CLIMATE SUMMARY December 2020

Samoa Meteorology Division

Ministry of Natural Resources and Environment

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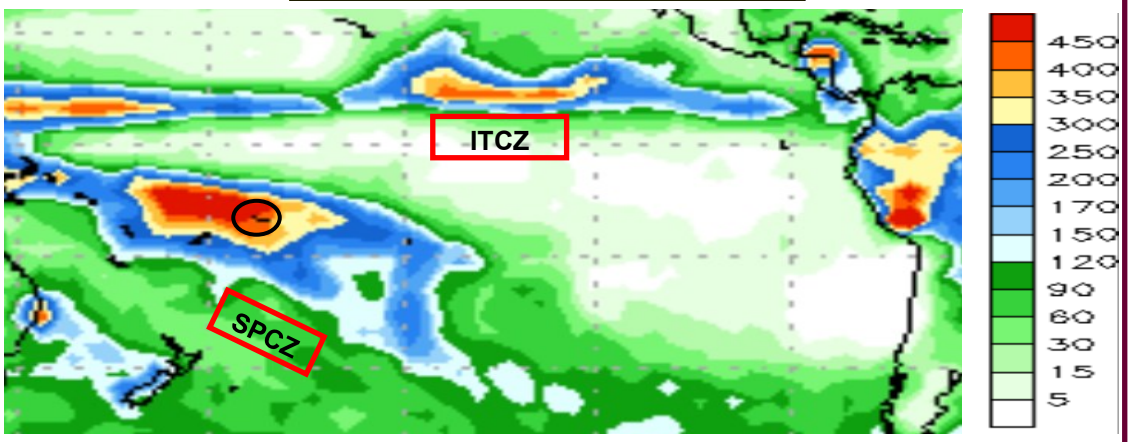
HIGHLIGHTS

- Generally, "*Average* to *Below average*" recorded in December 2020. **Pg 1 & 2**
- The warmest temperature of 32.8^{0}C was registered on the 03rd at Alafua. **Pg 3**
- Easterly winds remain dominant for most of the areas with variable winds evident in December 2020. **Pg 4 & 5**
- El Nino Southern Oscillation (ENSO) remains within La Nina thresholds. **Pg 6**
- Cooler anomalies strengthening within the central equatorial region, with warmer anomalies restraining to the western Pacific Ocean. **Pg 6**

Figure 1: SPCZ Position in December



GLOBAL SCALE OBSERVATIONS

The South Pacific Convergence Zone (SPCZ) was significantly active during December, mainly due to the current El Nino Southern Oscillation (ENSO) phase, which is La Nina. Consequently, rainfall activity elevated for the last month of 2020, resulting in flooding for most part of the islands. The Inter-Tropical Convergence Zone however (ITCZ) was seen to be segmented within the equatorial region, with rainfall activity to the far western and eastern region.

LOCAL SCALE OBSERVATIONS

For Samoa, most parts experienced serious impacts form the excess rainfall in December, where a lot of businesses, homeowners and essential services were affected. Rainfall statistics showed the highest December rainfall of 1316.1mm at Afiamalu, with the second highest of 1015.6mm at Alafua. A bulk of this rainfall was recorded in the second and third week of December, where convective activities linked to Tropical Cyclone Yasa south of the island brought heavy rainfall. In addition, the highest one - day fall was received at Afiamalu with the amount of 371.4mm on the 17th of December, with the second highest of 279.5mm on the 17th at Alafua. Regardless of rainfall activity, some areas experienced minimal rainfall, with the lowest of 216.9mm recorded at Fasito'o, and the second lowest of 226.8mm at Falelima station in Savaii. In general, *average to above average* rainfall was experienced in Samoa during the month of December 2020.

Table 1: Rainfall Statistics in December 2020

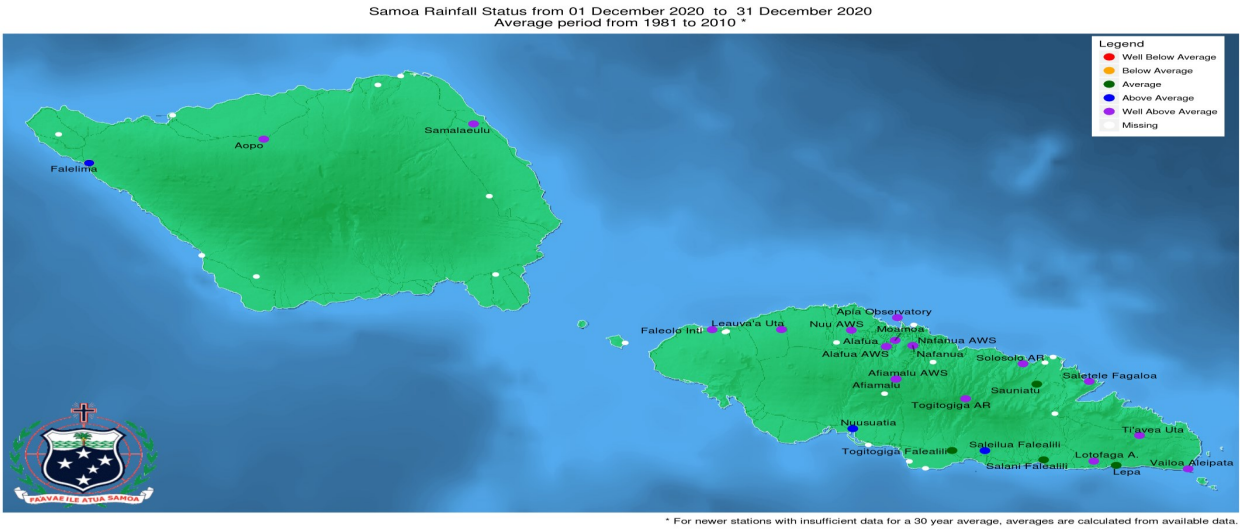
This table displays the rainfall status of all stations in the country in December 2020

Stations	December Rainfall (mm)	December 30 Year Long Term Average	% of Average	1 day fall (mm)	Date	# of Rainy Days	Rainfall Status
UPOLU							
Afiamalu	1316.1	555	237	371.4	17th	28	Well Above Average
Alafua	871.9	290	301	279.5	17th	29	Well Above Average
Apia	778.8	348	224	204.3	17th	24	Well Above Average
Faleolo	607.8	204	298	155.7	17th	19	Well Above Average
Fasitoo	216.9	204	106	89.1	21st	09	Average
Leauva'a	790.4	433	183	240.0	17th	23	Well Above Average
Lepa	576.6	485	118	192.4	13th	19	Average
Lotofaga	704.6	204	345	135.0	16th	27	Well Above Average
Nafanua	870.0	414	210	275.0	17th	27	Well Above Average
Nuu	710.4	290	245	232.6	17th	23	Well Above Average
Nuusuatia	477.8	194	246	88.6	17th	25	Well Above Average
Salani	454.6	204	222	78.8	17th	27	Well Above Average
Saleilua	600.4	420	143	188.8	17th	18	Above Average
Saletele	629.4	533	118	135.3	17th	17	Average
Saoluafata	543.6	462	118	123.0	16th	26	Average
Ti'avea	755.0	371	203	144.4	13th	29	Well Above Average
Togitogiga	883.0	432	204	185.0	17th	19	Well Above Average
Vailoa.A	513.2	266	193	107.8	13th	24	Above Average
SAVAII							
Aopo	1015.6	357	284	217.2	14th	24	Well Above Average
Falelima	226.8	177	128	87.2	11th	22	Above Average
Lefagaoalii	655.6	334	196	190.4	17th	19	Well Above Average
Samalaeulu	963.0	392	246	239.0	17th	28	Well Above Average
Tuasivi	620.8	231	269	165.0	17th	25	Well Above Average

Well Below Average <40%	Below Average 40%-80%	Average 80%-120%	Above Average 120%-160%	Well Above Average >160%

Figure 3: Rainfall Status Map in December 2020

This rainfall map is generated using observation data from Table 1



TEMPERATURE

Table 2: Air Temperature Statistics

This table displays the temperature statistics recorded across stations in December 2020

Stations	Max Temperature (^{0}C)		
	Mean Daily Temperature	Extreme Temp	Date
Nuu	24.1	31.9	01st
Alafua	27.2	32.8	03rd

Stations	Min Temperature (^{0}C)	
	Extreme Temp Min(^{0}C)	Date
Afiamalu	16.7	25th
Apia	22.0	19th
Alafua	21.5	18th
Faleolo	22.6	31st
Nafanua	21.9	18th

Temperatures in December were seen to be slightly warmer than previous months, with the warmest of 32.8^{0}C recorded at Alafua on the 03rd. On the other hand, night time temperatures were seen to be cool, with the lowest of 16.7^{0}C registered at Afiamalu station on the 25thDecember.

ATMOSPHERIC PRESSURE

Table 3: Atmospheric Pressure at Mean Sea Level (MSL)

This table displays the atmospheric statistics recorded across two stations in December 2020

Station	Highest MSL Pressure (hPa)	Date	Lowest MSL Pressure (hPa)	Date	Average MSL Pressure (hPa)
Apia	1012.8	27th	1010.5	23rd	1011.7
Faleolo	1013.1	27th	1006.7	17th	1010.7

The highest MSL Pressure recorded at Faleolo on the 27th was 1013.1hPa while also recording the lowest MSL pressure of 1006.7hPa on the 17th of December 2020. Severe weather conditions were experienced in the third and fourth week of December due to a number of low pressure systems located south of the islands.

(Note: Generally, high pressure systems associate with good weather conditions whereas low pressure systems associate with bad weather conditions)

WIND

Figure 4: Wind Speed and Directions

The following diagrams show the different wind speed and direction recorded daily at 9am across the country in December 2020. Rainfall activities are associated with dominant wind directions and geographical locations of rainfall stations.

Figure 4a : Apia Station

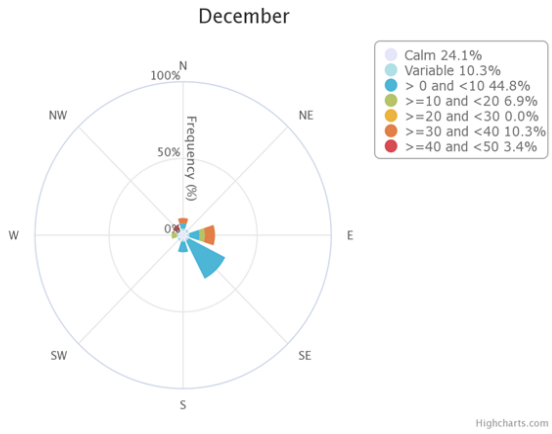
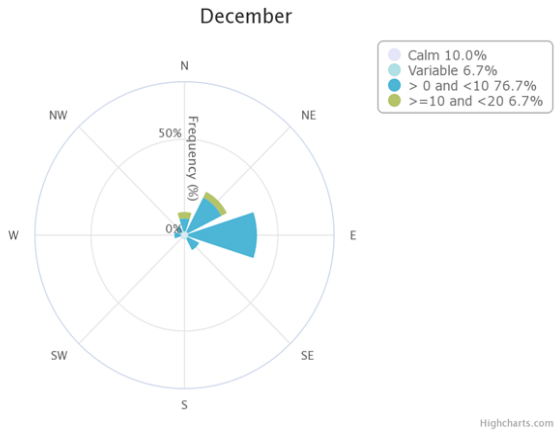


Figure 4b: Afiamalu Station



South westerlies possessed approximately 27.6% of the time in December as recorded at Apia station. Light winds of 1—10km/hr are frequently recorded with moderate winds of 21-30km/hr registered from the east for some time. Afiamalu on the other hand, experienced easterlies majority of the time , with light winds the dominant wind speeds. SPCZ activities during December was frequent, providing not only heavy rainfall but also gusty winds mainly directed from the south west part of Samoa.

Figure 4c : Alafua Station

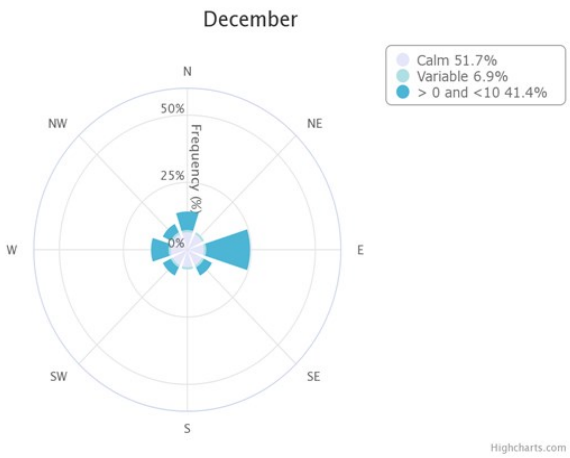


Figure 4d: Nafanua Station

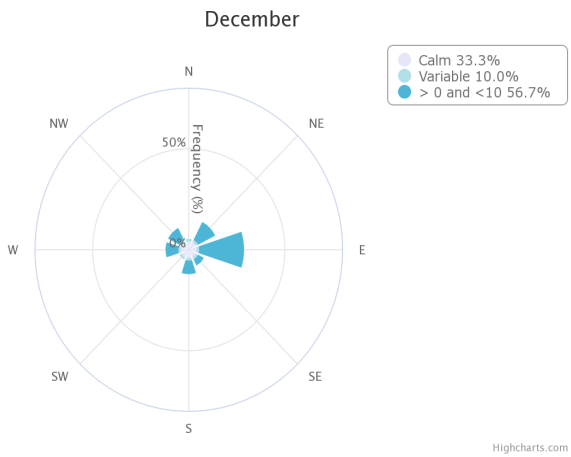
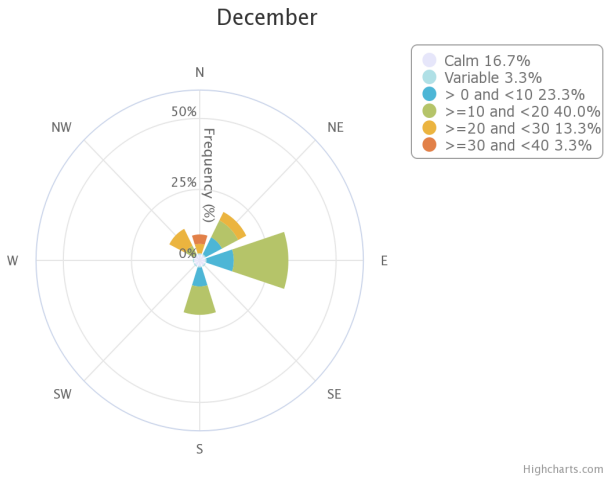


Figure 4e : Faleolo Station



Alafua, Faleolo and Nafanua were influenced mainly by light easterlies wind with a mixture of gentle winds (11 - 20km/h) throughout December. It was also evident that variable wind directions were recorded for these three (3) stations as well. Due to an active SPCZ in December, wind speeds strengthen slightly for some parts of the country, with gusty winds reaching up to 40km/hr, as shown by observations.

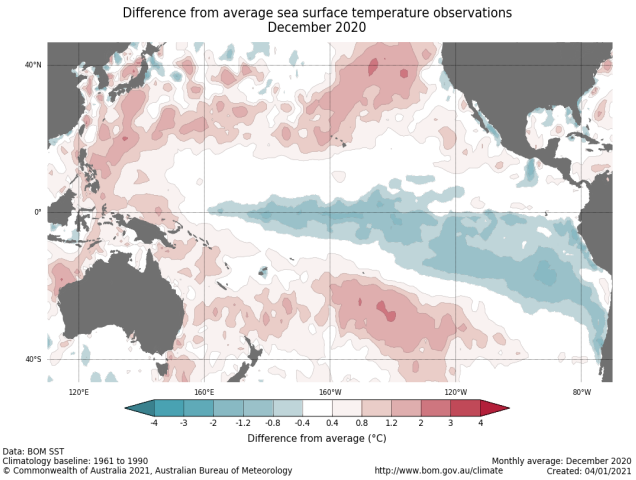
EL NINO SOUTHERN OSCILLATION (ENSO)

CURRENT ENSO STATUS

The El Nino Southern Oscillation is at *'La Nina'* thresholds as all parameters exceeded in the past few months. Climate models suggest a strengthening of this phase early into 2021.

Oceanic Indicator of ENSO

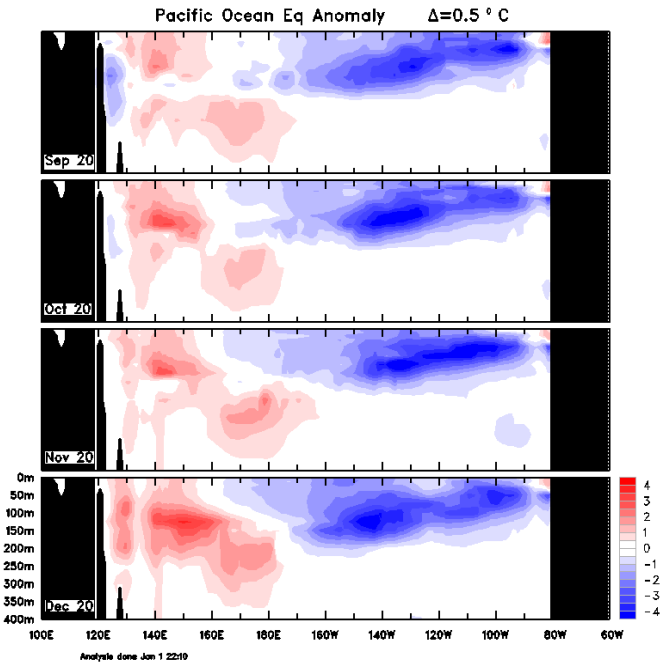
Figure 5: Sea Surface Temperature in December 2020



Sea Surface Temperatures (SSTs) along the equatorial region shows cooler anomalies strengthening towards the eastern part of the Pacific ocean. Warmer anomalies on the other hand is observed in the Southern Pacific region near the Date line as well as for most part of the eastern coast of Australia, across the Tasman Sea and to the north of New Zealand.

In addition, a slight warming of Nino indices since November is experienced, with Nino 3 value at –0.5^{0}C, Nino 3.4 at -0.8^{0}C and Nino 4 at –0.7^{0}C.

Figure 6: Sub-surface Temperature



The four-month sequence of sub-surface temperature anomalies (to December) shows warm anomalies congregating mostly to the western part of the equatorial pacific ocean, and cool anomalies in the central extending to the eastern region. In four months, the sub surface temperatures have shown remained within these levels, suggesting a continuation of the La Nina phenomenon in 2021. These observations are well coincided with model predictions as well.

Atmospheric Indicator of ENSO

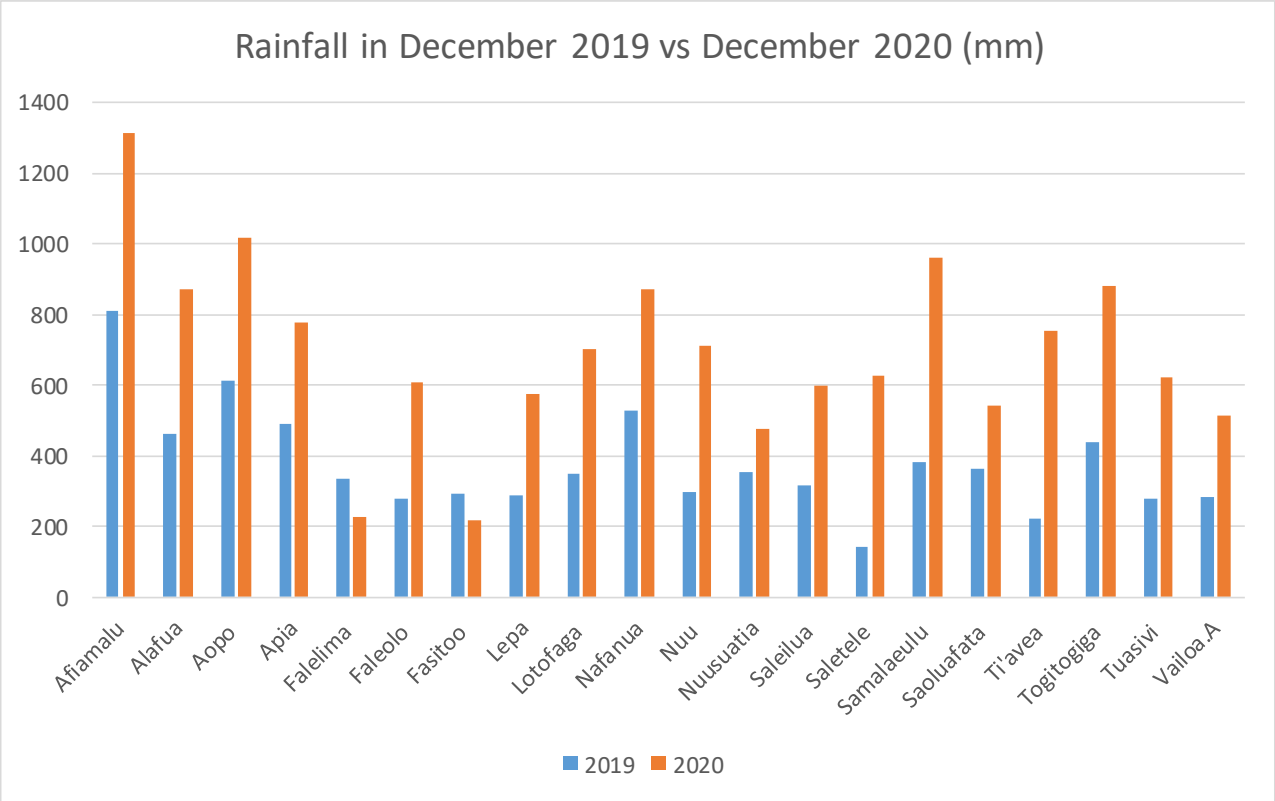
Southern Oscillation Index (SOI)

The approximate 30-day and 90-day Southern-Oscillation Index (SOI) values to 03rd January were +18.8 and +11.8 respectively.

(Sustained positive values of the SOI above +7 indicate La Nina. Whereas sustained negative values below –7 indicate El Nino. Values within –7 and +7 shows neutral conditions.)

APPENDIX

Figure 7: Graphical representation of total monthly rainfall in December 2019 vs December 2020 in all rainfall stations.



Rainfall activities for December 2019 was graphed against that of December 2020, showing a significant difference, where the later year was clearer wetter, with some stations recording more than 800mm. An active SPCZ was observed over the islands in December 2020, which suggests the main cause of heavy rainfall, coupling with the current ENSO phase, which is La Nina, where impacts for Samoa was evident. In addition, most rainfall stations observed one of their highest December rainfall in 2020, with Apia registering its 04th wettest December since the station was established. Similar conditions were also monitored for other neighbouring stations as well.

Observations continue to show the persistence of the La Nina phase well into 2021, which can greatly enhance rainfall activity for the second half of the wet season.