Australian Aid

Climate and Oceans Support Program in the Pacific

25 SPREP
Secretariat of the Pacific Regional Environment Programme

Monthly Climate Bulletin

January 2019

Summary

Issued 04 February 2019

Issue Contents:

- Recent observations and climate model outlooks suggest the immediate risk of El Niño has passed. However, there remains an increased likelihood that El Niño will develop later in 2019. The Bureau's ENSO Outlook has therefore moved to El Niño WATCH, meaning there is approximately a 50% chance of El Niño developing during the southern hemisphere autumn or winter.
- A moderate strength pulse of the Madden–Julian Oscillation (MJO) over the Maritime Continent and eastern Pacific during the past fortnight was the primary climate driver of rainfall over broader southwest Pacific regions. Most climate models predict the MJO will track further east, but there is disagreement amongst the models as to the strength of the MJO as it moves towards the central Pacific. If the MJO pulse weakens significantly in the coming week, its impact on tropical rainfall patterns would be expected to become insignificant.
- The Intertropical Convergence Zone (ITCZ) enhanced west of the Date Line. In the south Pacific, the SPCZ was over its normal position over the Solomon Islands, Vanuatu, Fiji, Tonga and Samoa. Enhanced convection over New Guinea Islands, Solomon Islands, Fiji, Tokelau and Cook Islands was associated with a moderate strength pulse of the MJO.
- Sea level in January was higher than normal in the equatorial and most of the southwest Pacific. Sea level was more than 15 cm above normal around Nauru and Kiribati. Sea level was near or below normal between Palau and the Marshall Islands.
- Above-normal rainfall totals are most likely for the Papua New Guinea northern coastline and northeastern islands, Nauru, Kiribati, northern and central Tuvalu and the northern Cook Islands. SCOPIC and the APEC Climate Center multi-model favour below-normal rainfall for Palau, the Federated States of Micronesia, Republic of Marshall Islands, southern Papua New Guinea, eastern Solomon Islands, most of Vanuatu, southeast Fiji, Tonga, Samoa, Niue and French Polynesia.
- Four tropical cyclones were formed in the south Pacific to date for this season. The probability of tropical cyclone occurrence is higher than normal in the western south Pacific from 3 to 16 February 2019.

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Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

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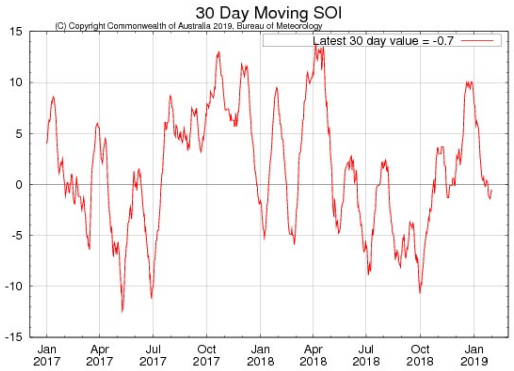
El Niño–Southern Oscillation

El Niño ALERT and positive Indian Ocean Dipole continues- *ENSO Wrap-Up issued on 22 January 2019*

Recent observations and climate model outlooks suggest the immediate risk of El Niño has passed. However, there remains an increased likelihood that El Niño will develop later in 2019. The Bureau's ENSO Outlook has therefore moved to El Niño WATCH, meaning there is approximately a 50% chance of El Niño developing during the southern hemisphere autumn or winter.



Tropical Pacific sea surface and sub-surface temperatures remain warmer than average, but since late 2018 they have cooled from El Niño-like values towards ENSO-neutral values. Atmospheric indicators such as cloudiness, trade winds and the Southern Oscillation Index all continue to generally remain within the ENSO-neutral range.

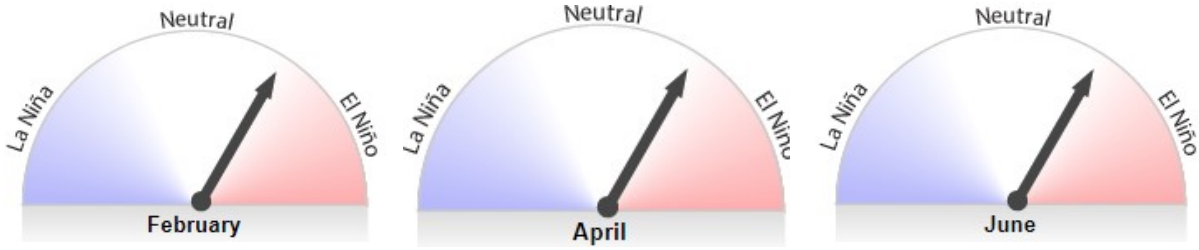
While most climate models indicate ENSO-neutral conditions for the immediate future, the current ocean warmth and likelihood of ongoing warmer than average conditions mean the risk of El Niño remains. Three of eight models suggest that El Niño may establish by mid-2019.

The Indian Ocean Dipole (IOD) is neutral. The IOD typically has little influence on Australian and Pacific climate from December to April.

The approximate 30-day and 90-day Southern-Oscillation Index (SOI) values to 20 January were -0,1 and +3 respectively.

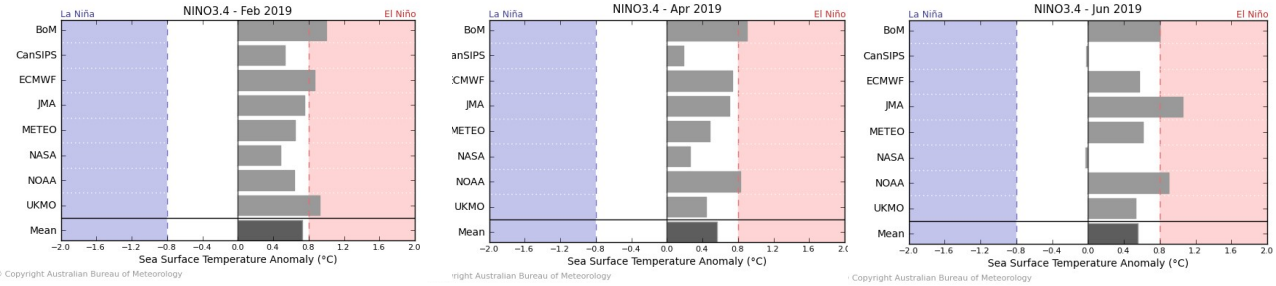
Bureau of Meteorology ENSO Wrap-Up: http://www.bom.gov.au/climate/enso/
Bureau of Meteorology ENSO Outlook: http://www.bom.gov.au/climate/enso/outlook/

Bureau of Meteorology NINO3.4 ENSO Model Outlooks for February, April and June



Average of international model outlooks for NINO3.4 for the months, February, April and June http://www.bom.gov.au/climate/model-

Bureau of Meteorology NINO3.4 International Model Outlooks



Bureau of Meteorology summary of international model outlooks for NINO3.4: http://www.bom.gov.au/climate/model-summary/

#tabs=Pacific-Ocean

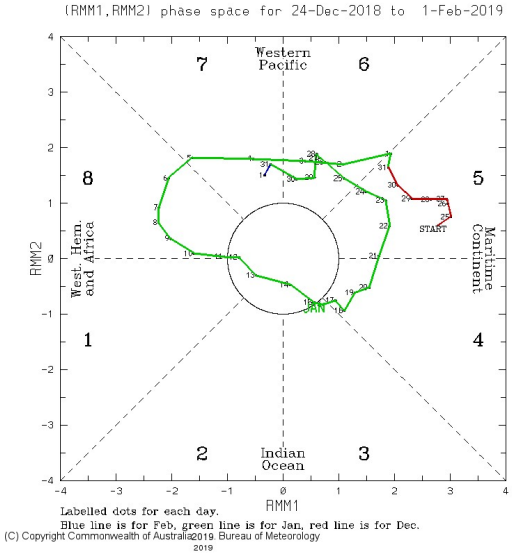
Madden–Julian Oscillation

Weekly Tropical Note
[Issued on Tuesday 22 January 2019]

During the past week, a moderate strength pulse of the Madden–Julian Oscillation (MJO) moved out of the Maritime Continent and over the tropical western Pacific region. When an MJO pulse is over the Maritime Continent and the western Pacific Ocean at this time of the year, enhanced rainfall and northwesterly (monsoonal) winds typically affect western Pacific. As the MJO pulse moves further into the tropical Pacific region, the main region of enhanced rainfall and monsoonal wind flow typically tracks further east and will contribute to above average rainfall towards the central Pacific Ocean. Most climate models currently predict the MJO will track further east, but there is disagreement amongst the models as to the strength of the MJO as it moves towards the central Pacific. If the MJO pulse weakens significantly in the coming week, its impact on tropical rainfall patterns would be expected to become insignificant.

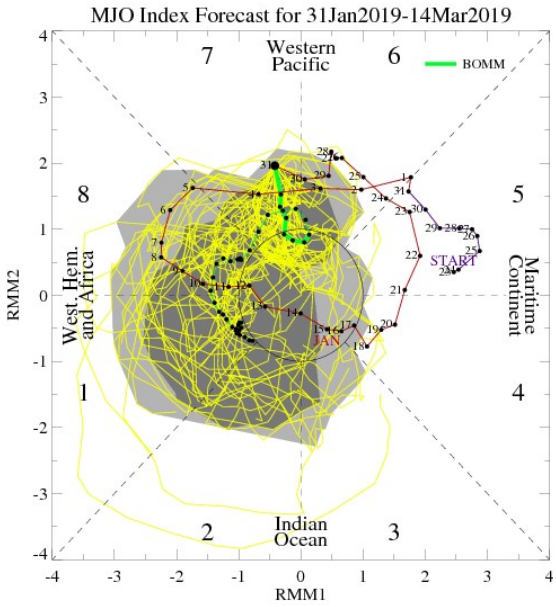
Bureau of Meteorology Weekly Tropical Climate Note Page:
http://www.bom.gov.au/climate/tropical-note/

40-Day MJO Phase Plot

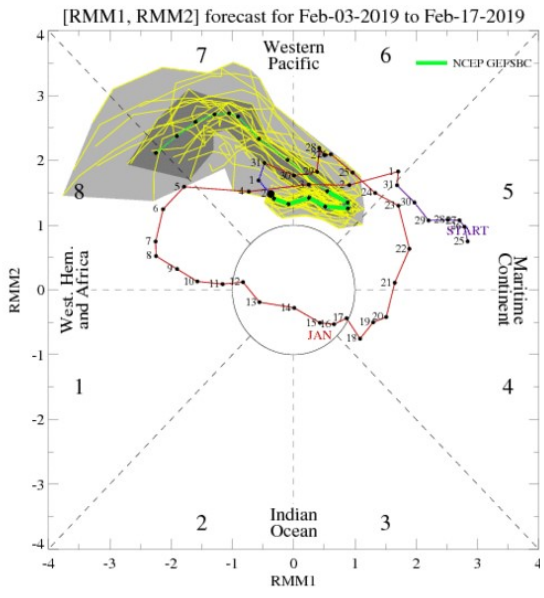


Bureau of Meteorology MJO Page:
http://www.bom.gov.au/climate/mjo/

MJO Phase Forecasts



Bureau of Meteorology MJO Forecast: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/bomm.shtml



NOAA MJO Model Forecasts: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/clivar_wh.shtml

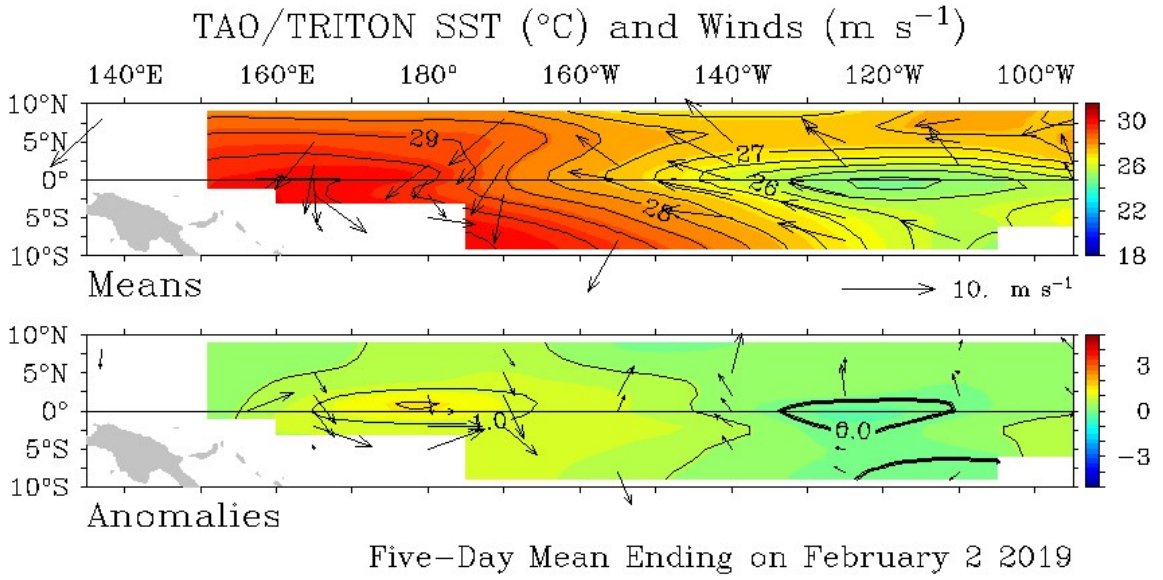
NOAA MJO Page: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml

Wind

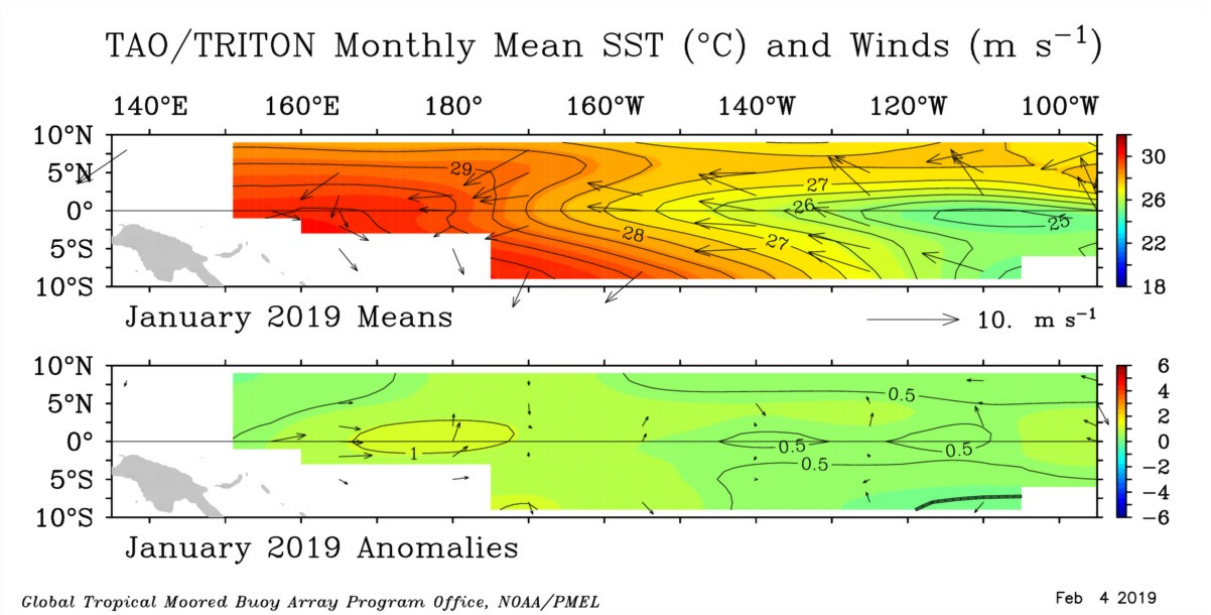
The equatorial trade winds were average across the tropical Pacific in January. Trade winds for the five days ending 2 February was dominated by westerlies and northwesterlies in the western Pacific while some southeastly to southerly winds observed between 150°W to 100°W.

During La Niña events there is a sustained strengthening of the trade winds across much of the tropical Pacific, while during El Niño events there is a sustained weakening of the trade winds across much of the tropical Pacific, or even a reversal of the trade winds.

Five-Day Mean SST/Wind Map



Latest Monthly SST/Wind Map



TAO/TRITON Data Display: http://www.pmel.noaa.gov/tao/jsdisplay/

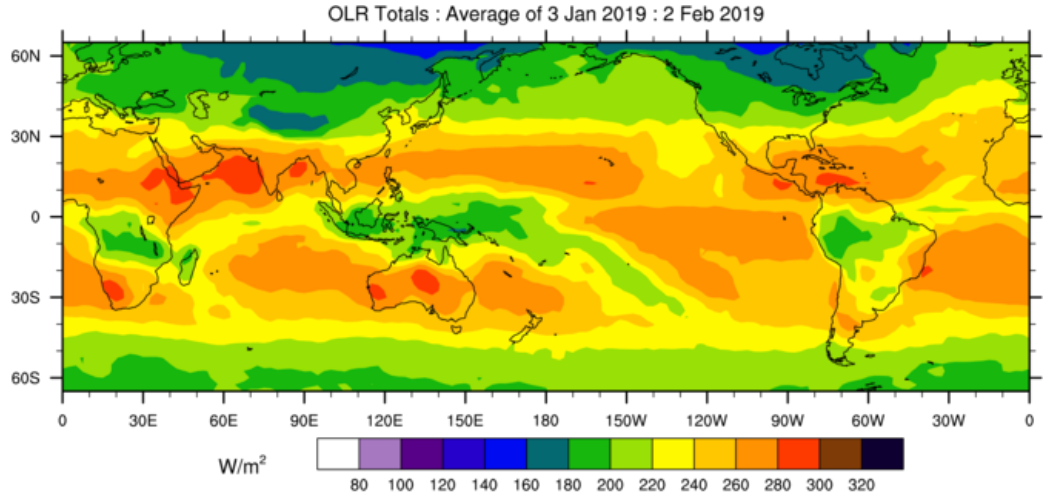
7-Day ACCESS Model South West Pacific Wind Forecasts: http://www.bom.gov.au/australia/charts/viewer/index.shtml?type=windbarb&level=10m&tz=AEDT&area=SWP&model=G&chartSubmit=Refresh+View

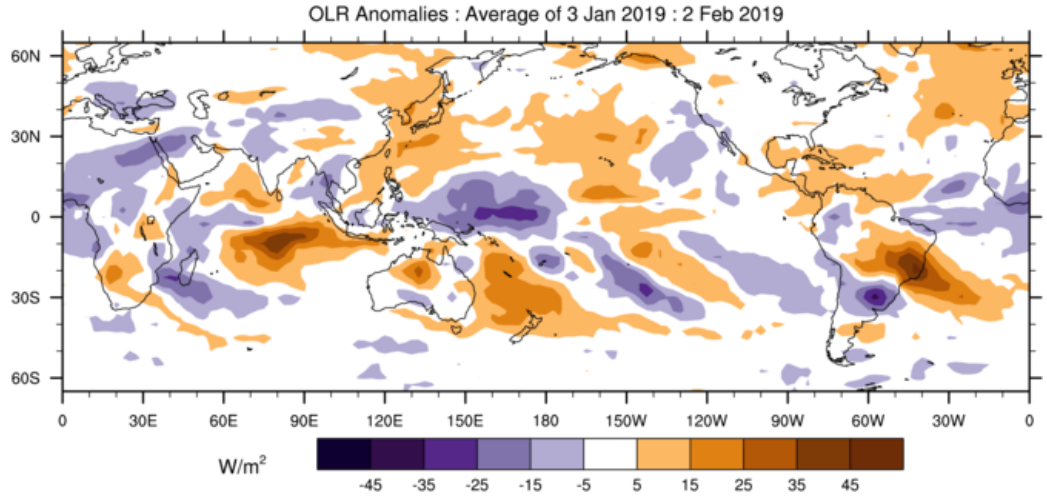
Cloud and Rainfall

The January 30-day OLR and TRMM anomaly maps suggest the ITCZ was enhanced west of the Date Line. In the south Pacific, the SPCZ was over its normal position over the Solomon Islands, Vanuatu, Fiji, Tonga and Samoa. Enhanced convection over New Guinea Islands, Solomon Islands, Fiji, Tokelau and Cook Islands was associated with a moderate strength pulse of the MJO.

Note:Global maps of outgoing longwave radiation (OLR) highlight regions experiencing enhanced or reduced cloudiness. The top panel is the total OLR in Watts per square metre (W/m²) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in W/m². In the bottom panel, negative values (blue shading) represent above normal cloudiness while positive values (brown shading) represent below normal cloudiness.

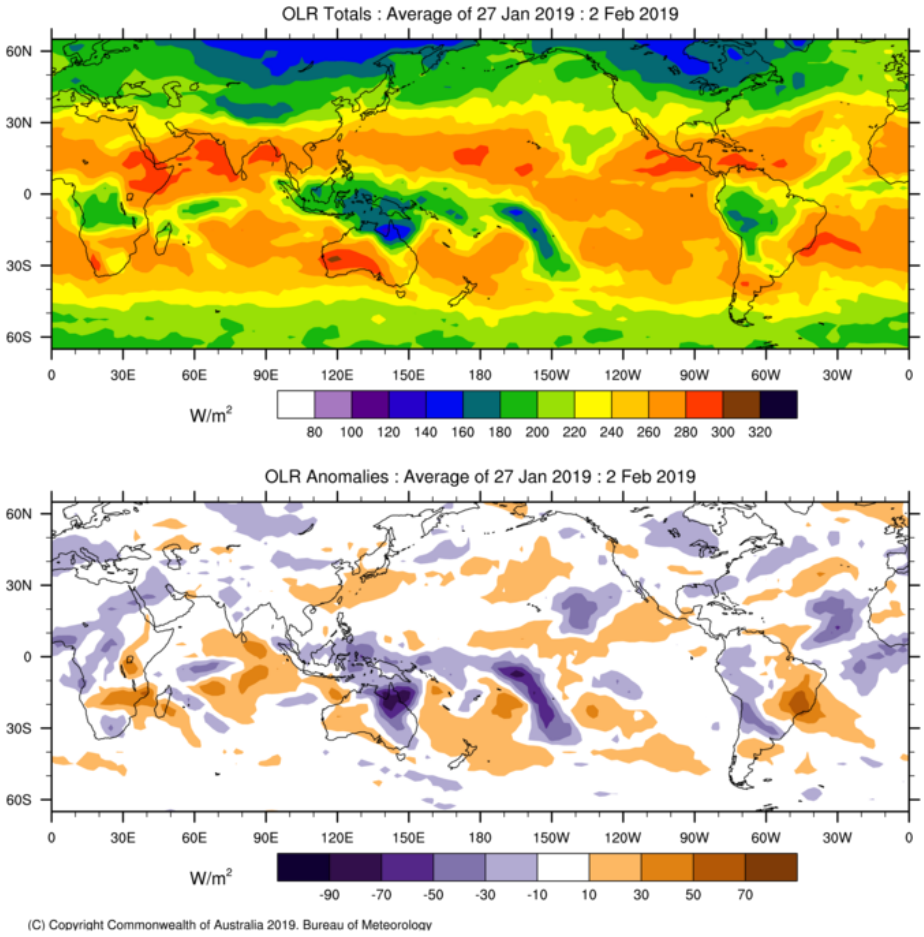
OLR Totals and Anomalies, 30 Day OLR





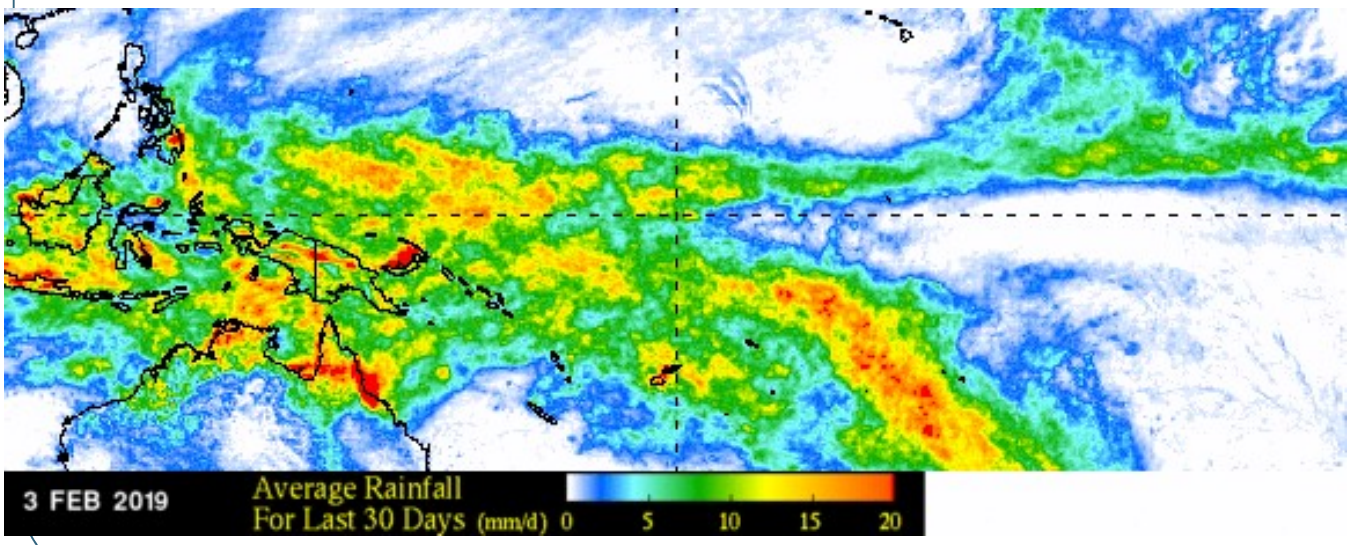
Cloud and Rainfall

OLR Totals and Anomalies, 7 Day OLR



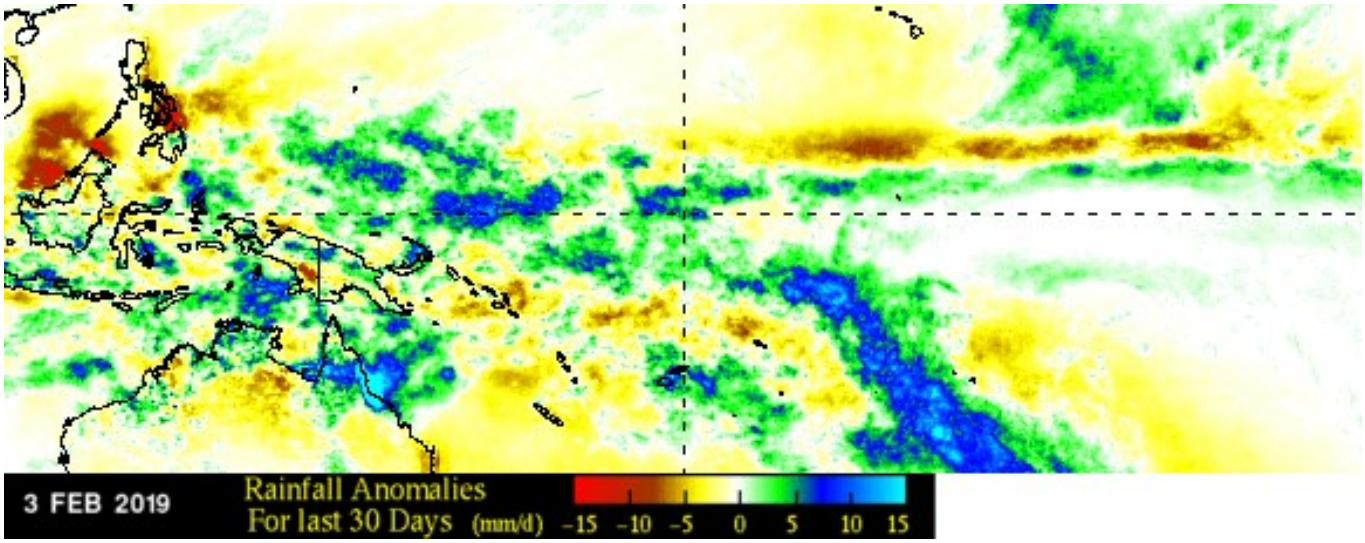
Bureau of Meteorology MJO - Cloudiness: http://www.bom.gov.au/climate/mjo/#tabs=Cloudiness

NASA Tropical Rainfall Measuring Mission (TRMM) 30-Day Rainfall Averages

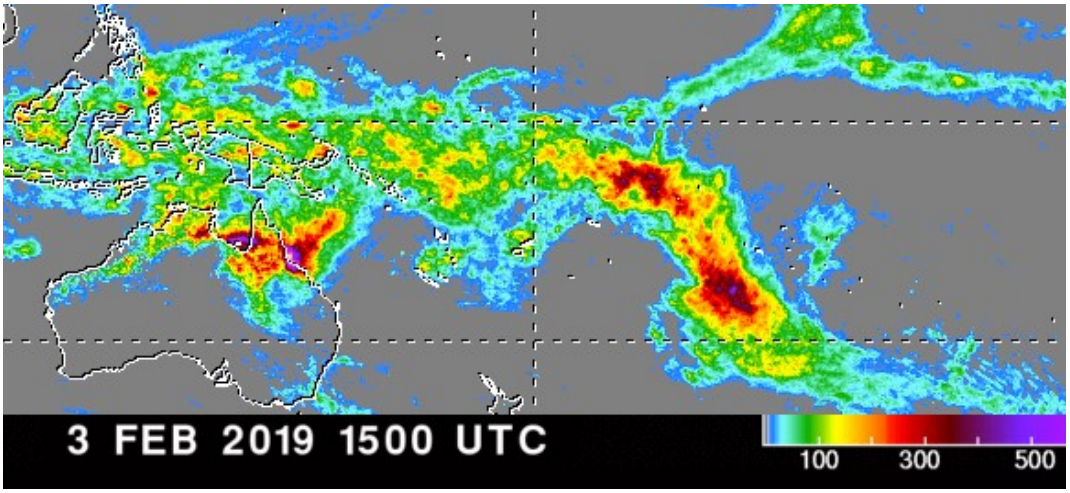


Cloud and Rainfall

30-Day Rainfall Anomalies

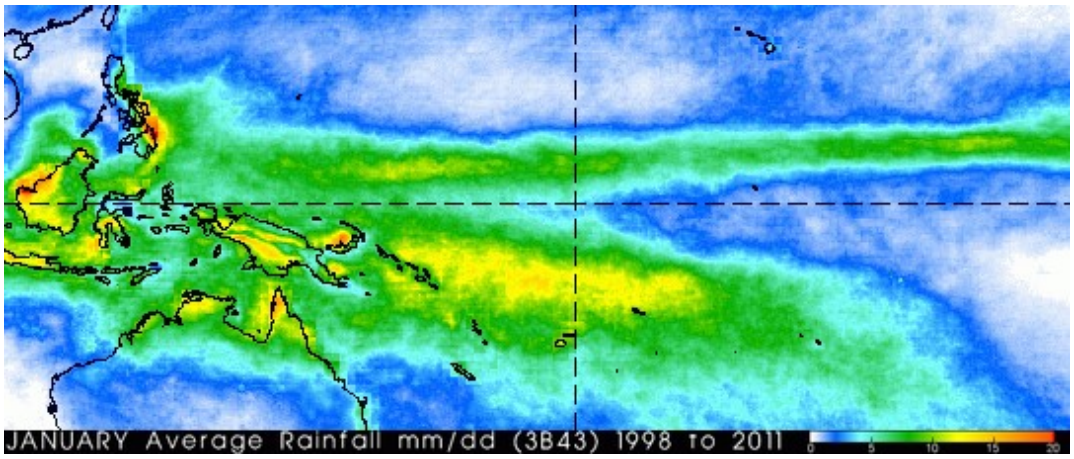


7-Day Rainfall Accumulation



NASA TRMM:
http://trmm.gsfc.nasa.gov/

Current Month Rainfall Climatology



Oceanic Conditions - Sea Surface Temperature

Sea surface temperature (SST) anomalies in the tropical Pacific Ocean remain warmer than average along most of the equator, and are close to average across parts of the Maritime Continent.

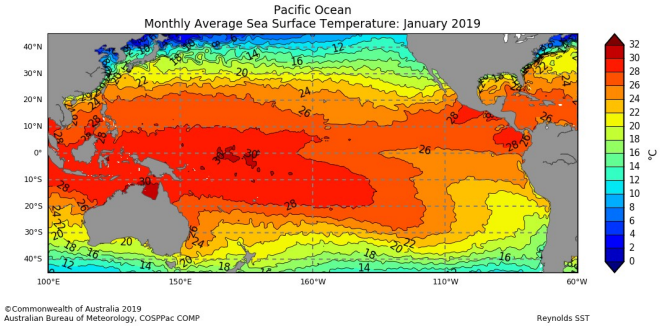
SSTs are also warmer than average in a broad band across the southern Pacific extending from around the Date Line to south of 30°S in the east; the opposite of what is expected in a typical El Niño. Central regions particularly for the Kiribati group experienced an increase of positive anomaly by more than 1.5°C. Federated State of Micronesia, Papua New Guinea, Solomon Islands and eastern zones of Vanuatu experienced cooler periods with a decrease in anomaly by more than -0.5° C.

SSTs for the three NINO regions have cooled slightly compared to two weeks ago, and while still warm, are within the ENSO neutral range. The weekly SST anomalies to 20 January for the NINO3, NINO3.4 and NINO4 regions were +0.5 °C, +0.4 °C and +0.7 °C, respectively.

Mean SST

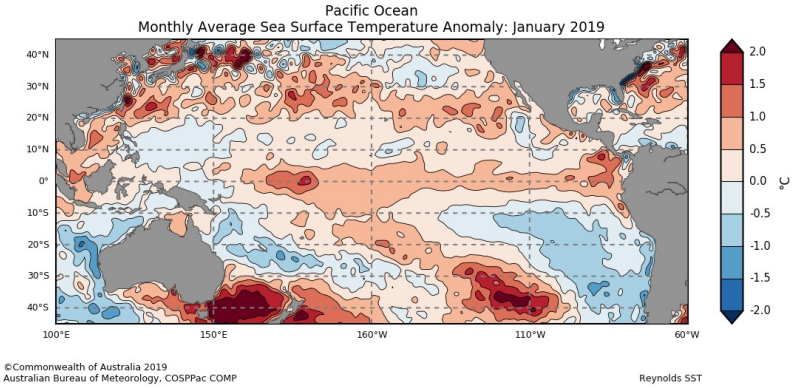
Pacific Community COSPPac Ocean Portal:

http://oceanportal.spc.int/



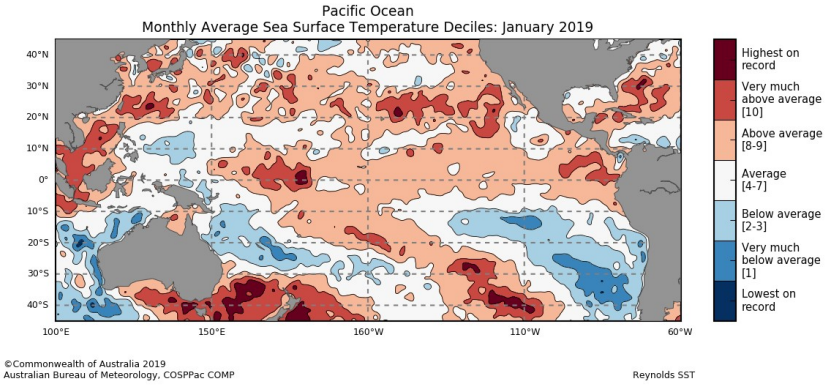
Anomalous SST

Pacific Community COSPPac Ocean Portal:
http://oceanportal.spc.int/



SST Deciles

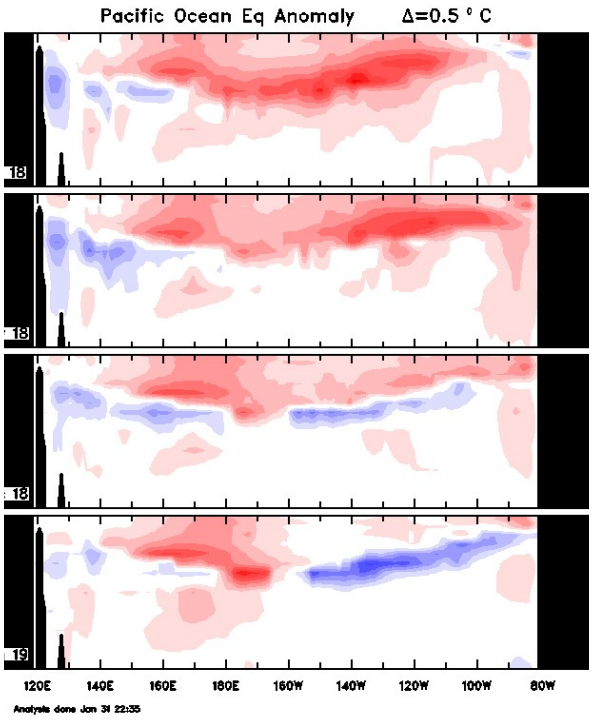
Pacific Community COSPPac Ocean Portal:
http://oceanportal.spc.int/

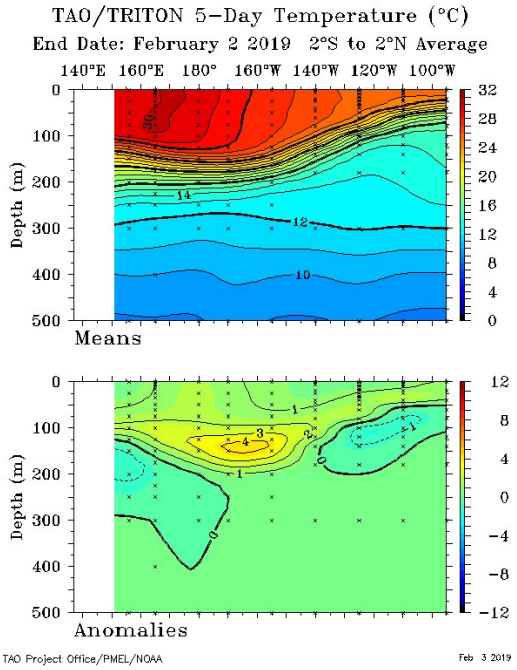


Oceanic Conditions - Sub Surface

The Bureau of Meteorology's four-monthly sequence of equatorial sub-surface plots show warm anomalies in the sub-surface have progressed eastwards in recent months. Warm anomalies across most of the top 200m of the western half of the equatorial Pacific sub-surface, and cool anomalies in the sub-surface of the eastern half, rising from about 150 m depth in the centre, to just below the surface in the very east of the basin. Warm anomalies in the sub-surface have decayed over late 2018 and early 2019, although small parts of the sub-surface to the west of the Date Line remain more than two and a half degrees warmer than average.

Sub-surface Temperature





Bureau of Meteorology Sea Temperature Analysis (monthly anomalies): http://www.bom.gov.au/mine/sst.shtml

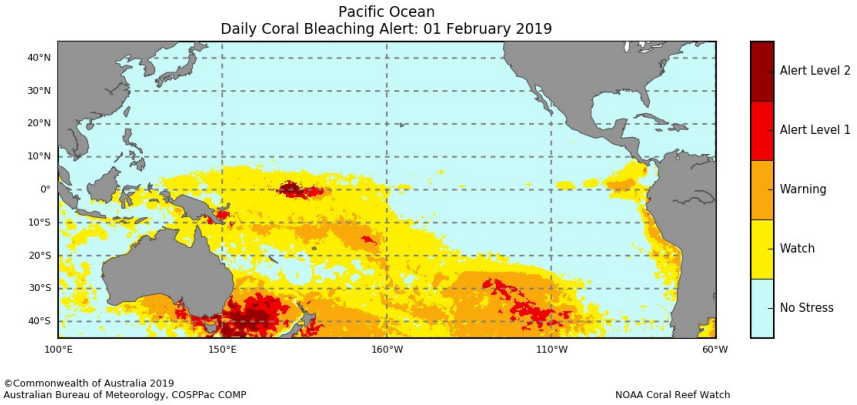
TAO/TRITON Data Display (weekly means and anomalies): http://www.pmel.noaa.gov/tao/jsdisplay/

Oceanic Conditions - Coral Bleaching

The daily Coral Bleaching Alert for 01 February 2019 shows Alert level 1 and warning for few countries in the western Pacific especially over eastern PNG, Kiribati and western Cook Island. Warning alert remains for Fiji, Solomon Islands, Tuvalu, Samoa and Niue, while remainder of the region is on watch alert

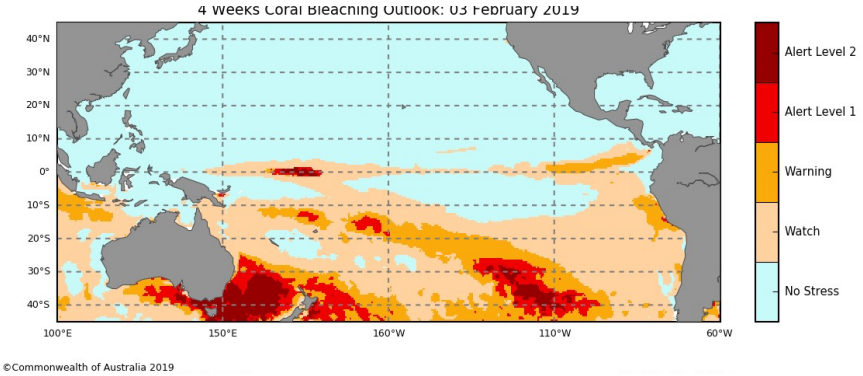
Daily Coral Bleaching Alert

About Coral Bleaching:
http://oceanportal.spc.int/portal/app.html#coral



4-Weeks Coral Bleaching Outlook

Pacific Community CO-SPPac
Ocean Portal:
http://oceanportal.spc.int/portal/app.html#coral



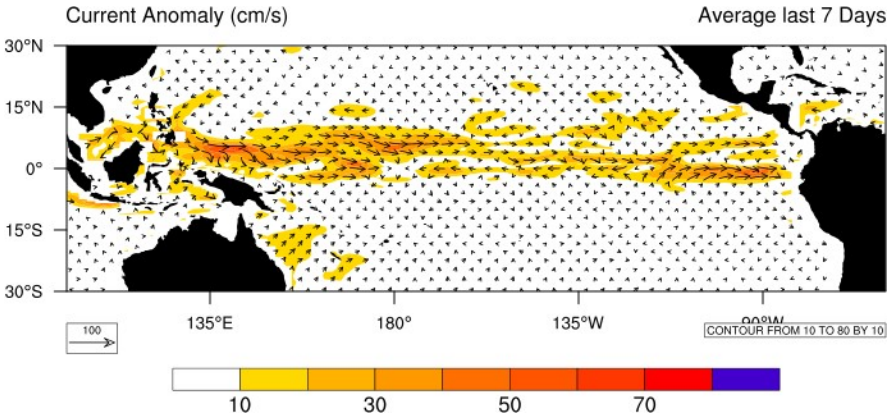
Oceanic Conditions - Ocean Surface Currents and Sea Level

The most recent seven-day ocean surface currents plot shows a stronger than normal eastward flowing Equatorial Counter Current in the central and western equatorial Pacific and stronger than normal westward flowing South Equatorial current from the far eastern Pacific.

Sea level in January was higher than normal in the equatorial and most of the southwest Pacific. Sea level was more than 20cmabove normal around Kiribati and more than 15cm for Nauru. Sea level was near or below normal for the Marshall Islands whereas Palau and FSM experienced lower than normal by a negative anomaly of 19cm.

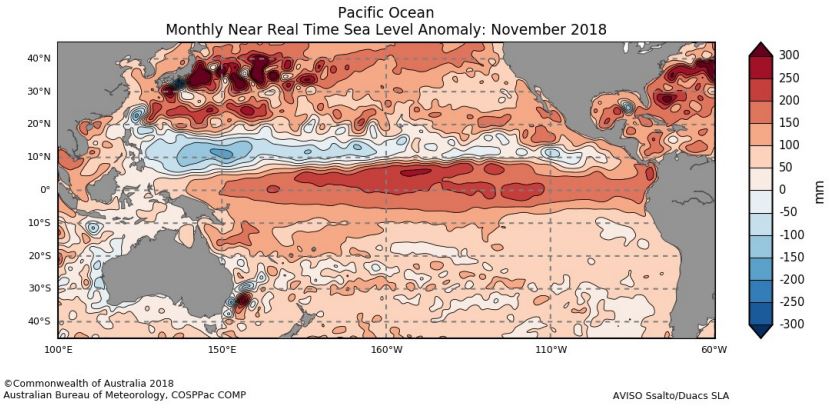
Ocean Surface Currents (Last 7-Days)

Bureau of Meteorology POAMA



Monthly Sea Level Anomalies

Pacific Community COSPPac Ocean Portal: http://oceanportal.spc.int/portal/app.html#sealevel



Pacific Sea Level Monitoring Information

Sea level data products, including tide prediction calendars and archives of quality-controlled weather and ocean measurements, are available from the Pacific Sea Level Monitoring page at: http://www.bom.gov.au/pacific/projects/pslm/

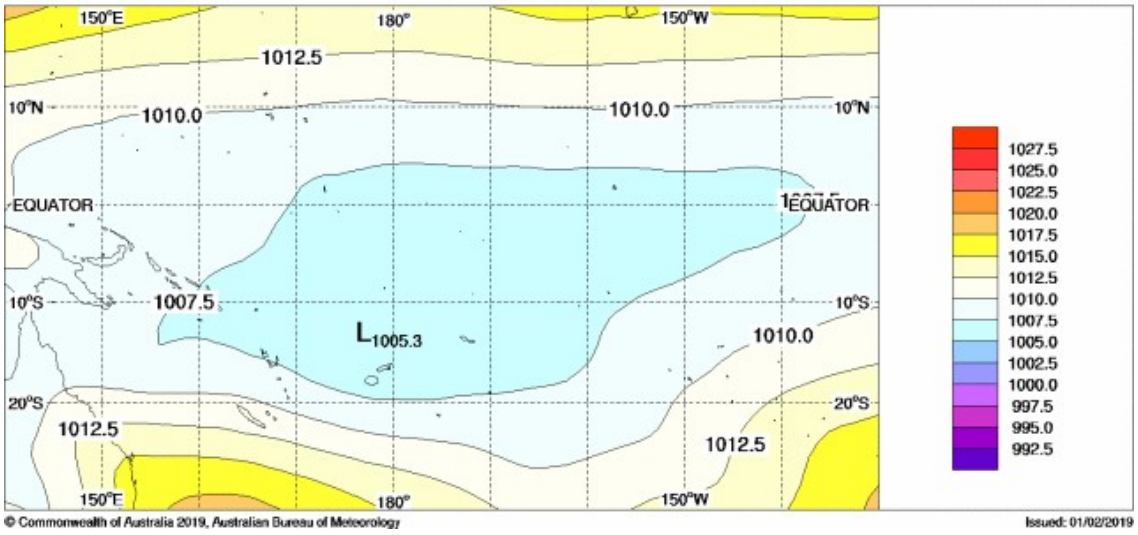
Mean Sea Level Pressure (MSLP)

The January mean sea level pressure (MSLP) anomaly map shows negative anomalies below –1 hPa in the tropical Pacific near and east of the Date Line. These negative anomalies are likely to be associated with near El Niño conditions in the central equatorial Pacific. Anomalies greater than +1 hPa were present over eastern Australia and over the Tasman Sea.

Areas of above (below) average MSLP usually coincide with areas of suppressed (enhanced) convection and rain throughout the month.

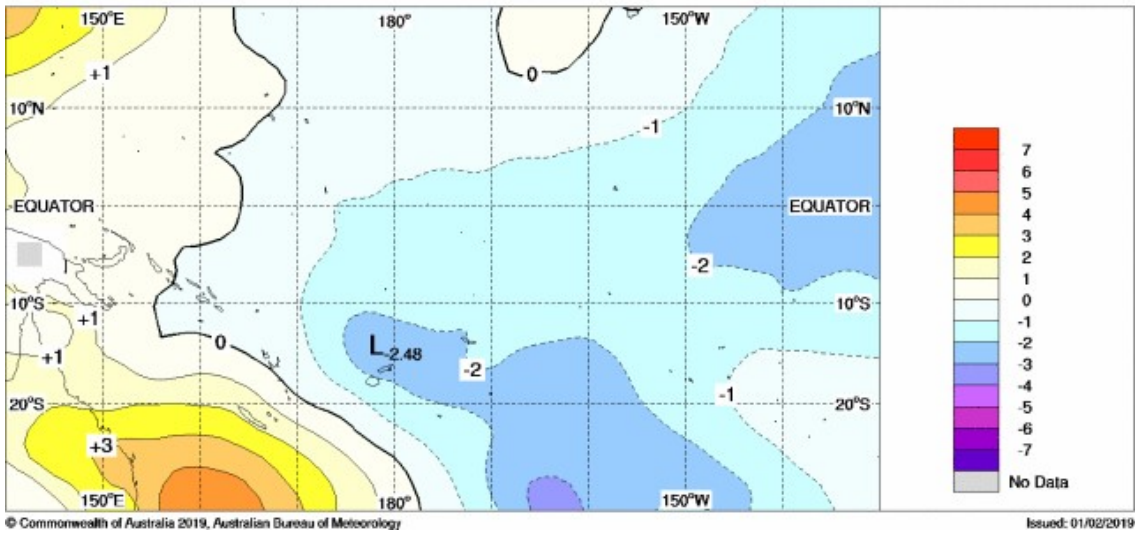
Mean

MSLP 2.5X2.5 ACCESS OP. ANAL. (hPa) 20190101 0000 20190131 0000



Anomalous [with respect to a 1979-2000 mean]

MSLP 2.5X2.5 ACCESS OP. ANAL.-NCEP2 (hPa) 20190101 0000 20190131 0000

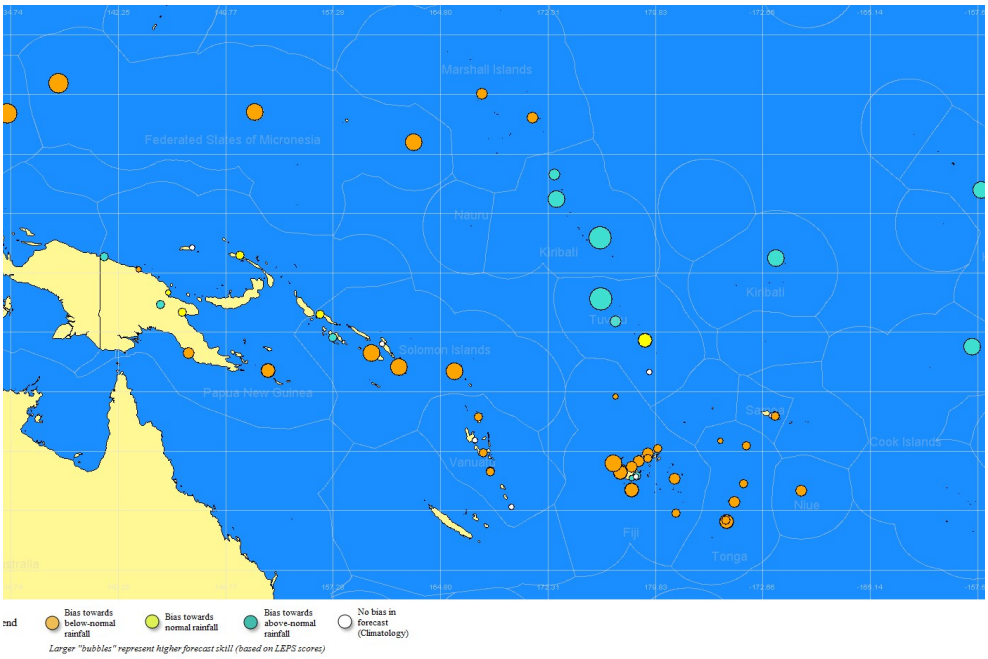


Bureau of Meteorology South Pacific Circulation Patterns: http://www.bom.gov.au/cgi-bin/climate/cmb.cgi?page=indexa&area=spac

Seasonal Rainfall Outlooks Feb to Apr 2019

Above-normal rainfall totals are most likely for the Papua New Guinea northern coastline and northeastern islands, Nauru, Kiribati, northern and central Tuvalu and the northern Cook Islands. SCOPIC and the APEC Climate Center multi-model favour below-normal rainfall for Palau, the Federated States of Micronesia, Republic of Marshall Islands, southern Papua New Guinea, eastern Solomon Islands, most of Vanuatu, southeast Fiji, Tonga, Samoa, Niue and French Polynesia.

SCOPIC v4

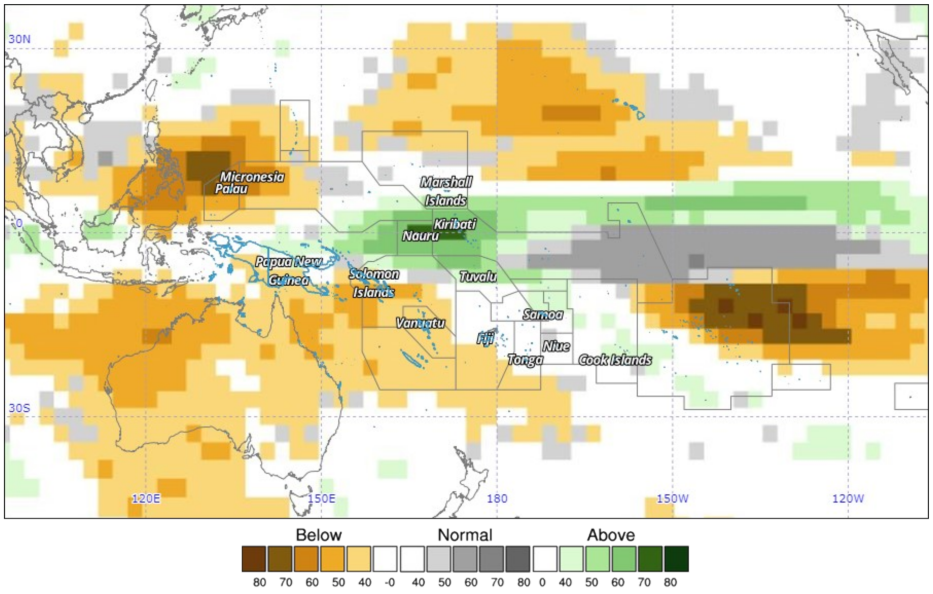


'About SCOPIC' www.pacificmet.net/project/climate-and-ocean-support-program-pacific-cosppac

COSPPac Online Climate Outlook Forum: https://www.pacificmet.net/products-and-services/online-climate-outlook-forum

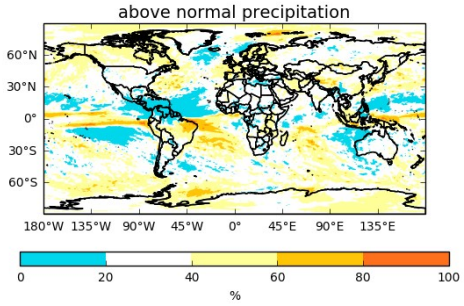
Seasonal Rainfall Outlooks Feb to Apr 2019

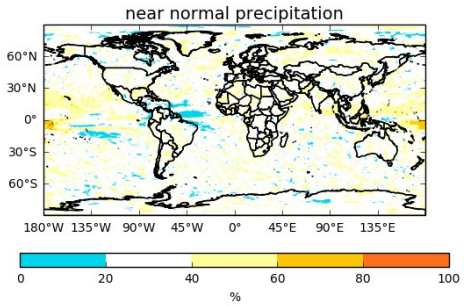
APEC multi-model outlook

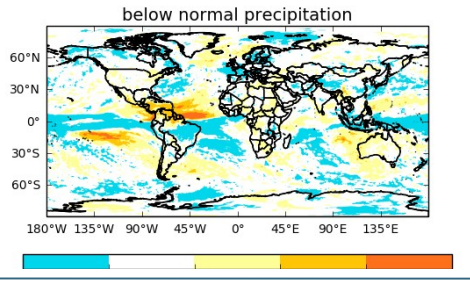


APEC Climate Information Toolkit for the Pacific http://clikp.sprep.org/

UKMO Pacific region tercile categories



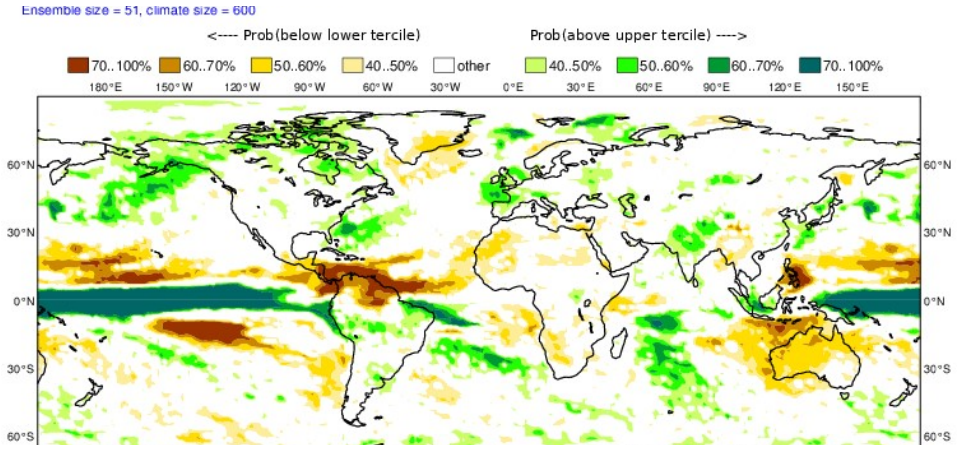




http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/glob-seas-prob

Seasonal Rainfall Outlooks Feb to Apr 2019

ECMWF Tropics tercile summary



http://www.ecmwf.int/en/forecasts/charts/catalogue/

Individual Model Links

UKMO Global long-range model probability maps: http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/glob-seas-prob

ECMWF Rain (Public charts) - Long range forecast: http://www.ecmwf.int/en/forecasts/charts/seasonal/rain-public-charts-long-range-forecast

POAMA Pacific Seasonal Prediction Portal: http://poama.bom.gov.au/experimental/pasap/index.shtml

APEC Climate Center (APCC): http://www.apcc21.org/eng/service/6mon/ps/japcc030703.jsp

NASA GMAO GEOS-5:http://gmao.gsfc.nasa.gov/research/ocean/

NOAA CFSv2:http://www.cpc.ncep.noaa.gov/products/CFSv2/CFSv2seasonal.shtml

IRI for Climate and Society: http://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/

Cyclones and Other Information

Tropical Cyclone Information

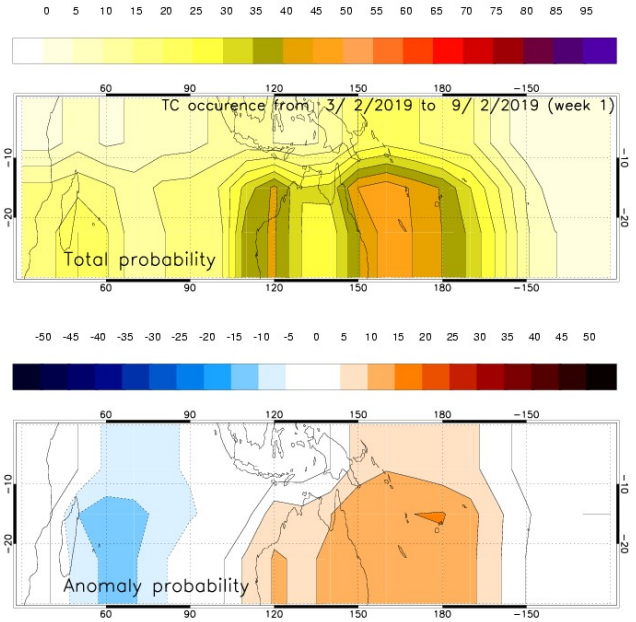
Four tropical cyclones (Liua, Owen, Penny and Mona) have formed in the south Pacific (east of the tip of Cape York, Queensland) to date this season. The long-term average for the period 1969-70 to 2017-18 is nine cyclones. According to the Meteo France weekly tropical cyclone forecasts, the probability of tropical cyclone occurrence is higher than normal in the western south Pacific from 3 to 16 February 2019.

The tropical cyclone season outlook for 2017-18 is available via: http://www.bom.gov.au/climate/cyclones/south-pacific/

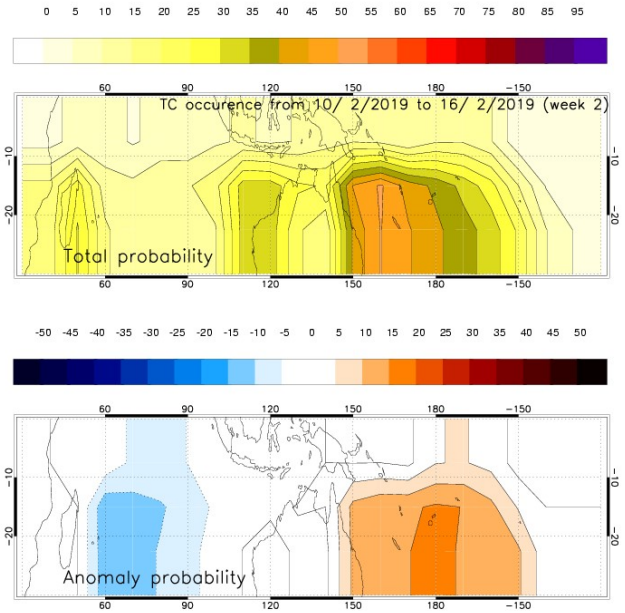
MeteoFrance Tropical Cyclone Weekly Forecast: http://www.meteo.nc/nouvelle-caledonie/cyclone/coin-des-experts

Meteo France Tropical Cyclone Weekly Fore-

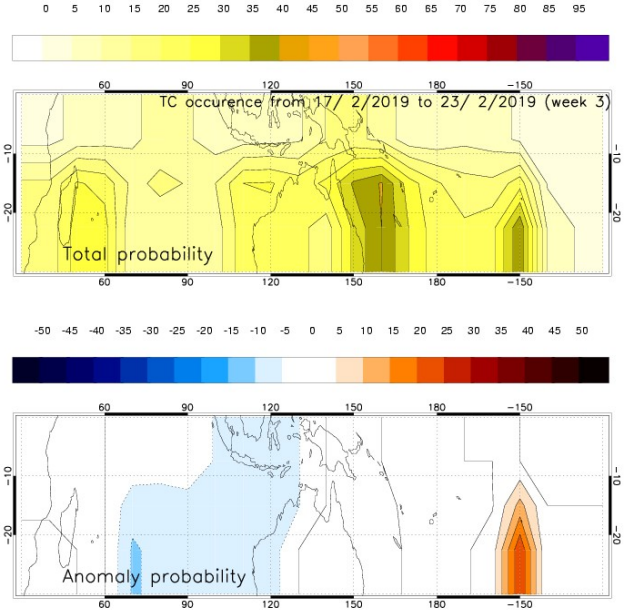
Week 1



Week 2



Week 3



Bureau of Meteorology Tropical Cyclone Climatologies: http://www.bom.gov.au/cyclone/climatology/index.shtml

PACCSAP Tropical Cyclone Data Portal: http://www.bom.gov.au/cyclone/history/tracks/

Fiji Meteorological Service Tropical Cyclone Warnings: http://www.met.gov.fj/

Japan Meteorological Agency Tropical Cyclone Information Page: http://www.jma.go.jp/en/typh/

Bureau of Meteorology Current Tropical Cyclone Page: http://www.bom.gov.au/cyclone/index.html

United States Joint Typhoon Warning Center Tropical Cyclone Warnings and Information: http://www.usno.navy.mil/JTWC/

New Zealand Meteorological Service Weather Warning: http://www.metservice.com/warnings/home

Other Information

Further Information:

Southern Oscillation Index

The Southern Oscillation Index, or SOI, gives an indication of the development and intensity of El Niño and La Niña events across the Pacific Basin. The SOI is calculated using the difference in air pressure between Tahiti and Darwin. Sustained negative values of the SOI below −7 often indicate El Niño episodes. These negative values are usually accompanied by sustained warming of the central and/or eastern tropical Pacific Ocean, and a decrease in the strength of the Pacific Trade Winds. Sustained positive values of the SOI greater than +7 are typical of La Niña episodes. They are associated with stronger Pacific Trade Winds and sustained cooling of the central and eastern tropical Pacific Ocean. In contrast, ocean temperatures to the north of Australia usually become warmer than normal. *http://www.bom.gov.au/climate/glossary/soi.shtml*

Multivariate ENSO Index (MEI)

The Climate Diagnostics Center Multivariate ENSO Index (MEI) is derived from a number of parameters typically associated with El Niño and La Niña. Sustained negative values indicate La Niña, and sustained positive values indicate El Niño. *http://www.esrl.noaa.gov/psd/enso/mei/index.html*

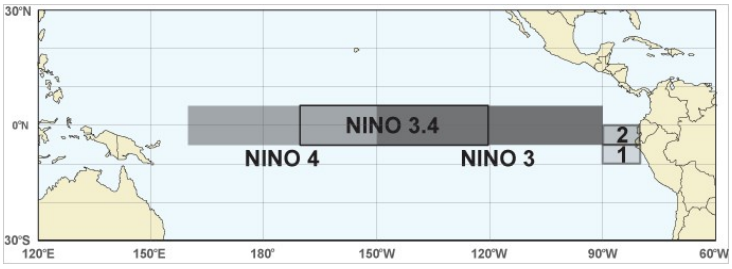
20 degrees Celsius Isotherm Depth

The 20°C Isotherm Depth is the depth at which the water temperature is 20°C. This measurement is important, as the 20°C isotherm usually occurs close to the thermocline, the region of most rapid change of temperature with depth, or the division between the mixed surface layer and deep ocean. A deeper than normal 20°C isotherm (positive anomaly) implies a greater heat content in the upper ocean, whilst a shallower 20°C isotherm (negative anomaly) implies a lower than normal heat content in the upper ocean. *http://www.pmel.noaa.gov/tao/jsdisplay/plots/gif/uwnd_sst_iso20_anom_nocap.gif*

Regions

SST measurements may refer to the NINO1, 2, 1+2, 3, 3.4 or 4 regions. These descriptions simply refer to the spatially averaged SST for the region described. The NINO regions (shown in the figure below) cover the following areas:

Region	Latitude	Longitude
NINO1	5-10°S	80-90°W
NINO2	0-5°S	80-90°W
NINO3	5°N to 5°S	150-90°W
NINO3.4	5°N to 5°S	120-170°W
NINO4	5°N to 5°S	160°E to 150°W



NOTE: NINO1+2 is the combined areas 1 and 2