Climate Update for Tonga

October 2009 Climate Summary

Dec2009 to Feb2010 Rainfall Outlook

Issued 10th November 2009

October's Climate in Brief

- Niuatoputapu and Vava'u is currently in Drought. Rainfall has been below normal for the last six months.
- Drought Warning is current for Ha'apai.
- *Well below normal rainfall was recorded across the country during October..*

October was very much dry throughout Tonga. Weather was dominated by the existence of ridges of high pressure systems from the south to southwest bringing cool southerly winds and fine weather to the country. Weak frontal systems during the first few weeks brought the little rain that was received during October. Vava'u recorded the lowest temperature for the month at 11.7°C and Ha'apai recorded the lowest rainfall at 7.7mm. October rainfall totals throughout Tonga continue to reflect El Nino type conditions.

El Niño conditions exist in the equatorial Pacific. Many dynamical climate models project the continuation of El Niño through 2009 and into 2010

Rainfall outlook for the next 3 months: Above normal rainfall is favoured for Niuafo'ou, normal rainfall is favoured for central Tonga and the chances for below normal rainfall is the highest for southern Tonga.

Rainfall in Tonga is reduced during an El Nino Event and the frequency of occurrence of Tropical cyclones increases according to historical records.

Temperature October 2009

Mean air temperatures was below normal across the country during October. The mean temperature for the month was 23.1°C which was 1.5°C cooler than normal but 0.1°C warmer than September 2009. Daytime maximum temperatures were cooler than normal across the country except Niuafo'ou where it was 0.8°C warmer than normal. Overnight minimum temperatures were cooler than normal in the north and Fua'amotu except for Ha'apai and Nuku'alofa where it was 0.3°C warmer than normal.

Table 1: Temperature October 2009

Location	Highest Maximum Temp	Lowest Minimum Temp	Mean Temperature (°C)	Departure from Normal	Comments
Niuafo'ou	31.5	19.4	25.7	-0.5	Below normal
Niuatoputapu			NA	NA	NA
Vava'u	29	**11.7** Record low	22.0	-2.8	Below normal
Ha'apai	30.9	18.2	23.8	-0.3	Below normal
Nuku'alofa	27.3	14.5	22.0	-1.1	Below normal
Fua'amotu	27.0	13.1	21.9	-0.6	Below normal

Rainfall October 2009

Ha'apai recorded extremely low rainfall in October. Niuafo'ou and Vava'u recorded well below normal rainfall. The highest daily rainfall was 22.0mm recorded in Nuku'alofa on the 6th. Niuatoputapu and now Vava'u is currently in drought. Rainfall has been below normal since May, same for Ha'apai except that in June it received above normal rainfall and July to October rainfall was below normal. **Drought warning is current for Ha'apai**.

Table 2. Rainfall October 2009

Station (data period)	August Total (mm)	September Total (mm)	October Total (mm)	Forecast Probability			Comments
				33%tile Rainfall (mm)	67%tile Rainfall (mm)	Median Rainfall (mm)	
Niuafo'ou 1971-2009	97.6	151.3	20.6	134.3	183.3	154.	Well below normal 3rd lowest in its record
Niuatoputapu 1947-2009	45.7	76.5	N/A				
Vava'u 1947-2009	60.7	91.1	29.7	100.3	172.0	137.8	Well Below Normal 7th lowest in its record
Ha'apai 1947-2009	57.4	102.5	7.7	60.0	122.0	92.0	Well below Normal 4th lowest in its record
Nuku'alofa 1945-2009	80.4	357.2	51.7	53.3	130.7	99.0	Below normal
Fua'amotu 1980-2009	104.6	322.7	48.3	42.2	110.0	62.0	Below normal

Forecast Validation for the last 3 months, August - October 2009.

The rainfall outlook for the August to October 2009 period was for above normal for northern Tonga and below normal to normal conditions for central and southern Tonga with a low skill level. The observed rainfall for the last 3 months was above normal in southern Tonga and below normal elsewhere. Generally, the forecast for Aug—Oct period was moderately consistence with what was predicted for central and southern Tonga but inconsistent for the north.

Table 3. Aug– Oct 2009 Rainfall

Location	Aug - Oct 2009 Forecast Range		Aug – Oct 2009 Observed Data (mm)	Comments
	33%tile Rainfall (mm)	67%tile Rainfall (mm)		
Niuafo'ou	330.3	475.0	269.5	Below Normal
Niuatoputapu			N/A	
Vava'u	317.3	470.9	181.2	Below Normal
Ha'apai	236.0	353.3	167.6	Below Normal
Nuku'alofa	262.0	392.0	489.9	Above Normal
Fua'amotu	276.0	394.3	475.6	Above Normal

Current Conditions

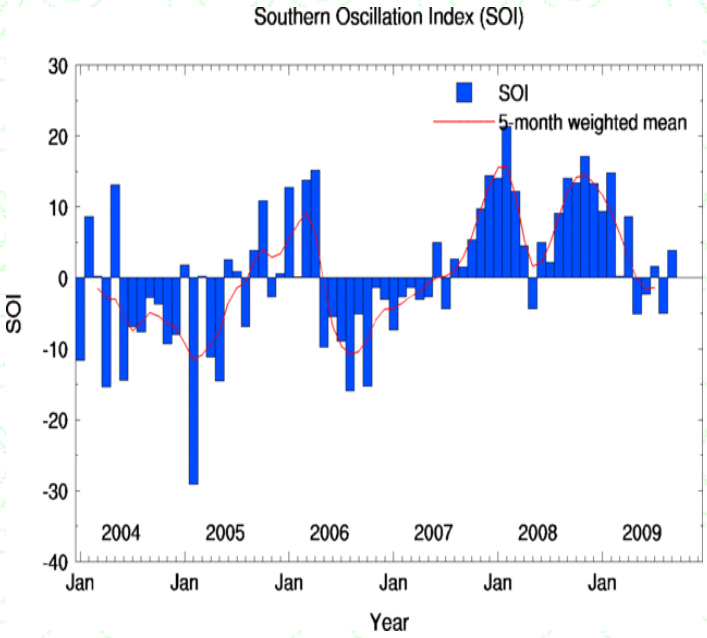
Drought Status (Summary analysis)

Niuatoputapu and Vava'u is currently in drought, rainfall has been below normal for the last six months. At least 379mm of rainfall is required next month to end this drought. Drought Warning is current for Ha'apai.

El Niño Southern Oscillation (ENSO) status.

Pacific Ocean temperatures remain at El Niño event levels as they have in the last three months however there has been some cooling in the last fortnight.

As would be expected during an El Niño event, cloudiness near the Dateline has been greater than normal over the last four weeks. However, compared to past El Niños, the current trend in cloudiness is weak. Pacific sea surface temperatures are predicted to remain above El Niño thresholds until the end of the year according to most international climate models.



Seasonal Predictions for Tonga (December09 - February 2010)

Rainfall Outlook

SCOPIC model outlook for December09 to February 2010 period is for rainfall to be above normal for Niuafo'ou , normal for Niuatoputapu, Vava'u and Ha'apai and below normal for Tongatapu. The skill level of the forecast is moderate to good.

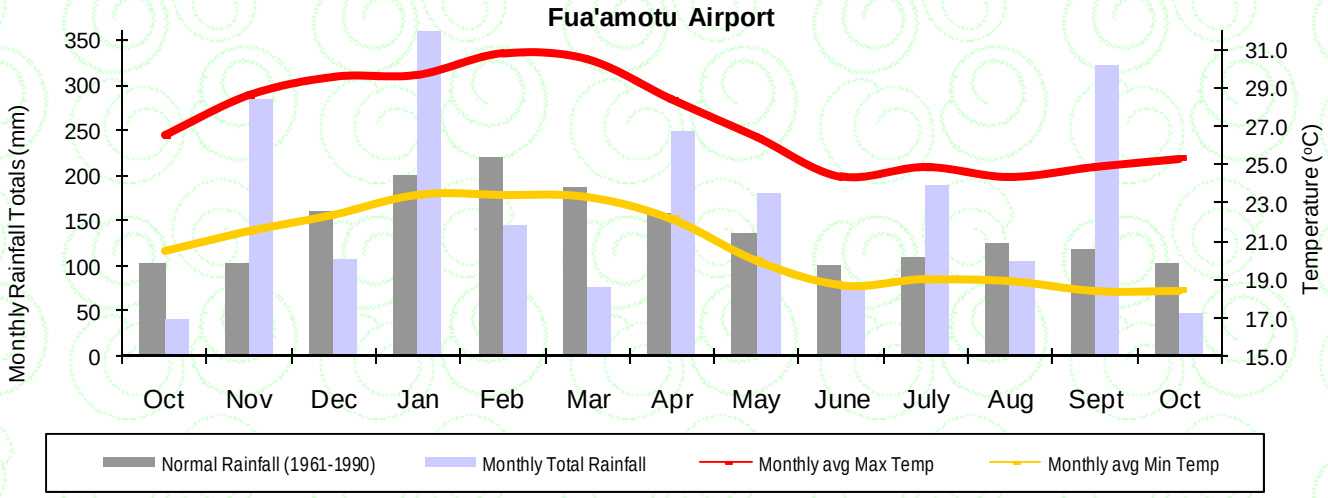
The confidence level in the outlook is related to how consistently the Pacific Ocean affects the rainfall in Tonga. Therefore the outlook confidence level for the December to February 2010 period according to climatological historical data shows this effect to be moderate to good .

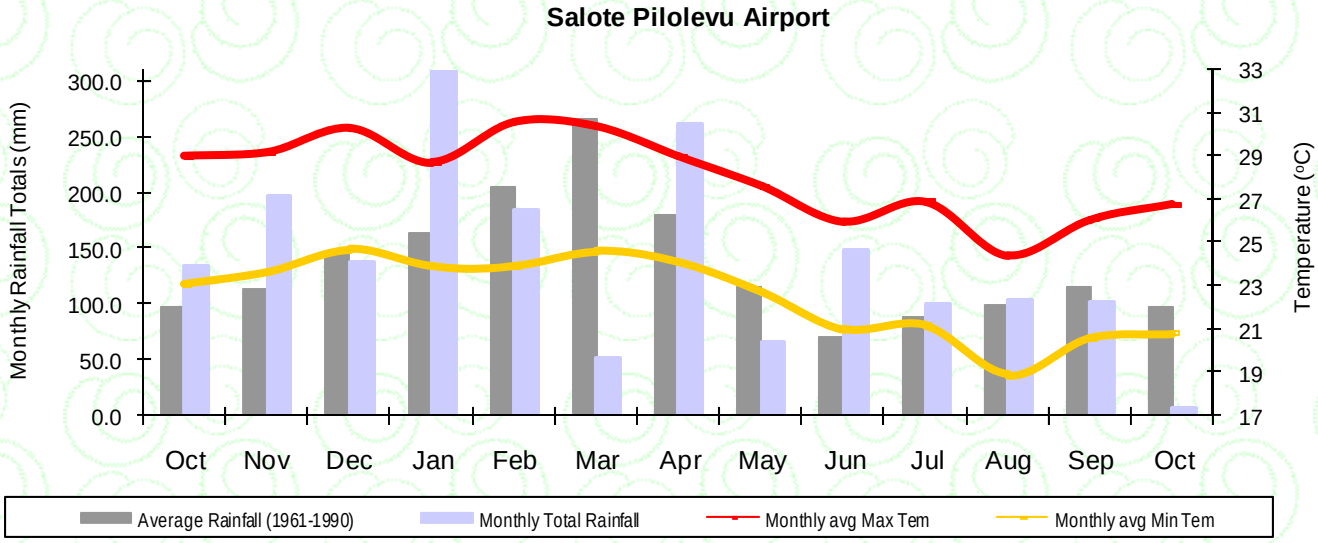
Table 4. Seasonal Rainfall Outlook for December 2009—February

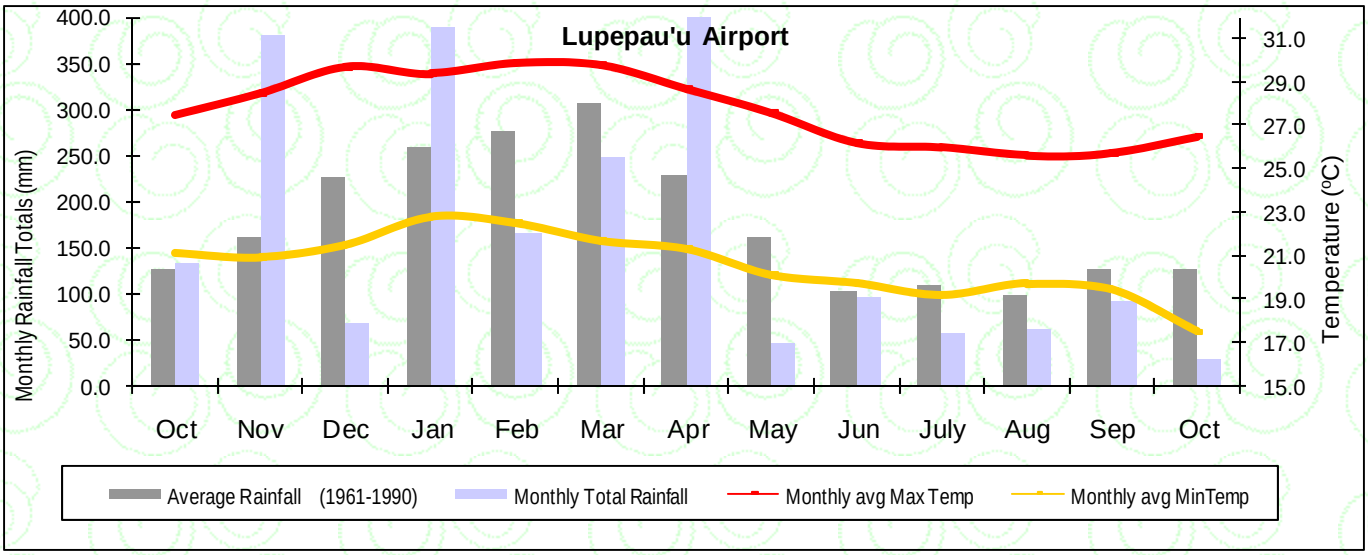
Location	Below normal probability (%)	33%tile Rainfall (mm)	Normal Probability %	66%tile Rainfall (mm)	Above normal Probability (%)
Niuafo'ou	7	676.0	12	924.0	81
Niuatoputapu	36	647.0	37	857.0	27
Vava'u	37	606.0	52	883.0	10
Ha'apai	12	431.0	54	678.7	34
Nuku'alofa	64	429.3	30	714.3	6
Fua'amotu	53	400.5	23	768.7	24

:***Note the rainfall values are for the three month period (December09— February2010).***

Rainfall Recorded over the last 13 month October 2008 to October 2009







Note:

*The Tonga Meteorological Service currently uses the **Seasonal Climate Outlook for Pacific Island Countries** (SCOPIC) Model for its seasonal rainfall prediction, validation and drought analysis. The system analyses current sea surface temperature patterns across the Pacific Ocean and then matches the most similar patterns experienced through the available historical period. The terms "**Below normal**" refers to rainfall in the lowest 33%, "**Normal**" refers to rainfall between the 33% and 67%, "**Above normal**" refers to rainfall in the highest 67% . Table 4 shows the percentage chance of receiving rainfall in each category from meteorological stations in Tonga. If conditions are **Climatology** then it means that we are forecasting an equal chance of rainfall to be in any tercile.*

***Average day time** and **night time** temperature is the average daily maximum and minimum temperature recorded throughout Tonga.*

*The drought analysis summary is based on the ENSO phases on a 4 month aggregate drought index using the Standardised Precipitation Index (SPI) method. SCOPIC focuses mainly on meteorological drought as it uses only rainfall for analysis. "**Drought** is a weather-related natural disaster that occurs when there is not enough water for users' normal needs. As people use water in many different ways, there is no universal definition". In this analysis we refer to **drought** as a prolonged period of **below-normal** rainfall (6-month rainfall that is below the 40th percentile.*

In this issue the use of Southern Tonga refers to Tongatapu and 'Eua, Central Tonga refers to Ha'apai and Vava'u, Northern Tonga is referred to Niuatoputapu and Niuafo'ou.

Significant Event

- Niuatoputapu and Vava'u is currently in drought. Rainfall has been below normal for the last six months.
- Drought warning is current for Ha'apai.

Southwest Pacific Wet Season and also the Cyclone Season

Wet Season which is also the cyclone season starts in November to the following April. During an El Nino event, the rainfall in Tonga is reduced and the frequency of occurrence of cyclones increases from one to two cyclones to affect Tonga in a season.

Disclaimer

This summary is prepared as soon as possible following the end of the month, once climate data is received from recording stations around Tonga so the values may change on receipt of later information and the ENSO information is received from various Meteorological Agencies. Delays in data collection, communication and processing occasionally arise. While every effort is made to verify observational data, the Tonga Meteorological Service does not guarantee the accuracy and reliability of the analysis and rainfall predictions presented, and accepts no liability for any losses incurred through the use of this summary and its contents. This information should be used as for guidance only. All requests for data and for further information about this forecast should be directed to the Director of the Tonga Meteorological Service, at P.O. Box 845, Nuku'alofa. Or email at fmt_met@met.gov.to