature is predicted in all of South America except for part of the southern and southeast portion, where there is generally no predictive signal or a weak tendency towards below-normal. Model consistency is very strong in the large region tending towards above-normal temperature. Most of the region expected to have a warm tendency also had observations of above-normal temperature during November-January.

RA IV (North America, Central America and the Caribbean): Enhanced probabilities for above-normal temperature are predicted in most of North America, including Central America and the Caribbean, with the exception of a sizable area in the south-central part of the continent and another smaller area in the southeast. Individual models show high consistency in all of the regions tending towards above-normal. Model consistency is very strong throughout the areas with an above-normal prediction. Above-normal temperature was also observed during November-January through all of Central America and much of northern and eastern North America.

RA V (Southwest Pacific): A strongly enhanced probability for above-normal temperature is predicted in all of Indonesia, some of the northwest Pacific islands, most of the southwest Pacific islands, most of New Zealand, and all except the southwest portion of Australia. These tendencies match the November-January observations fairly well in most of Australia, Indonesia, and some South Pacific islands. Model consistency is very high in the regions having enhanced probabilities for above-normal.

RA VI (Europe): A somewhat enhanced probability for above-normal temperature is predicted in most of Europe, including Iceland and most of Greenland. Individual models are quite consistent in predicting above-normal in most of Europe—in particular far western and southern Europe. Consistency is relatively weaker in northeast Europe, Scandinavia and interior eastern Greenland. The observations for November – January also indicate above-normal temperature in most of Europe.

2.3 Predicted precipitation, March-May 2016

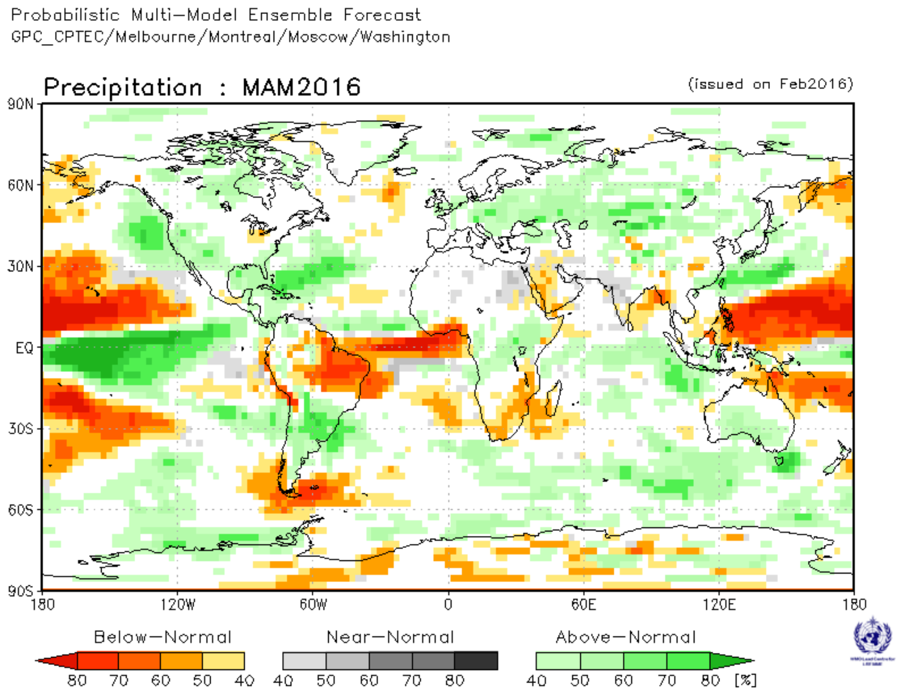


Figure 5: Probabilistic forecasts of precipitation for the season March-April-May 2016. The tercile category with the highest forecast probability is indicated by shaded areas. The most likely category for below-normal, above-normal and near-normal is depicted in orange, green and grey shadings respectively. White areas indicate equal chances for all categories in both cases. The baseline period is 1983-2001.

The continuing strong El Niño condition predicted to continue through the March-May 2016 season is reflected in the predicted large-scale seasonal precipitation anomalies in many of the regions normally impacted by El Niño. Several of these are noted in the following precipitation prediction, such as a tendency towards below-normal rainfall in northeast South America, southeast Africa, and most of the northwest and southwest tropical Pacific islands. Meanwhile, also consistent with El Niño, an above-normal precipitation tendency is predicted for part of southeast South America, and part of southern North America.

RA I (Africa): Enhanced probabilities for below-normal precipitation are predicted in southeast Africa, with fairly good model consistency. This part of Africa also experienced below-normal precipitation during November-January. There is a tilt of the odds towards above-normal rainfall in much of eastern equatorial Africa and interior central Africa, also with fairly good model consistency, and also in agreement with the November-January observations. Enhanced probabilities for near-normal rainfall are predicted in some parts of the Sahara, which normally receives little or no rainfall during this time of the year.

RA II (Asia): Enhanced probabilities for above-normal precipitation are predicted in a wide area spanning from western Asia eastward through central and east-central Asia, with good model consistency. A tilt of the odds towards above-normal is also predicted in parts of far eastern and southeast Asia. A tendency towards below-normal is predicted in part of the Arabian peninsula and in the western part of southeast Asia, with fair model consistency.

RA III (South America): Strongly enhanced probabilities for below-normal precipitation are predicted in northeast South America, with more moderately enhanced probabilities for below-normal along part of the tropical west coast and in part of the extreme southern tip of the continent. Except for the extreme southern part, these regions have strong model consistency. A tilt of the odds towards above-normal precipitation is forecast in a large portion of southeast South America, with very good model consistency. The northeast portion of South America, with a predicted tilt towards below-normal, also experienced below-normal precipitation during November-January, while the southeast part received above-normal precipitation, also consistent with the forecast.

RA IV (North America, Central America and the Caribbean): A tilt of the odds towards above-normal precipitation is forecast for parts of southern North America and the northern Caribbean region, with strong model consistency. The northwest Caribbean has already received above-normal rainfall during November-January. A more weakly enhanced tilt of the odds towards above-normal precipitation is predicted in part of northern North America, with fair consistency.

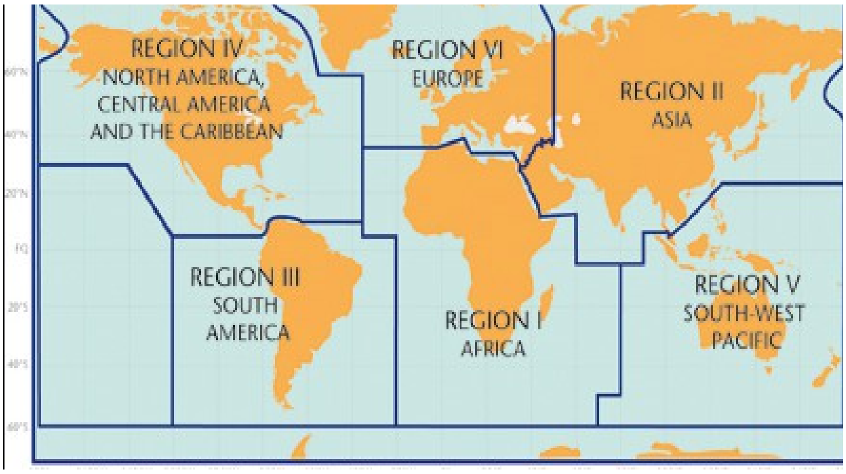
RA V (Southwest Pacific): An enhanced probability for below-normal precipitation is predicted in most of the tropical South Pacific islands, and most of the tropical North Pacific islands, with very good model consistency. Parts of central Indonesia and southern and southeast Australia have a weak tendency towards above-normal rainfall, with moderate model consistency. Below-normal precipitation was observed in much of the northwest and southwest tropical Pacific islands regions during November-January.

RA VI (Europe): Slightly enhanced probabilities for above-normal precipitation are predicted over much of east-central and eastern Europe. Model consistency is quite strong over these portions of Europe.

3. How to use the Global Seasonal Climate Update

a) Seasonal outlooks for any region or nation should be obtained from the relevant Regional Climate Centre (RCCs – see below for contact details) or National Meteorological and Hydrological Services (NMHSs). The GSCU is intended as guidance for RCCs, RCOFs and NMHSs. It does not constitute an official forecast for any region or nation.
b) Seasonal forecasts are probabilistic in nature. Although the text and figures used in the GSCU highlight the tercile categories with highest predicted probability, it is important to recognise that the other tercile categories may also have substantial (though lower) probability.
c) The geographical areas occupied by the forecast signals should not be considered precise. Similarly, signals with small spatial extent may be unreliable.
d) The skill of seasonal forecasts is substantially lower than that of shorter range and skill may vary considerably with region and season. It is important to view the forecast maps together with the skill maps provided in the supplementary appendices.

For reference, the six WMO Regional Association domains are depicted in the figure below.



Designated and developing Regional Climate Centres and Regional Climate Centre Networks

RA I: https://www.wmo.int/pages/prog/wcp/wcasp/RCC-Africa.html

RAII: https://www.wmo.int/pages/prog/wcp/wcasp/RCC-Asia.html

RA III: https://www.wmo.int/pages/prog/wcp/wcasp/RCC-SouthAmerica.html

RA IV: https://www.wmo.int/pages/prog/wcp/wcasp/RCC-NorthAmerica.html

RA V : https://www.wmo.int/pages/prog/wcp/wcasp/RCC-SouthwestPacific.html

RA VI : https://www.wmo.int/pages/prog/wcp/wcasp/RCC-Europe.html

References

Sources for the graphics used in the GSCU:

- NOAA National Centers for Environmental Information http://www.ncdc.noaa.gov/oa/ncdc.html
- The WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble prediction (LC-LRFMME): http://www.wmolc.org

Resources

- WMO portal to the Global Producing Centres (GPC) for Long-range Forecasts: http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html
- WMO Portal for Regional Climate Outlook Forums (RCOFs): http://www.wmo.int/pages/prog/wcp/wcasp/clips/outlooks/climate_forecasts.html
- International Research Institute for Climate and Society (IRI): http://portal.iri.columbia.edu/portal/server.pt
- NOAA Climate Prediction Centre (CPC): http://www.cpc.noaa.gov/
- APEC Climate Center: http://www.apcc21.net
- The WMO Lead Centre for the Standard Verification System for Long-Range Forecasts (LC-SVSLRF): http://www.bom.gov.au/wmo/lrfvs/
- *To be completed*

Acknowledgements

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- NOAA National Centers for Environmental Information ;

- Global Producing Centres: Beijing, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Pretoria, Seoul, Tokyo, Toulouse, Washington;
- WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble;
- International Research Institute for Climate and Society;
- Met Office;
- Meteo France;
- *To be completed*