WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION

GLOBAL SEASONAL CLIMATE UPDATE

TARGET SEASON: March-April-May 2025

Issued: 20 February 2025

Beijing CMCC CPTEC ECMWF Exeter Melbourne Montreal Moscow Offenbach Pretoria Pune Seoul Tokyo Toulouse Washington

Summary

For November 2024 – January 2025 seasonal mean, except for the equatorial central and eastern Pacific, the observed sea-surface temperature (SST) anomalies in global oceans were generally above-average. The Pacific Niño SST index anomaly in the eastern Pacific (Niño 1+2) was near-zero, while the other three Niño indices were below-average, with the largest negative anomaly for Niño 3.4. Overall, the ocean and atmospheric conditions in the equatorial central and eastern Pacific were consistent with a weak La Niña. The observed Indian Ocean Dipole (IOD) anomaly was below-average. Both the North Tropical Atlantic (NTA) and South Tropical Atlantic (STA) SST index anomalies were above-average, indicating widespread warmth in the tropical Atlantic that has persisted for over a year[1].

For March-May 2025, sea surface temperature anomalies in the Niño 3.4 and Niño 3 regions are expected to return to near-average, indicating a neutral state in the El Niño–Southern Oscillation (ENSO). Further west, in the Niño 4 region, the sea surface temperature anomaly is also forecast to decrease to near-average. The strength of the Indian Ocean Dipole (IOD) index is likewise anticipated to be near-average. In the equatorial Atlantic, sea surface temperatures are predicted to be above average in both the northern (NTA) and southern (STA) regions.

Consistent with the anticipated continuation of widespread above-normal sea-surface temperatures in all oceans, except for the near-equatorial eastern Pacific Ocean, there is a prediction of above-normal temperatures over almost all land areas. Extensive areas of increased probabilities for above-normal temperatures include most of mainland Africa and Madagascar, nearly all of mainland Asia, South America between the equator and 20° S, the Caribbean, Central America, the southern and eastern regions of North America below 45° N, throughout the western Pacific west of 160° E, and across all of Europe. Regions with a large increase in the probability for above-normal temperatures include the Arabian Peninsula, extending eastward into the northern parts of Eastern Asia, the western coastal regions of the Indian subcontinent and Southeast Asia, and a horseshoe pattern emanating from the Maritime Continent and extending north-eastward and south-eastward into the north and south Pacific. Regions with no clear indication for predicted signal include eastern parts of Southeast Asia and the northeastern regions, and western coastal parts of North America.

Predictions for rainfall for March-May 2025 are consistent with the enhanced positive east-to-west sea surface temperature gradient typically observed during La Niña, even though the prediction based on the Niño indices is for ENSO-neutral. Enhanced probabilities for near- or below-normal rainfall are predicted along or south of the equator, extending eastward from 150º E to the western coast of South America. Probabilities for above-normal rainfall are moderately enhanced over the central and eastern Maritime Continent. To the south, this region of above-normal rainfall probability extends to cover Australia and further south-eastward to 150º W. Except for a few small regions, there is no clear signal for rainfall prediction over Africa. There is a prediction for an enhancement in probabilities for below-normal rainfall over the southern parts of the Arabian Peninsula, extending eastward into Central Asia. Regions with an increase in the probability for above-normal rainfall are indicated in the southern part of the Arabian Sea, extending eastward into the Bay of Bengal and Southeast Asia. A region of enhanced probability for below-normal rainfall is predicted over the interior and southern regions of North America, with regions of stronger probability located in the southwest, crossing into the northern parts of Central America.

[1] https://www.cpc.ncep.noaa.gov/products/people/mchen/AttributionAnalysis/images/Attribution202501.pdf

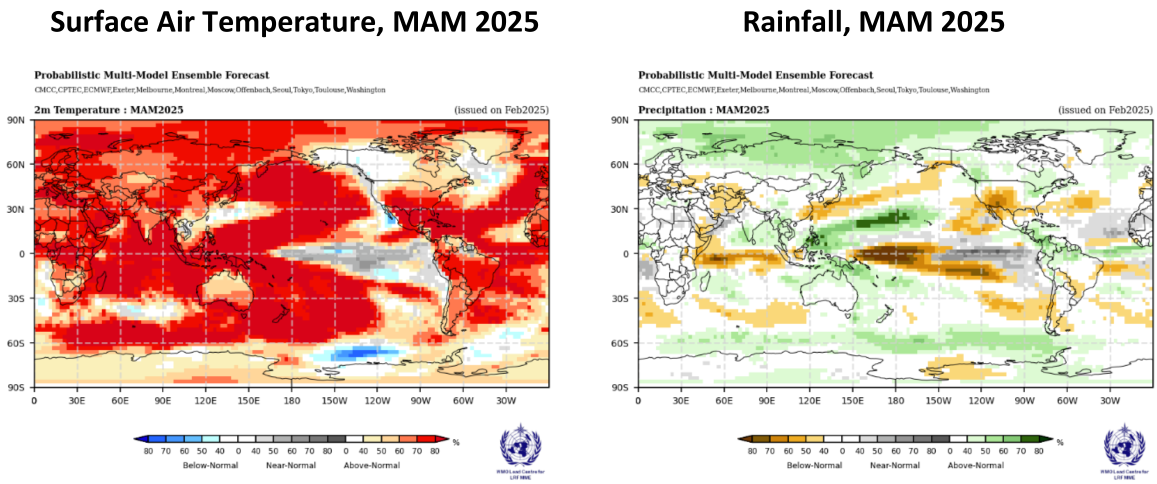


Figure 1. Probabilistic forecasts of surface air temperature and rainfall for the season March-May 2025. The tercile category with the highest forecast probability is indicated by shaded areas. The most likely category for below-normal, above-normal, and near-normal is depicted in blue, red, and grey shadings respectively for temperature, and orange, green and grey shadings respectively for rainfall. White areas indicate equal chances for all categories in both cases. The baseline period is 1993–2009.

1. Observations: November 2024 -January 2025

In the following sections, observed temperature and rainfall patterns for the previous season are discussed. For more detailed information about regional and local climate anomalies, the reader is referred to the concerned WMO Regional Climate Centres (RCCs) or RCC Networks, listed in Section 5.

1.1 Large-scale sea-surface temperature (SST) indices

For November 2024 – January 2025 seasonal mean, except for the equatorial central and eastern Pacific, the observed sea-surface temperature (SST) anomalies in global oceans were generally above-average. The Pacific Niño SST index anomaly in the eastern Pacific (Niño 1+2) was near-zero, while the other three Niño indices were below-average, with the largest negative anomaly for Niño 3.4. Overall, the ocean and atmospheric conditions in the equatorial central and eastern Pacific were consistent with a weak La Niña. The observed Indian Ocean Dipole (IOD) anomaly was below-average. Both the North Tropical Atlantic (NTA) and South Tropical Atlantic (STA) SST index anomalies were above-average, indicating widespread warmth in the tropical Atlantic that has persisted for over a year[1].

Month	Niño 1+2	Niño 3	Niño 4	Niño 3.4	IOD	NTA	STA
November 2024	0.3	0.0	0.1	-0.1	-0.5	0.9	0.3
December 2024	-0.1	-0.4	-0.4	-0.6	-0.5	0.6	0.4
January 2025	-0.2	-0.2	-0.6	-0.7	-0.4	0.9	0.4
November 2024 – January 2025	0.0	-0.2	-0.3	-0.5	-0.5	0.8	0.4

Table 1. Large-scale oceanic indices (°C). Anomalies are with respect to the 1991–2020 average. (*Source:* U.S. Climate Prediction Center)

1.2 Observed temperature

From November 2024 -January 2025, temperature anomalies over land areas were predominantly above-average, with only a few regions experiencing below-average temperatures (Figure 2, top). The most significant positive land-temperature anomalies were observed north of 45° N across North America and Asia. Positive temperature anomalies were also noted in Europe, northern and southern Africa, other parts of Asia, the Maritime Continent, Australia, and New Zealand. Regions with negative temperature anomalies included northern parts of Central America extending into southwestern North America, eastern coastal areas of Greenland, interior western Africa, and the extreme northwest region of South America.

Over oceans, below- to near-average temperature anomalies were observed over the equatorial Pacific, extending from 170° E to the western coastal regions of South America and further south along the coastal areas. These anomalies reflected weak La Niña conditions. The eastern Indian Ocean and the western Pacific experienced above-average temperature anomalies, and further, along a horseshoe pattern extended into both the northern and southern Pacific Ocean. Above-average temperature anomalies were also observed in the equatorial Atlantic and the northeastern Atlantic.

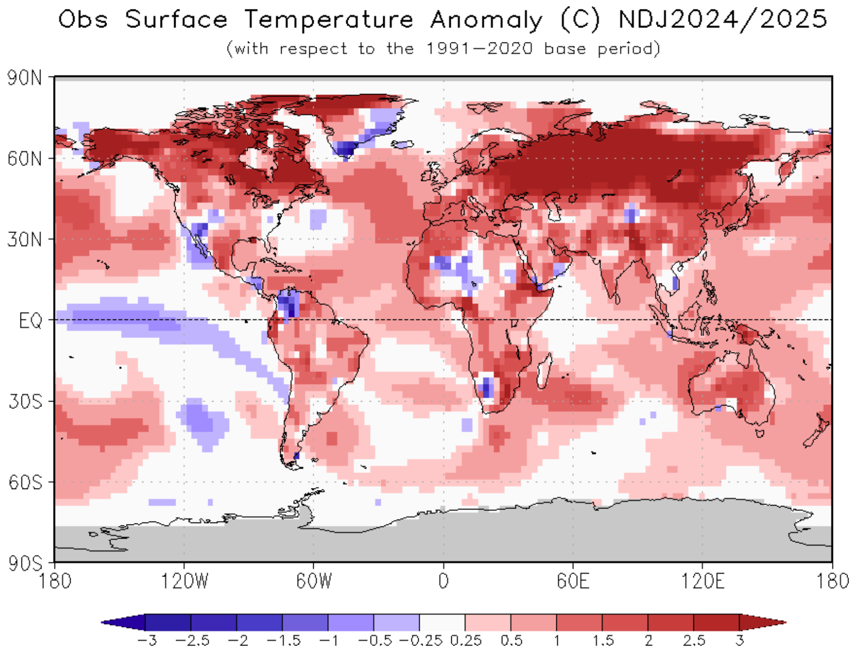
In land areas, extreme warmth (exceeding all seasonal mean temperatures observed from 1991 to 2020) was observed over the southern part of Central America, extending into the southern regions of the Caribbean Islands, along 60° N in eastern parts of Asia, and in the eastern parts of the Maritime continent. Over the oceans, warm extremes were noted in the western tropical Atlantic, extending northeastward towards the southern and western parts of the British Isles, in the western parts of the Indian Ocean off the coast of Africa near 30° S, and in the interior sections of the horseshoe pattern that extended from the western Pacific into the northern and southern Pacific Ocean. There were no systematic regions with cold extremes observed.

1.3 Observed rainfall

From November 2024 - January 2025, the rainfall anomaly pattern in the equatorial Pacific reflected the effects of weak La Niña conditions. This pattern was accentuated due to enhanced east-west sea surface temperature (SST) gradients, with positive SST anomalies in the western equatorial Pacific and negative SST anomalies in the central equatorial Pacific. Below-average rainfall was observed east of 120° E in the equatorial tropical Pacific and extended to the northern coastal regions of Central America. Below-average anomalies also occurred in the northern Pacific north of 30° N, the northern parts of the equatorial Atlantic, oceanic areas off the eastern coast of North America, and the equatorial and southern parts of the Indian Ocean west of 90° E. Regions with above-average rainfall included the eastern parts of the Indian Ocean extending into the oceans adjacent to the Maritime continent, and the Caribbean.

Across land regions, South America experienced below-average rainfall. Similar conditions were seen in western and eastern coastal areas of North America, southeastern Greenland, southern Europe, coastal East Asia, northern central Australia, western Africa between the equator and 20°S, and northern Madagascar. Above-average rainfall was observed over the Maritime continent, extending into Southeast Asia and southern parts of the Indian subcontinent, northern Asia, and southern Caribbean Islands.

Only a few isolated land regions exhibited either wet or dry extremes during this season, defined as areas where the seasonal mean rainfall was either above (wet extremes) or below (dry extremes) of all seasonal mean rainfall observed from 1991-2020. Wet extremes were observed in extreme northeastern North America, northern Europe, and the western coastal areas of southern Africa. Dry extremes occurred over Greenland’s southeastern coast and the western coastal regions of North America between latitudes 40-60° N.



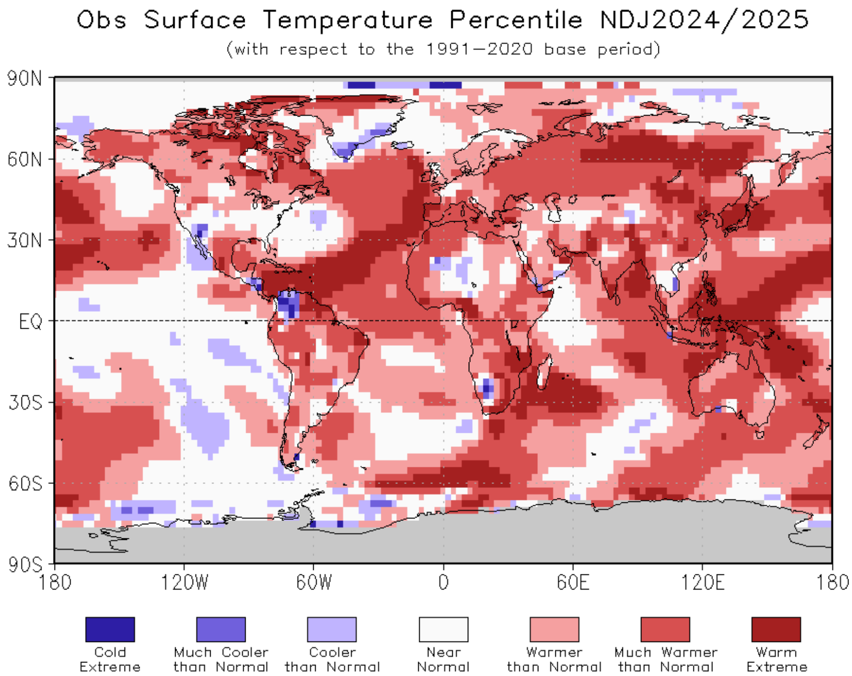
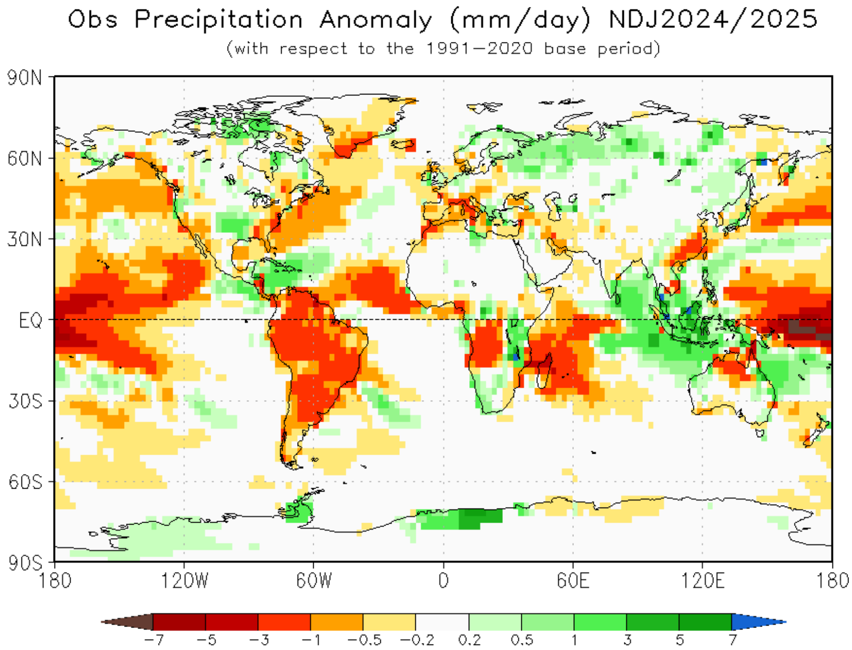


Figure 2. Observed November 2024 - January 2025 near-surface temperature anomalies relative to 1991–2020 (top). The *Cooler than Normal, Near Normal, and Warmer than Normal* shadings on the percentile map (bottom) indicate that seasonal mean anomalies were in the bottom, middle, and upper tercile of the 1991–2020 distribution, respectively. Regions with anomalies in 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 anomalies exceeded the coldest and warmest temperature values of the 1991–2020 period for the season. Grey shading indicates areas where observational analysis was not available. (*Source:* U.S. Climate Prediction Center).



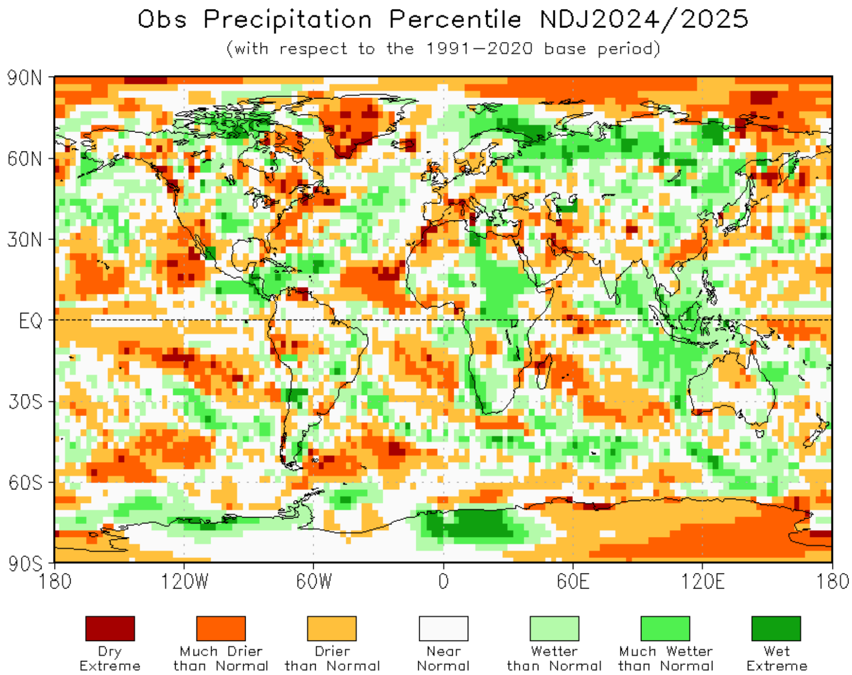


Figure 3. Observed rainfall anomalies for November 2024 - January 2025, relative to 1991–2020 base period (top). The *Drier than Normal, Near Normal and Wetter than Normal* shadings on the percentile map (bottom) indicate that seasonal mean anomalies were in the bottom, middle, and upper tercile of the 1991–2020 distribution, respectively. Regions with anomalies in the lowest and highest decile (or 10%) of the distribution are marked as *Much Drier than Normal* and *Much Wetter than Normal*, respectively. The *Dry Extreme* and *Wet Extreme* shadings indicate that the anomalies exceeded the driest and wettest values of the 1991–2020 period for the season.
(*Source:* U.S. Climate Prediction Center).

2. Predicted evolution of the state of the climate over the next three months March-May 2025)

2.1 Large-scale SST-based indices, March-May 2025

Month	Nino 1+2	Nino 3	Nino 4	Nino3.4	IOD	NTA	STA
March 2025	-0.2±0.2	-0.1±0.1	-0.2±0.2	0.1±0.2	0.0±0.1	0.4±0.1	0.4±0.1
April 2025	-0.3±0.4	-0.0±0.2	0.0±0.2	-0.0±0.2	0.0±0.1	0.4±0.1	0.4±0.2
May 2025	-0.2±0.4	-0.0±0.3	0.1±0.2	-0.0±0.2	-0.2±0.1	0.4±0.1	0.4±0.2
March – May 2025	-0.2±0.3	-0.0±0.2	0.1±0.2	-0.0±0.2	0.0±0.1	0.4±0.1	0.4±0.2

Table 2: Multi-model forecasts for oceanic indices (℃), with standard deviation. Values are the equal-member-weighting average of those derived, using each GPC model's own hindcast climate mean, from the GPCs supplying SST forecasts (GPC Beijing, CMCC, ECMWF, Exeter, Melbourne, Montreal, Offenbach, Seoul, Tokyo, Toulouse, Washington). The standard deviation is calculated on all ensemble members. The latitude/longitude bounds of the regions are given in the supplementary information section.

For March-May 2025, sea surface temperature anomalies in the Niño 3.4 and Niño 3 regions are expected to return to near-average, indicating a neutral state in the El Niño-Southern Oscillation (ENSO). Further west, in the Niño 4 region, the sea surface temperature anomaly is also forecast to decrease to near-average. The strength of the Indian Ocean Dipole (IOD) index is likewise anticipated to be near-average. In the equatorial Atlantic, sea surface temperatures are predicted to be above average in both the northern (NTA) and southern (STA) regions during this period.

2.2 Predicted temperature, March-May 2025

For information on the construction of the multi-model forecast maps, refer to the supplementary information section. (Note: Maps indicating forecast consistency among GPC models are available from the WMO Lead Center for Seasonal Forecast Website[2]).

[2] https://wmolc.org/seasonIndiFcstUI/plot_IndiFCST

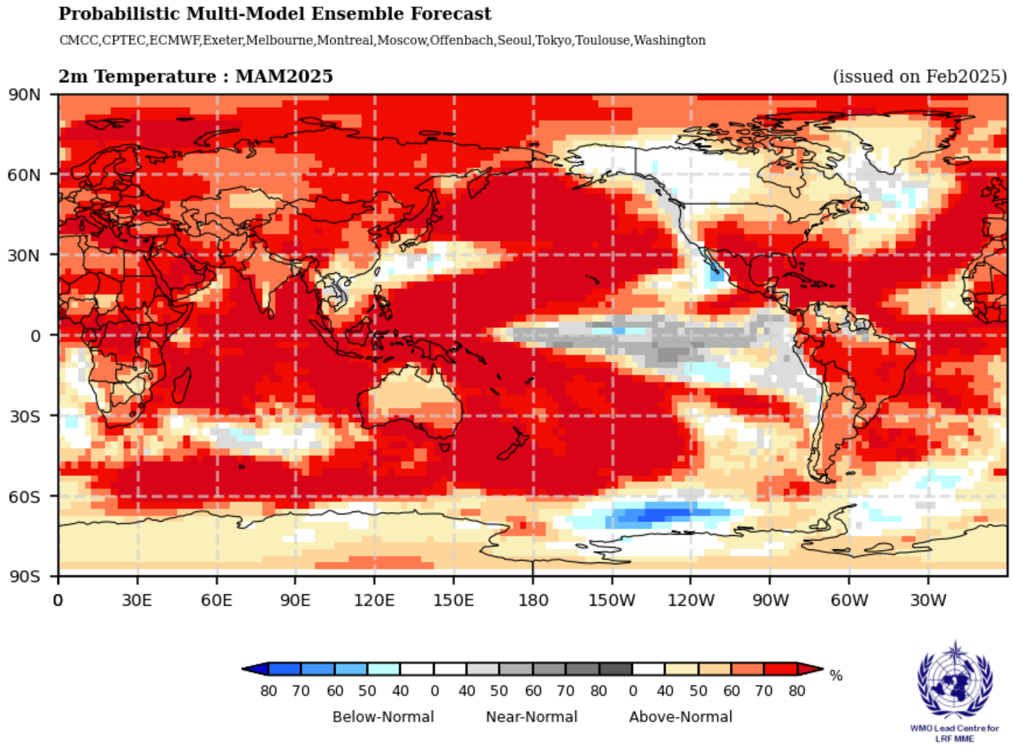


Figure 4. Probabilistic forecasts of surface air temperature for December-February 2024-25. The tercile category with the highest forecast probability is indicated by shaded areas. The most likely category for below-normal, above-normal, and near-normal is depicted in blue, red, and grey shadings, respectively. White areas indicate equal chances for all categories in both cases. The baseline period is 1993–2009. Figure is generated by The WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble.

Consistent with the anticipated continuation of widespread above-normal sea-surface temperatures in all oceans, except for the near-equatorial eastern Pacific Ocean, there is a prediction of above-normal temperatures over almost all land areas. Extensive areas of increased probabilities for above-normal temperatures include most of mainland Africa and Madagascar, nearly all of mainland Asia, South America between the equator and 20° S, the Caribbean, Central America, the southern and eastern regions of North America below 45° N, throughout the western Pacific west of 160° E, and across all of Europe. Regions with a large increase in the probability for above-normal temperatures include the Arabian Peninsula, extending eastward into the northern parts of Eastern Asia, the western coastal regions of the Indian subcontinent and Southeast Asia, and a horseshoe pattern emanating from the Maritime Continent and extending north-eastward and south-eastward into the north and south Pacific. Regions with no clear indication for predicted signal include eastern parts of Southeast Asia and the northeastern regions, and western coastal parts of North America.

RA I (Africa): Enhanced probabilities of above-normal temperatures are expected across most of mainland Africa and Madagascar, with the highest increase in probabilities occurring between 10º S and 20º N, supported by strong to moderate model consistency. A weaker increase in probabilities for above-normal temperatures is predicted north of 20º N and south of 10º S, with model consistency ranging from moderate to weak.

RA II (Asia): Enhanced probabilities for above-normal temperatures are expected across nearly all of mainland Asia. The largest increase in probabilities is observed over the Arabian Peninsula, extending eastward over the mountainous regions of the Third Pole, into the northern parts of Eastern Asia, and arching northward to northeastern parts of Asia. A strong increase in the probability for above-normal temperatures is also predicted along the western coastal regions of the Indian subcontinent and Southeast Asia. Model consistency over these regions is moderate to strong. Regions with a moderate increase in the probability for above-normal temperatures are predicted over the interior parts of the Indian subcontinent and Central Asia, with model consistency ranging from moderate to low. There is no clear signal for temperature prediction over the eastern parts of Southeast Asia.

RA III (South America): Enhanced probabilities for above-normal temperatures are expected over South America between the equator and 20º S, with model consistency generally strong. A moderate increase in the probability for above-normal temperatures is anticipated south of 25º S, with moderate model consistency. Along the western coastal region below the equator, there is either no clear indication for the predicted signal or a weak enhancement in the probability for near-normal temperatures. A similar prediction is also likely for the northernmost part of the continent.

RA IV (North America, Central America, and the Caribbean): A strong increase in the probability for above-normal temperatures is predicted over the Caribbean, Central America, and the southern and eastern regions of North America below 45º N, with strong model consistency. A moderate increase in the probability for above-normal temperatures is predicted for areas above 45º N, but only in the eastern parts of the continent, with moderate model consistency. There is no clear indication for the predicted signal over the northeastern regions and western coastal parts of North America.

RA V (Southwest Pacific): Widespread and strongly enhanced probabilities for above-normal temperatures are predicted throughout the western parts of the region, with model consistency mostly high. This area of predicted warmth extends to about 160º E, marking the western edge of a narrow tongue of near-normal temperatures associated with the prediction of ENSO-neutral. This area of above-normal probability extends into other parts of the Pacific along a horseshoe pattern straddling the equatorial Pacific. One extension is towards the northeast, reaching the western coast of North America, where at 30º N, the region of above-normal probability swings northwest towards the coastal regions of eastern Asia. Another branch of this extension moves southeast and terminates at 120º W. The same region of probability for above-normal temperatures also covers New Zealand and the ocean off the eastern coast of Australia. Extending westward from 160º E to the coastal regions of South America, the probability for near-normal temperatures is weakly enhanced. A moderate increase in the probability for above-normal temperatures is also predicted over Australia, the western coastal regions of North America, Greenland, and in the southern Pacific between 60 -30º S and east of 120º W.

RA VI (Europe): The probabilities for above-normal temperatures are increased across all of Europe, with the highest probabilities north of approximately 45º N, extending westward into the British Isles. Enhanced probabilities for above-normal temperatures are also predicted over southern Europe, with strong model-to-model consistency in these regions. For the remaining regions of Europe, predictions indicate a moderate increase in probabilities for above-normal temperatures.

2.2 Predicted rainfall, March-May 2025

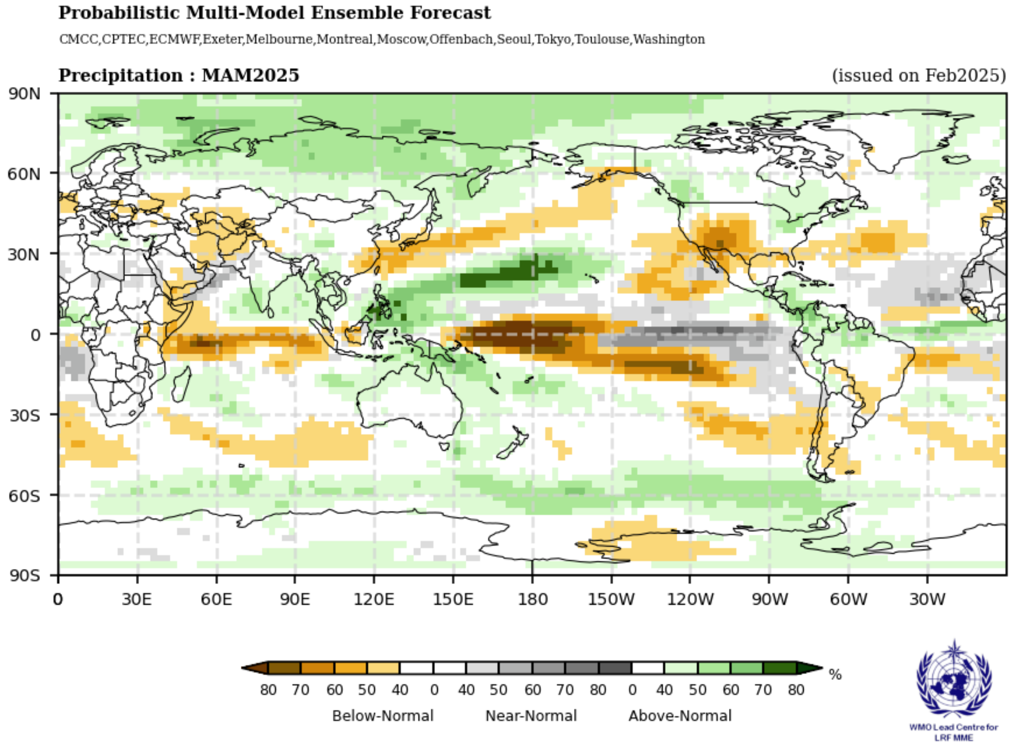


Figure 5. Probabilistic forecasts of rainfall for the season for December-February 2024-2025. The tercile category with the highest forecast probability is indicated by shaded areas. The most likely category for below-normal, above-normal, and near-normal is depicted in orange, green and grey shadings, respectively. White areas indicate equal chances for all categories in both cases. The baseline period is 1993–2009. Figure is generated by The WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble.

Predictions for rainfall for March-May 2025 are consistent with the enhanced positive east-to-west sea surface temperature gradient typically observed during La Niña, even though the prediction based on the Niño indices is for ENSO-neutral. Enhanced probabilities for near- or below-normal rainfall are predicted along or south of the equator, extending eastward from 150º E to the western coast of South America. Probabilities for above-normal rainfall are moderately enhanced over the central and eastern Maritime Continent. To the south, this region of above-normal rainfall probability extends to cover Australia and further south-eastward to 150º W. Except for a few small regions, there is no clear signal for rainfall prediction over Africa. There is a prediction for an enhancement in probabilities for below-normal rainfall over the southern parts of the Arabian Peninsula, extending eastward into Central Asia. Regions with an increase in the probability for above-normal rainfall are indicated in the southern part of the Arabian Sea, extending eastward into the Bay of Bengal and Southeast Asia. A region of enhanced probability for below-normal rainfall is predicted over the interior and southern regions of North America, with regions of stronger probability located in the southwest, crossing into the northern parts of Central America.

RA I (Africa): Except for a few small regions, there is no clear signal for rainfall prediction over Africa. There is a moderate increase in the probability for below-normal rainfall in the vicinity of the Greater Horn of Africa. A moderate increase in the probability for above-normal rainfall is also indicated in the vicinity of the Gulf of Guinea and over Madagascar.

RA II (Asia): There is a prediction for an enhancement in probabilities for below-normal rainfall over the southern parts of the Arabian Peninsula, extending eastward into Central Asia, with model consistency ranging from weak to moderate. An enhanced probability for below-normal rainfall also includes a band off the coast of eastern Asia, extending north-eastward to the Bering Sea and the Gulf of Alaska, where it merges with an increase in the probability for above-normal rainfall along the Arctic Circle. The model consistency over these regions is generally moderate.

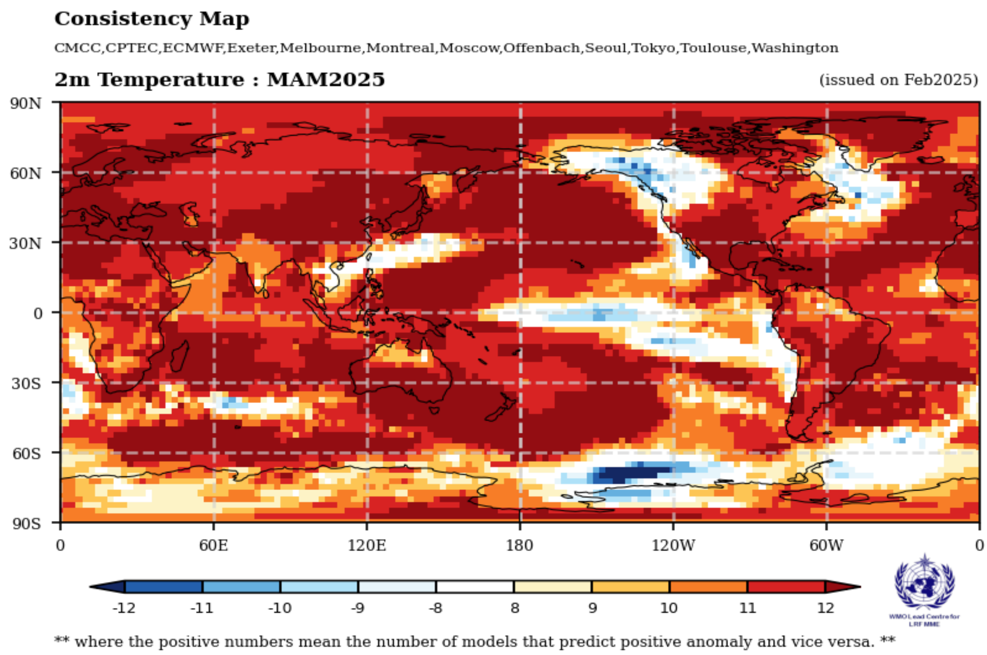
Regions with an increase in the probability for above-normal rainfall are indicated in the southern part of the Arabian Sea, extending eastward into the Bay of Bengal and Southeast Asia, with model consistency ranging from moderate to strong.

RA III (South America): There is an enhancement in the probability for above-normal rainfall over the northeastern part of South America, with moderate model consistency. Regions with an increase in the probability for below-normal rainfall, with moderate model consistency, include the northeastern region extending into the Atlantic Ocean, near the eastern coastal region at 30º S, and the southern regions south of 30º S.

RA IV (North America, Central America, and the Caribbean): Probabilities for above-normal rainfall are enhanced over an area extending from southern Central America to most of the Caribbean and the northwestern tip of South America, with moderate model consistency. Enhanced probabilities for above-normal rainfall are also predicted north of 50º N over northwestern and northeastern North America, with moderate model consistency. A region of enhanced probability for below-normal rainfall is predicted over the interior and southern regions of North America, with regions of stronger probability located in the southwest, crossing into the northern parts of Central America. The model consistency over this region is moderate to strong.

RA V (Southwest Pacific): Probabilities for above-normal rainfall are moderately enhanced over the central and eastern Maritime Continent. To the south, this region of above-normal rainfall probability extends to cover Australia and further extends southeastward to 150º W. Another area of enhanced probability for above-normal rainfall extends northeastward from the Maritime Continent to 150º W into the northern Pacific, with moderate to strong model consistency across all these regions. East of 150º E, regions with enhanced probabilities for near- or below-normal rainfall form complex zones of contrasting rainfall anomalies across the Pacific Ocean. An equatorial band of below-normal rainfall east of 150º E transitions to a prediction for enhanced probability of near-normal rainfall east of 150º W, continuing all the way to South America. This narrow equatorial tongue is accompanied by a strip of below-normal rainfall to its south that extends eastward to about 90º W. Additionally, there is a band of enhanced probability for below-normal rainfall extending northeastward from about 150º W to the western coast of North America. East of 120º W and along 30º S, there is a band of rainfall with moderate increase in below-normal rainfall extending to the western coast of South America.

RA VI (Europe): There is a prediction for an increase in the probability for above-normal rainfall over northern Europe. There is also a prediction for an increase in the probability for below-normal rainfall over parts of eastern Europe. Over the rest of Europe, there is no clear signal for rainfall prediction.



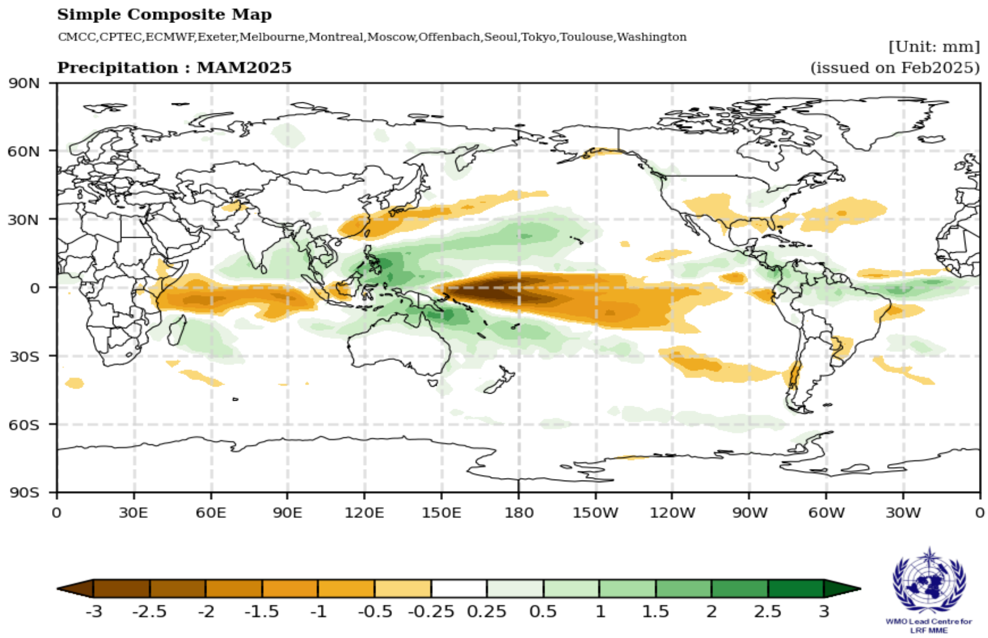


Figure 6. Consistency maps for sign of ensemble mean anomalies for the seasonal mean of December-February 2024-2025 for surface air temperature (top) and rainfall (bottom) from different model forecasts. The consistency map is constructed using the following procedure: At each grid point the number of models with positive or negative anomaly is counted and the number that is larger in plotted on the map. For example, if the number of models with positive (negative) anomaly is larger then the count is plotted on the map using the red (blue) scale. Darker (lighter) colours imply that there is a higher (lower) consistency in the sign of anomalies between models.

3. Latest updates for monitoring and prediction information

Each month, the latest updates for the real-time monitoring and seasonal mean predictions included in GSCU can be found at:

Monitoring:

https://ftp.cpc.ncep.noaa.gov/mingyue/GSCUWMO/

Predictions:

www.wmolc.org/board/downloadExt?fn=WMOLC_T2M.png

http://www.wmolc.org/board/downloadExt?fn=WMOLC_PREC.png

4. How to use the Global Seasonal Climate Update

The GSCU is intended as guidance for RCCs, Regional Climate Outlook Forums (RCOFs) and National Meteorological and Hydrological Services (NMHSs). It does not constitute an official forecast for any region or nation. Seasonal outlooks for any region or nation should be obtained from the relevant RCCs (see below for contact details) or NMHS.

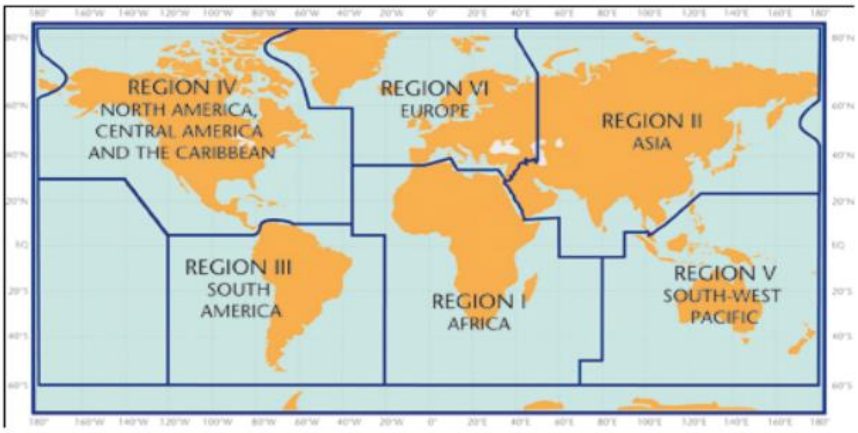
Figure 4 shows the spatial pattern of seasonal mean surface air temperature forecast probabilities. Probabilities are calculated for the average temperature for the season being in the highest third (above-normal or warm), middle third (normal) or lowest third (below-normal or cold) ranges of the baseline record (1993-2009) at each location. Colour code is indicated only for the category that has the highest probability of occurrence. For example, for regions highlighted in red, the most likely forecast category for seasonal mean surface air temperature to occur is warmer than normal. Similarly, the blue colour highlights regions where the seasonal mean surface air temperature forecast indicates the colder than normal category as most likely, while grey colour highlights regions where the seasonal mean temperature forecast indicates the near normal category as most likely. Deeper shades of respective colours highlight increasing probability for the seasonal mean temperature to be in the indicated category. White areas indicate equal chances for all categories.

A particular colour does not assure that the seasonal mean temperature is “certain” to be observed in the most likely forecast category that is shown, but rather its probability of being in that category. As a consequence, the observed seasonal mean temperatures have a non-negligible probability to be observed in a category different from the category indicated on the map as most likely. Users need to take the probabilistic nature of seasonal forecasts into account when making decisions. It should also be noted that the absolute values for the surface air temperature corresponding to the definitions of the above normal (warm), normal or below normal (cold) categories depend on the climatology (historical information) at the location, and therefore, is location dependent.

The interpretation of the probabilities for the rainfall forecast (Figure 5) is the same as that for the seasonal mean surface air temperature except that green and brown colours indicate whether the forecasted seasonal mean rainfall is most likely to be in the wet or dry category. As for surface temperature, grey colour highlights regions where the seasonal mean rainfall forecast indicates the near normal category as the most likely.

The skill of seasonal forecasts is substantially lower than that of weather timescales 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 material.

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



5. Designated and developing WMO Regional Climate Centres and Regional Climate Centre Networks

- https://public.wmo.int/en/our-mandate/climate/regional-climate-centres

6. Resources

Sources for the graphics used in the GSCU:

- The WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble (LC-LRFMME): http://www.wmolc.org
- WMO portal to the Global Producing Centres for Long-range Forecasts (GPCs-LRF): https://public.wmo.int/en/programmes/global-data-processing-and-forecasting-system/global-producing-centres-of-long-range-forecasts
- WMO portal for Regional Climate Outlook Forums https://public.wmo.int/en/our-mandate/climate/regional-climate-outlook-products
- International Research Institute for Climate and Society (IRI): https://iri.columbia.edu/
- NOAA Climate Prediction Centre (CPC): http://www.cpc.ncep.noaa.gov ; https://www.cpc.ncep.noaa.gov/products/people/mchen/AttributionAnalysis/

7. Acknowledgements

This Global Seasonal Climate Update was jointly developed by the WMO Infrastructure (INFCOM) and Services (SERCOM) Commissions with contributions from:

- WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble (LC-LRFMME), Korea Meteorological Administration, NOAA National Centers for Environmental Prediction
- WMO Global Producing Centres for Long-Range Forecast (GPCs-LRF): GPC-Beijing (China Meteorological Administration), GPC-CPTEC (Center for Weather Forecast and Climate Studies, Brazil), GPC-ECMWF (European Center for Medium-Range Forecast), GPC-Exeter (UK Met Office),GPC- Melbourne (Bureau of Meteorology), GPC-Montreal (Meteorological Services of Canada), GPC-Moscow (Hydro meteorological Center of Russia), GPC-Offenbach Deutscher Wetterdienst), GPC-Pretoria (South African Weather Services), GPC-Seoul (Korea Meteorological Administration), GPC-Tokyo (Japan Meteorological Agency), GPC-Toulouse (Météo-France), GPC-Washington (National Centers for Environmental Prediction), GPC-CMCC (Centro Euro-Mediterraneo sui Cambiamenti Climatici), GPC-Pune (India Meteorological Department).
- International Research Institute for Climate and Society (IRI)