

**SEVERE WEATHER FORECASTING AND DISASTER RISK  
REDUCTION FULL DEMONSTRATION PROJECT  
(SWFDDP)**

**REGIONAL SUBPROJECT RA V**

**PROGRESS REPORT N°7**

**For the period 1 November 2012 – 28 February 2013**

*(5 April 2013)*



Part of SWFDDP website banner

## 1 Overview:

### 1.1 Introduction:

The meeting of the Regional Subproject Management Team (RSMT) of the RA V Severe Weather Forecasting and Disaster Risk Reduction Demonstration Project (SWFDDP) for the planning of the expansion of the Regional Subproject to include nine South Pacific Islands was held from 1 to 4 November 2010, in Wellington, New Zealand. The meeting report can be found at: [Meeting of the Regional Subproject Management Team \(RSMT\) of the SWFDDP - South Pacific Islands](#), Wellington, New-Zealand, 1-4 November 2010.

Based on the success of the Pilot phase of the SWFDDP (1 November 2009 to 31 October 2010), it was concluded that the RSMT will implement a full Demonstration Phase with expanded participation, from 1 November 2010 to 31 October 2012.

The next RSMT meeting will be held in Nadi, Fiji, 26-29 August 2013 and will focus on the next phase for the Project and the overall sustainability of SWFDDP.

The Regional Subproject Implementation Plan (RSIP) can be found at: [Regional Subproject Implementation Plan \(RSIP\) for the full phase of the SWFDDP - South Pacific Islands](#) (pdf).

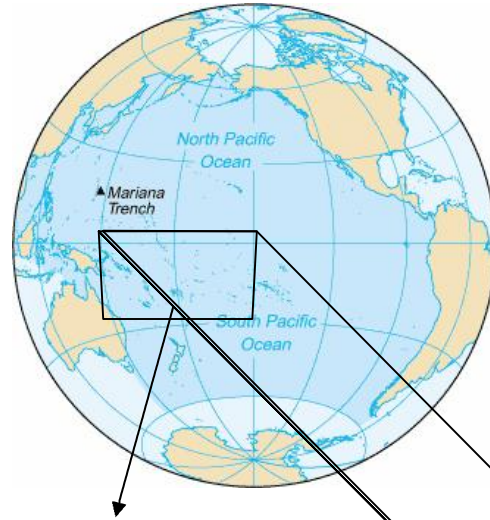
The principles and the goals of the Project were well outlined in section 1.1 of the plan. The Cascading Forecasting Process of global centres providing products through a lead RSMC to NMHSs is described in section 1.2. The overall framework of the Project in RA V is presented in section 1.3.

#### Full demonstration phase participants:

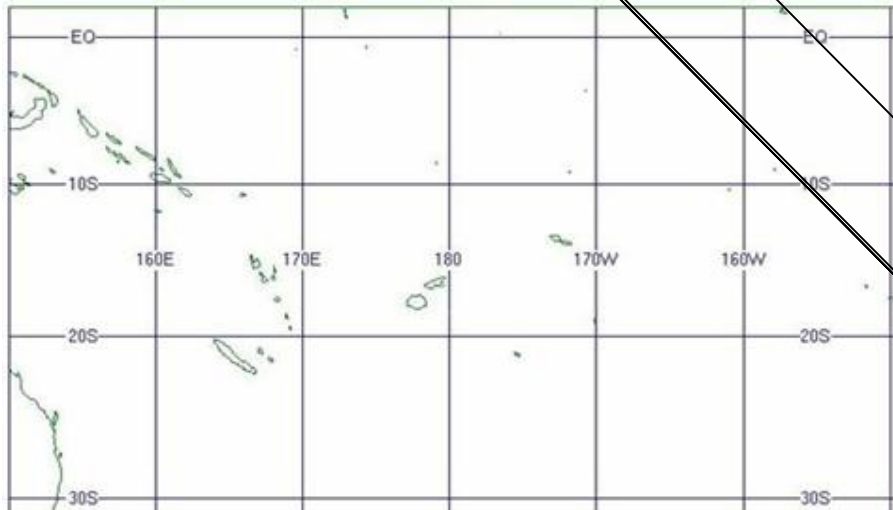
A Pilot phase involving a group of 4 participating countries in 2009/10 (Samoa, Vanuatu, Solomon Islands, and Fiji) was completed on 31 October 2010. It was followed by a full Demonstration phase in 2010/12 which includes the 4 Pilot phase NMHSs plus the following five NMHSs: Cook Islands, Niue, Kiribati, Tonga and Tuvalu.

The Regional centres include: RSMC Wellington as lead RSMC for this Subproject (having responsibility for the development and management of a dedicated project Portal), RSMC Darwin (Geographic), and RSMC Nadi (Activity – Tropical Cyclone Centre (TCC)). Fiji also participates in the project as a NMHS.

The Global centres (ECMWF, UK Met Office, USA and JMA) will continue to participate actively. The Met Office has tailor made products for the area 150E – 120W, 10N – 40S, which is larger than the 'South Pacific window' - 150E - 150W, 2N -30S of the RSMC Wellington Guidance product (see below).



**SWFDDP 'South Pacific Window' (subset of the above map)**



## South Pacific Ocean Map (showing location of participating NMHS)

South Pacific Ocean Map



This seventh Progress Report of the full Demonstration phase spans the period 1 November 2012 to 28 February 2013. The previous Progress Reports can be found at: <http://www.wmo.int/pages/prog/www/CBS-Reports/DPFS-index.html>.

This progress report compiles and assesses the feedback received from the RSMCs and the NMHSs in order to determine the quality of the guidance provided by RSMC Wellington as well as the quality and applicability of the global and regional products available. The feedback will also be used in order to ascertain the relevance and the quality of the warnings issued and the level of service provided by the NMHSs to the Disaster Management and Civil Protection Authorities (DMCPAs) and the media.

Of the participating countries, Kiribati, Tuvalu, Tonga, Niue and Cook Islands depend on RSMC Nadi for some or all of their forecasts and warnings. This poses a challenge in how such forecasts and/or warnings should be evaluated when they are issued by somebody else. Each country should accept some degree of responsibility for what goes out to their public and any feedback should be passed on to RSMC Nadi. This way it makes sense for each of them to evaluate the forecasts and warnings just as if they had produced them.

Reports<sup>1</sup> and feedback received from participating NMHSs for the period 1 November, 2012 - 28 February, 2013 ( **Boldface**: Pilot phase participants)

Centre/Country	Event report (Appendix H)	Evaluation table(Appendix I)	Verification of warnings <sup>2</sup>	Case studies <sup>3</sup>
<b>NMHS Samoa</b>	x	x		
<b>NMHS Solomon Is.</b>	x	x		
<b>NMHS Vanuatu</b>	x	x		
<b>NMHS Fiji</b>	x	x		
NMHS Cook Is.	x	x		
NMHS Kiribati	x	x		
NMHS Niue	x	x		
NMHS Tonga	x	x		
NMHS Tuvalu	x	x		

<sup>1</sup> RSMC Wellington submitted a report describing its activities, major events and South Pacific Guidance evaluation statistics over the period. RSMC Darwin submitted a *report outlining their activities*.

<sup>2</sup> No NMHS has presented formal verifications of their warnings<sup>+</sup> yet.

<sup>3</sup> No NMHS has presented a case study for the period.

+ To put things in perspective, most NMHSs don't have a formal warning system in place at the moment, or are just trialling a system.

## 2. Input from RSMCs and Global centres:

### 2.1 RSMC Wellington:

As the lead RSMC for this project, Wellington continued to provide a platform (MetConnect Pacific at [www.swfddp.metservice.com](http://www.swfddp.metservice.com)) for the SWFDDP products. This web site also provides helpful background material and links to global centres, other RSMCs and the NMHSs. Twice daily the RSMC staff produces the RSMC Daily Severe Weather Forecasting Guidance Products, referred to as the "South Pacific Guidance (SPG)" charts.

Users of the SWFDDP website, **MetConnect Pacific** (<http://swfddp.metservice.com>) view the SPG charts on the landing page. The SPG charts continued to be published uninterrupted on MetConnect Pacific (MCP) twice a day around 0300 UTC and 1500 UTC.

The RSMC Darwin images on MetConnect Pacific updated twice a day without any hitches. Under 'Wind Diagnostics', there are still a number of fields unavailable.

As agreed in the Implementation Plan, as of 1 December 2010 the threshold criteria used to generate the SPGs were changed. The new criteria provide more realistic thresholds in terms of what ranks as a severe weather event and taking into account the vulnerabilities of low-lying islands. The criteria thresholds for rain, wind and waves were raised to: rain  $\geq 100\text{mm}/24\text{hrs}$ , winds  $\geq 30$  knots and waves  $\geq 2.5\text{m}$  along and north of  $15^{\circ}\text{S}$ , and  $\geq 3.5\text{m}$  south of  $15^{\circ}\text{S}$ .

A total of 1200 SPG Charts were produced and posted on MetConnect Pacific by RSMC Wellington Lead meteorologists from 1 November 2012 to 28 February 2013. 87% of these charts contained a combination of one or more of heavy rain, strong wind and large waves. Given that this period included 4 months of the traditional cyclone season, heavy rain guidance featured prominently for most countries.

## **2.2 RSMC Darwin:**

RSMC Darwin continued to contribute regional NWP guidance and tropical climate monitoring products during the full demonstration phase of the SWFDDP-RAV from 1 November 2012 to 28 February 2013. Charts and NWP products are available on the RSMC Darwin web site, and a selection of regional NWP products is available directly on the MetConnect Pacific web page.

A priority during this period has been the conversion of SWFDDP products from ACCESS-T to ACCESS-G. This is necessary as part of the upgrade of the ACCESS NWP model suite from APS0 to APS1 (Australian Parallel Suite 1). The tropical model, ACCESS-T, will be decommissioned and replaced by an improved global model, ACCESS-G. The new global model has higher horizontal resolution (40 km, increased from 80 km), improved physics and an increase in vertical levels from 50 to 70. Additionally, ACCESS-G forecasts will be available for a forecast period of 7 days, compared with current ACCESS-T forecasts to +72 hours.

Test products from the new ACCESS-G model will become available for external use in March 2013. There should be no significant change in the appearance of ACCESS products available to SWFDDP participating countries after the changeover.

Gridded data and products from ACCESS-TC will continue to be available to the SWFDDP through the upgrade process. Another upgrade of ACCESS-G to a horizontal resolution of 25 km is expected to take place later in 2013.

Work continues to allow access to ACCESS-TC track maps and bulletins via the MetConnect Pacific web site. New rainfall guidance maps are also being developed for the SWFDDP based on a 'poor man's ensemble' (PME) of available global and regional NWP models.

## **2.3 RSMC Nadi**

RSMC- Nadi numbered 17 tropical disturbances during the period. Out of those, only five attained tropical cyclone intensity as follows:

- Evan (Cat 4) was the 1<sup>st</sup> cyclone for the 2012/13 cyclone season. It was named on 12 December UTC and was handled by RSMC-Nadi till 19 December when it was downgraded. Evan caused extensive damages to Fiji, Samoa and Wallis. Evan claimed 4 lives in Samoa and 10 are still missing. No fatalities were reported in Fiji.

- Freda (Cat 4), the 2<sup>nd</sup> cyclone of the season, was named on 29 December when the system was located to the south of Solomon Islands. Freda moved further south over open waters before being downgraded on 2 January. No major damages were reported.
- Garry (Cat 3), the 3<sup>rd</sup> cyclone was named on 21 January when the system was centred north of Samoa. Garry tracked over open waters towards Southern Cooks and was reclassified as a depression late on 27 January after leaving the Southern Cooks. Minor damages were reported over Southern Cooks.
- Haley (Cat 1) became the 4<sup>th</sup> cyclone for the season over the open waters between the Southern Cooks and French Polynesia on 10 February. Haley was downgraded to tropical depression on 11 February. There were no reports of any significant damage.
- Sandra (Cat 4) was the 5<sup>th</sup> cyclone to occur in the Nadi area after crossing 160°East from the Brisbane area on 10 March as a Cat 3. It reached Category 4 as it moved south over the open waters west of New Caledonia. Sandra was handed over to Wellington as a Cat 1 on 13 March. No major damages were reported.

## **2.4 Products from global centres:**

**ECMWF:** The ECMWF products continued without interruption during the reporting period and were well received by SWFDDP forecasters.

**UK Met Office (UKMO):** UKMO products continued without interruption during the reporting period and were well received by SWFDDP forecasters.

**JMA:** JMA provided both deterministic and probabilistic products and these were well received by SWFDDP forecasters.

### **Other centres:**

NCEP provided a link to deterministic and ensemble products for the South Pacific area. In addition, US NOAA NWS makes available a link to experimental NWP fields from a WRF nested in the GFS model over a Fiji domain, at 12km resolution and Samoa-American Samoa-Niue domain, at 4km.

## **3. Summary of the severe weather events 1 November 2012, to 28 February 2013**

### **3.1 Severe Weather Events reported by RSMC Wellington:**

**Weather Systems: Tropical cyclones refer to the RSMC Nadi report.**

**Weather Systems: other weather systems**

The Table below has listed the number of heavy rain, strong wind, and large wave and tropical cyclone events for each month for each participating country.

	Country	Date (UTC)	Month	Heavy Rain	Large Waves	Strong Wind	TC	High Tide	SPG 1	SPG 2	SPG 3	SPG 4	Comments
1	Solomon Islands	28	Dec	Henderson 266mm/24hr Auke, Malaita 77mm/24hr			Freda		√	√	√	√	Flooding around Guadalcanal
		10	Mar	Henderson 142mm/24hr			Sandra		√	√	√	√	Dengue Fever cases increased
2	Vanuatu	21-22	Nov	Southern Vanuatu 108mm/24hr					√	√	√		TD-02F
		25-26	Nov	Northern Vanuatu 430mm/48hr					√	√	√	√	There was no report of any damages
		18	Jan	Northern Vanuatu 101mm/24hr					√	√	√	√	Marginal heavy rain event.
		28	Feb	Northern Vanuatu 106mm/24hr					√	√	√	√	Marginal heavy rain event.
3	Kiribati	13-15	Nov				Eita Village, Tarawa						Apparently, easterlies 20-25kt prevailing at the time. Wave heights unknown but waves 2.5m in SPG. No overtopping of sea walls.
4	Tuvalu	3	Jan	Funafuti 113mm/24hr					√	√	√		Forecast area on fringes of Tuvalu region
		12	Jan	Funafuti 142mm/24hr					√	√	√	√	
5	Fiji	6	Nov	Taveuni: 110mm/24hr					√	√	√	√	Localised. SPG didn't cover north of Fiji.





8	Niue	9	Nov		Avatele & Tamakautoga 3-4m (est)								Area of large waves on SPG charts included Tonga but not Niue.
		14	Dec			Hanan Airport, Alofi SE 23G30kt							During TC Evan. Below the criteria to qualify for severe weather.
		15	Jan			Hanan Airport, Alofi NW 17G29kt			√	√	√	√	During TD-08F. Below the criteria to qualify for severe weather
		4	Feb			X			√	√	√	√	Strong wind warning issued but no observations to substantiate.
9	Cook Islands	10	Dec		3m east Rarotonga	Rarotonga G54kt			√	√	√	√	Unnamed TD-03F and 1 fatality while unloading fishing vessel
		15-17	Feb	Avarua 161mm/72hr									Unnamed TD-08F. Below 100mm/24hr threshold. No heavy rain included on SPG charts.
		23-27	Jan			Aitutaki, Rarotonga 35-40kt est	Garry		√	√	√	√	Area on SPG charts included part of Northern Cook Islands but not southern Cook Islands

SPG 1 = South Pacific Guidance chart day before the target day

SPG 2 = South Pacific Guidance chart 2 days before the target day

SPG 3 = South Pacific Guidance chart 3 days before the target day

SPG 4 = South Pacific Guidance chart 4 days before the target day

High Tide = Abnormally High Tide

Observations real as per criteria or eye witness accounts suggesting rain sufficient to cause flooding (significant surface or river), damaging winds or waves

**Criteria**

Rain fall ≥ 100mm per 24 hours or less

Wind ≥ 30kt

Waves ≥ 2.5m north of 15 South

Waves ≥ 3.5m south of 15 South

### 3.2 Vanuatu:

A tropical low travelled through northern Vanuatu from 20 November to 22 November 2012. It did not become a tropical cyclone. Anelghauhat, Aneitum on Southern Vanuatu recorded 108mm in the 24 hours ending 2100 UTC on 22 November 2012. Whitegrass Observation Station, Tanna Island recorded 91mm in the 24 hours ending 2100 UTC on 21 November 2012. A heavy rainfall warning was issued 24 hours in advance. No damage was reported.

A trough system was over northern Vanuatu from 24 to 26 November 2013. Sola, Torba Province, Northern Vanuatu recorded 160mm in the 24 hours ending 2100 UTC on 25 November 2012 and 270mm/24hrs ending 2100 UTC 26 Nov 2012. A heavy rainfall warning was issued 6 hours in advance. No damage was reported.

A trough system was active and over Vanuatu from 15 to 19 January 2013. Sola, Torba Province, Northern Vanuatu recorded 101mm in 24 hours ending 2100 UTC on 18 January. A heavy rainfall warning was issued 6 hours in advance. No damage was reported.

A trough system was active over or near Vanuatu from 25 to 28 February 2013. Sola, Torba Province, Northern Vanuatu recorded 105.6mm in the 24hours ending 2100 UTC on 27 February. A heavy rainfall warning was issued 12 hours in advance. No damage was reported.

### 3.3 Solomon Islands

On 6 March 2013, tropical cyclone Sandra started as a depression located to the southwest of Rennell Island moving to the northeast. On 8 March, it was upgraded and named tropical cyclone Sandra category 1 with central pressure of 989hpa located 15.0°S 156.0°E approximately 310 nautical miles southwest of Rennell and moving north-eastward. Sandra became category 2 on 9 March with a central pressure 985hPa located 15.3°S157.8°E approximately 250 nautical miles southwest of Rennell moving east-south-eastward. On 10 March TC Sandra become category 3 with central pressure of 974 hPa located 15.8°S159.9°E approximately 240 nautical miles south of Rennell moving east-south-eastward with further intensification. Later it became category 4 with central pressure of 940hPa located 16.2°S, 161.0°E approximately 260 nautical miles south-southeast of Rennell. On 11 March, all warnings had been downgraded to watch advices as Sandra, with a central pressure of 930 hPa was located near 17.1°S,161.8°E approximately 320 nautical miles south-southeast of Rennell. On 12 March, the final advice was cancelled. At Henderson on Guadalcanal, 142mm of rain was recorded in the 24 hours ending 0000 UTC on 10 March. Lata recorded 20 knot winds at 0000 UTC on 11 March. There was some damage to root crops. TC warnings were issued 24-48hours before the onset.

### 3.4 Fiji:

There was a trough over the Fiji group on 6 November 2012. Matei Airport, Taveuni recorded 109.9mm/24hr on 6 Nov 2012. Heavy rainfall warnings were issued 24 hours in advance. No damages or casualties were reported.

A trough affected Fiji on 18 November 2012. Yasawa-i-rara recorded 100.7mm in the 24 hours to 2100 UTC on 18 November. Heavy rainfall warnings (Alert?) were issued 48 hours in advance. No damages or casualties were reported.

Severe TC Evan affected Fiji from 16 to 18 December. Nadi recorded 185km/hr gust at 0300 UTC on 16 December 2012. Yasawa recorded 130km/hr sustained winds at 2200 UTC 16 December. Monasavu recorded 529mm in the 24 hours ending 2100 UTC on 17 December 2012. There were no fatalities; just some flooding and property damage. Fiji was warned up to 48 hours in advance and was well prepared.

A trough affected Fiji from 6 to 7 January 2013. Tokotoko recorded 107mm in the 24 hours to 2100 UTC 6 January. Monasavu recorded 120mm in 24 hours ending 2100 UTC on 7 January. No warnings were issued however isolated heavy rainfalls were mentioned in the public forecast. No damages were reported.

Tropical depression 15F affected Fiji on 21 February. Lautoka recorded 118mm in 24 hours ending 2100 UTC on 21 February. Penang recorded 109mm in 24 hours ending 2100 UTC on 21 February. A heavy rainfall warning was issued 6 hours in advance. No damages were reported.

### 3.5 Samoa

Salani on Upolu Island recorded 172mm of rainfall in the 24 hours ending 1900 UTC on 9 November and 140mm over the next 24 hours ending 1900 UTC on 10 November. No warnings were issued. There was little impact from this event.

Apia on Upolu Island recorded strong winds of 63km/hr at 2230 UTC on 9 December. No warnings were issued. There was little impact from this event.

TC Evan affected Samoa on the 13 and 14 December 2012 with onset around 1200 UTC on 13 December. Tropical cyclone warnings were issued more than 24 hours before the onset. Mt Fiamoe on Upolu Island recorded 114km/hr winds at 0030 UTC on 13 December. Lemafa on Upolu Island recorded 115km/hr winds at 2300 UTC on 13 December. Alaoa on Upolu Island recorded 404mm of rain in the 24 hours ending 1900 UTC on 14 December. The warnings helped the Disaster Management Office and response agencies to plan for potential impacts. The impact resulted in a one in a 100 year flood event which killed 4 people and left 10 missing. Evan caused major damages to the infrastructure (roads, bridges, water and electricity supply, communication), residential houses, businesses, agriculture and the natural environment. The total cost of the impacts is \$210.7 million USD (reflects the combined cost of impact caused by the flood and cyclone).

Apia on Upolu Island recorded winds of 66km/hr at 0240 UTC on 11 January 2013. Falealili on Eastern Upolu Island recorded 129mm rainfall in the 24 hours ending 1900 UTC on 12

January. Fagaloa, northeast of Upolu recorded 150mm rainfall in the 24 hour period ending 1900 UTC on 13 January. High wind and flood warnings were issued 48 hours in advance. There was little impact from this event.

Apia on Upolu Island recorded winds of 51km/hr at 0300 UTC on 30 January. Afiamalu on Upolu Island recorded 208mm rainfall in the 24 hours ending 1900 UTC on 31 January. A heavy rainfall and wind warning was issued 9 hours before the onset. There was little impact from this event.

A tropical depression affected Samoa from 31 January to 5 February. Afiamalu on Upolu Island recorded 120mm rainfall in the 24 hours ending 1900 UTC on 1 February. Faleolo on Upolu Island recorded 53km/hr winds at 2340 UTC on 4 February. A tropical depression (tropical cyclone and related phenomena) warning (or a Watch?) was issued nearly 48 hours before the onset. There was little impact from this event.

### **3.6 Cook Islands:**

TD03F affected the Cook Islands on 10 December 2012. Rarotonga observed winds gusting to 54 knots at 1600 UTC on 10 December. Three metre (3m) waves were observed on the eastern side of Rarotonga between 1000 and 1800 UTC on 10 December. Warnings were issued by Nadi 6 hours before the event. There was 1 fatality.

TD08F affected the Cook Islands on 15-17 January, 2013. At Avarua on Rarotonga, 67, 66 and 29mm of rain fell in the 24 hours ending 2300 UTC on 15 January, 1400 UTC on 16 January, and 1800 UTC on 17 January, respectively. No warnings were issued. Little impact was reported.

Tropical cyclone Garry affected the Cook Islands 23-27 February. Winds of 21 knots gusting 33 were recorded at Rarotonga at 1800 UTC on 26 February. The Nikao Rarotonga recorded a rainfall of 55.9mm in the 24 hours ending 1500 UTC 25 January. TC warnings were issued by RSMC Nadi well in advance. There were many interactions with key stakeholders such as the Disaster Management Team, Police and Red Cross. The public and businesses were well prepared. Little damage was reported.

### **3.7 Tuvalu:**

Heavy rainfall was observed on 3 January 2013. Funafuti recorded 117mm in the 24 hours ending 2100 UTC on 3 January. No warnings were issued and there was little impact.

Heavy rainfall was observed 12 January. Funafuti recorded 113mm in the 24 hours ending 2100 UTC on 12 January. No warnings were issued however heavy showers were mentioned in the public forecast. A combination of this rain and King tides led to flooding of low lying areas.

### **3.8 Kiribati:**

Strong easterly winds and swells coupled with a Spring Tide affected all the islands of Kiribati 13-15 November 2012. Kiribati issued a high tide (King tide) warning and there was some flooding of low lying areas.

### **3.9 Niue:**

On 9 November 2012 large waves were observed on the southern and south-western side of the island. Damaging Heavy swell warning was issued by Niue Meteorological Service straight after the report from one of the Met Staff. Three (3) to 4m waves were observed at Tamakautoga and Tapa Point at 2100 UTC on 9 November.

On 11 December, Tropical Cyclone Evan lay far to the north-northwest of Niue. A strong wind warning was issued for Niue waters on 12 December and land, on the 13 December. At Hanan Airport winds of 23 knots gusting to 30 were observed at 0300 UTC on 14 December. These winds didn't pose any problems.

TD08F affected Niue on 12 to 14 January 2013. A strong wind warning was issued for Niue waters on 12 January and land, on 14 January. At Hanan Airport winds of 17 knots gusting to 29 were recorded at 1500 UTC on 15 January. These winds posed no issues.

A tropical disturbance lay to the west-northwest of Niue on 4 February 2013 and a strong wind warning was issued for both land and water. No severe weather was observed.

### **3.10 Tonga**

A heavy rainfall advisory was issued more than 24 hours before the onset of heavy rain on 07 November 2012. Fua'amotu recorded 111mm in the 24 hours ending 2100 UTC on 07 November 2012. There was flooding in low-lying areas.

A heavy rainfall advisory was issued about 14 hours before the event was expected to start at 1200 UTC on 21 February 2013. However, the start of the real heavy rain didn't eventuate until 4 days after the initial advisory was issued.

Fua'amotu recorded 116.6mm in the 24 hours ending 2100 UTC on 25 February. There was flooding over low-lying areas of Tongatapu and school was closed.

## **4. Comments about the SPG and the NWP products.**

### **RSMC Wellington**

US Satellite hydro-estimation data are proving useful in estimating how much rainfall has occurred up to the start of the forecast period or an indication of how much might have fallen during an event just completed.

The following statements have appeared in previous reports and according to a recent survey of RSMC Wellington forecasters, are still applicable:

- The UKMO, ECMWF and JMA precipitation probability charts continue to

give a weak signal at 100mm over 24 hours and a good signal for 50mm. Wellington forecasters rely on these products, together with the help of pattern recognition, to estimate rainfall totals  $\geq 100\text{mm}$  in 24 hours.

- The wind guidance from the various NWP centres has proved consistently reliable so the number of over-forecast strong wind areas is small.
- A large amount of wave guidance still continues to appear on the SPG charts in spite of the split in wave criteria across  $15^{\circ}\text{S}$ .

## **Fiji**

Forecasters consistently refer to the SPG charts and find them helpful. The ensemble products from the ECMWF and the UKMO are useful in determining the probability of occurrence of an event above a certain threshold.

## **Samoa**

The SPG charts have enabled forecasters to issue warnings with confidence and a good lead time. The NWP from UKMO, ECMWF and RSMC Darwin have also been very helpful in the decision-making process.

## **Vanuatu**

The SPG charts continue to be very useful as they have enabled forecasters to issue warnings with a good lead time. The NWP/Ensemble products were also very useful.

## **SIMS**

The SPG charts provided by RSMC Wellington and the TC Outlooks issued by RSMC Nadi were very useful in triggering warnings with a good lead time. All the NWP models gave useful information for significant weather events.

## **Niue**

Niue finds the SPG charts very useful except for the swell event of 9 November when the envelope of heavy swells stopped between southern Tonga and Niue. It gives the forecaster a good heads-up on upcoming severe weather events. The NWP guidance was useful especially the 4km WRF.

## **Tuvalu**

The SPG charts and TC Outlooks are the key guidance for the daily weather forecast. Forecasters use the UK NWP products occasionally and have started using the RSMC Darwin products and the ECMWF model since the recent SWFDDP in-country training.

## **Kiribati**

The SPG charts provided useful advice that 2.5m waves could be expected during the King Tides on 13-15 November 2012.

## **Cook Islands**

Guidance from RSMC Wellington, Nadi and Darwin proved very useful.

## **Tonga**

The SPG charts are quite useful in making forecasters more situationally aware what significant weather events. Should there be disagreement among guidance material it is comforting to find the SPG agreeing with one's position.

## **5. Project evaluation against SWFDDP goals:**

### **5.1 To improve the ability of NMHSs to forecast severe weather events**

NMHSs generally agreed that the SWFDDP products and, in particular, the SPG charts have helped raise their awareness of expected significant weather or wave events and give them more confidence in forecasting them.

- Fiji stated that without the range of guidance on MetConnect Pacific their forecasters would not be able to issue useful forecasts and warnings for upcoming severe weather for both TC and non-TC related.
- Niue stated that the in-country training helped forecasters use the MetConnect products with more confidence.
- Tonga is now more alert to the potential severe weather up to 5 days in advance.

### **5.2 To improve the lead time of alerting these events**

All NMHSs (who issue warnings) agreed that the SWFDDP products have helped them provide a healthy lead time or enabled them to issue timely warnings which wouldn't have been the case in the past. As a result of SWFDDP;

- Tonga now issue alerts 24-48 hours in advance compared to 6-12 hrs previously
- SIMS was able to issue warnings up to 48 hours in advance with accuracy
- Tuvalu provide alerts with up to 72 hours lead time
- Fiji has been warning the public at least 24 hrs in advance
- Vanuatu provides non-TC (heavy rainfall) warnings with 6-12 hours lead time and TC warnings, at least 24 hours.



**5.3 To improve the interaction of NMHSs with Disaster Management and Civil Protection Authorities (DMCPA) before, during and after severe weather events**

- In the various severe weather events the Fiji media broadcast several interviews with the director and the acting director
- Samoa, Cook Islands, Tuvalu, Niue, and SIMS have worked closely with their DMCPA's
- The SI National Disaster Management Office used the forecasts to plan their emergency preparedness and relief efforts
- Vanuatu has a close working relationship with their NDMO

**5.4 To identify gaps and areas for improvements**

- Fiji found it difficult to verify forecasts and warnings for heavy swell events
- Vanuatu also cites difficulty in verifying forecasts
- Both SIMS and Cook islands cited lack of experience amongst forecasting team. The available guidance is very important to them
- Tonga finds the current set of web products somewhat limited and would like to be able to explore vorticity and convergence fields at 850 hPa for example+
- Samoa would like to modify its forecast warning system
- Both Niue and Kiribati are hampered by slow internet connections

**5.5 To improve the skill of products from Global Centres and RSMCs through feedback from NMHSs**

- Tonga would like more details in the guidance issued the day before an event e.g., sub areas within the main area, with own confidence levels.
- Niue would like the USA NOAA NWS WRF model run to go out to 5 days
- SIMS forecasters are not familiar with NCEP and JMA products and need to gain experience with them
- Tuvalu finds the products reliable and accessible
- Samoa have encouraged other centres to use their wind profiler data for verification purposes
- Fiji and Vanuatu provided no comments

**6. Evaluation of the weather warnings:**

**6.1 Feedback from the public**

- SIMS received a number of calls concerned with the heavy rainfall warning before businesses and schools were shut down
- In Niue, Fiji and Vanuatu the public acknowledged the timely warnings.
- Compliments for Samoa Meteorological Service ' about their role in the "follow-up media interview programme"

- Tuvalu and Tonga received no feedback from the public.

## 6.2 Feedback from the DMCPA's

- In Niue the NDMO acknowledged the timely issue of warnings for TC Evan
- The SI National Disaster Management Office used the forecasts to plan their emergency preparedness and their relief efforts.
- The Vanuatu NDMO acknowledges the importance of the warnings and a MOU has been signed to strengthen the relationship
- Fiji, Tuvalu and Tonga reported no feedback.
- In Samoa, DMO was positive about the issue time of the meteorological service warnings

## 6.3 Feedback from the Media

- SI media broadcast interviews with the SIMS director about the severe events
- Fiji media found the forecasts and warnings posted on the Fiji Meteorological Service web site to be useful
- Niue disseminated warnings to media through fax and email.
- Tuvalu, Vanuatu and Tonga reported no interactions.
- Samoa received positive feedback with “words of encouragement” for its role in the follow-up media interview programme

## 6.4 Objective verification by the NMHSs

There was no objective verification by the NMHSs (Refer to comment underneath table in section 1)

The following is from RMSC Wellington's report:

The table below shows the number of SPG Charts produced from 1 November 2012 to 28 February 2013 under the various categories and different countries. A total of 1200 South Pacific Guidance charts were produced by RSMC Wellington Lead meteorologists and posted on MetConnect Pacific and 87% of these charts contained a combination of one or more of heavy rain, strong wind and large waves. Nearly all participating countries received guidance of one sort or another 25 to 35% of the time while Niue figured in just 11% of all the guidance. Only large wave guidance was received by Kiribati. Given that this period included 4 months of the traditional cyclone season, heavy rain guidance featured prominently for most countries.

Nov 2012-February 2013	SWFDDP	Solomons	Vanuatu	Kiribati	Tuvalu	Fiji	Samoa	Tonga	Niue	Cooks
Heavy Rain	807	337	230	0	272	266	224	268	111	289
Strong Wind	484	86	94	0	105	93	121	126	66	169
Large Waves	833	95	155	402	158	142	183	145	64	340

TC References	214	31	20	0	25	68	45	50	17	42
Combination of one or more of the above	1043	364	327	402	322	379	302	345	130	460
Nil sig	157	836	873	798	878	821	898	855	1070	740
Total number of SPG charts	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200

A simplified verification spreadsheet was demonstrated to the SWFDDP participating countries during the 2012 in-country training. This will enable individual NMHSs to keep a tally of SPG charts and hits and misses of warnings. At the same time, they are able to calculate the probability of success and false alarm ratio for each event. This is not yet been used operationally in any of the participating countries. This will be discussed at the next RSMT meeting in the coming months.

#### 7. Case studies:

No case studies were provided.

#### 8. Conclusions:

Most NMHS's submitted their reports on time except for Vanuatu and Samoa. The reports followed the format prescribed.

Given that this reporting period included the most active months of the cyclone season, there were more reports of severe weather than in previous reports. More NMHS's reported interactions with their DMCPA's and media than in previous reports. Still, there were a few NMHS's that didn't have any interaction with the DMCPA's, media or the public, notably Tonga and Tuvalu. Fiji received no feedback from its DMCPA.

Steve Ready participated in the 7<sup>th</sup> Tropical Cyclone RSMCs/TCWCs Technical Coordination Meeting in Citeko, West Java, Indonesia, 12-15 November 2012.

Steve Ready participated in the WMO Coastal Inundation Forecast Demonstration Project (CIFDP) in Fiji from 18-21 February. The SPG will undoubtedly provide a useful data input for CIFDP and there are also similarities with SWFDDP in the way the Project is set up.

### SWFDDP In-country training

The NZ MetService completed the last round of SWFDDP in-country training for participating countries, in Niue, on 23 November 2012. All the training was carried out by MetService staff between May and November 2012 (see Table 4 below). Jonathan Tunster was taken off the forecast roster at MetService for this time to prepare and deliver the

training material. A second trainer provided a supporting role to Jon in each of the trips. All aspects of the 'Cascading Process', including a half to full day workshop involving several agencies connected to emergency response, were conducted.

Countries	Dates (including travel)	MetService Trainers
Samoa	5-13 May 2012	JT & JL
Fiji & Kiribati	12-23 Jun 2012	JT & JL
Cook Islands	16-22 Sep 2012	JT & SR
Tuvalu & Tonga	2-13 Oct 2012	JT & MS
Solomon Islands & Vanuatu	23 Oct – 3 Nov 2012	JT & JL
Niue	17-24 Nov 2012	JT & LM

*Table 4. List of countries visited and the MetService trainers that carried out the training (JT = Jon Tunster, Meteorologist, JL = James Lunny, WMO Manager, SR = Steve Ready, Manager RSMC Wellington, MS = Mark Schwarz, Meteorological Instructor and LM = Lisa Murray, Meteorological Instructor).*

MetService would like to acknowledge the role of the New Zealand Ministry for the Environment (MfE) and the New Zealand Ministry of Foreign Affairs and Trade (MFAT) in funding the SWFDDP in-country training programme. MetService would also like to acknowledge the support provided by USA NOAA NWS staff in helping with and contributing to components of the training in Samoa and Fiji.

The training provided during 2012 was done to a higher standard than in 2009/10 when the project was beginning, and the training was better attended, both at the NMHSs and the DRR workshops. As a result, the NMHSs were very appreciative of this opportunity to engage in the in-country training and requested that this type of training be conducted again in the near future.

#### **Upgrades to MetConnect Pacific**

The following is a list of proposed upgrades for the Project website:

- Archiving and accessing SPG charts
- ACCESS-TC products from RSMC Darwin to be loaded directly
- UKMO multi-model ensemble products to be loaded directly
- Overhaul of website graphics (e.g. new MetService branding)
- Collective display of synops for each Pacific Island country

- Archiving of UKMO and RSMC Darwin NWP images loaded directly
- Reporting forms to be completed online
- Creation of a system for automatically emailing 'News' alerts

MetService is still negotiating with a potential donor for the funding of these upgrades. Once the funding is secured, at least, part of the upgrade work is likely to be outsourced as there is a number of high priority, significant projects waiting to get started at MetService.

## **CHALLENGES**

- Sustainability of SWFDDP: securing funding for on-going modifications to MetConnect Pacific; and the next round of in-country training, probably before the 2014/2015 cyclone season.
- There are gaps in the non-TC warning system, most notably alerts/warnings for heavy rain and an alert system for damaging swells. In an effort, to close these gaps Steve Ready plans to present a simplified approach to advising communities about heavy rain through using alert and warning banners in forecasts and warnings, at the next RSMT meeting.
- Filling the gap created by the absence of radars for monitoring heavy rainfall potential flooding events.

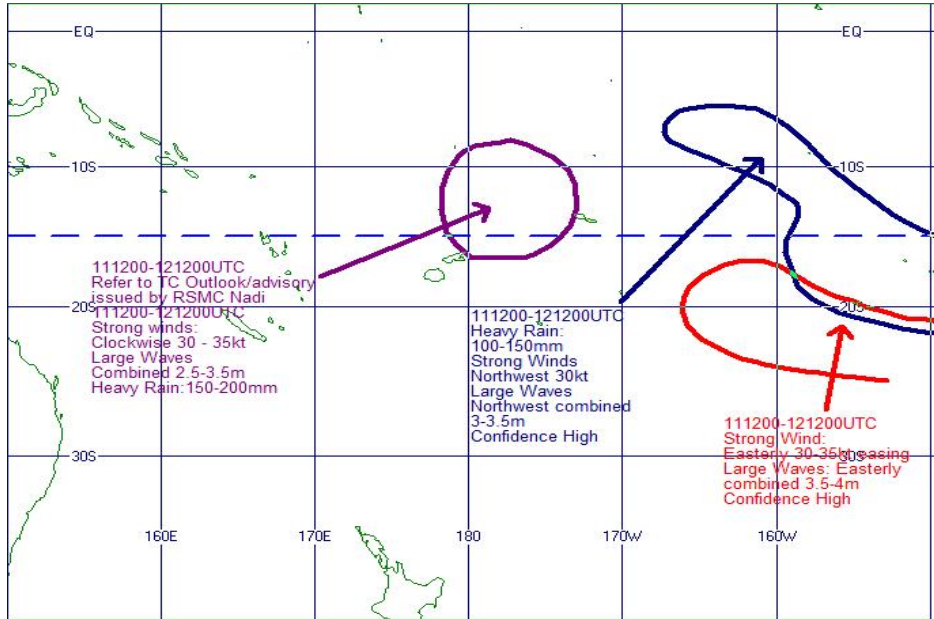
1. APPENDICES

A. Tropical cyclone events

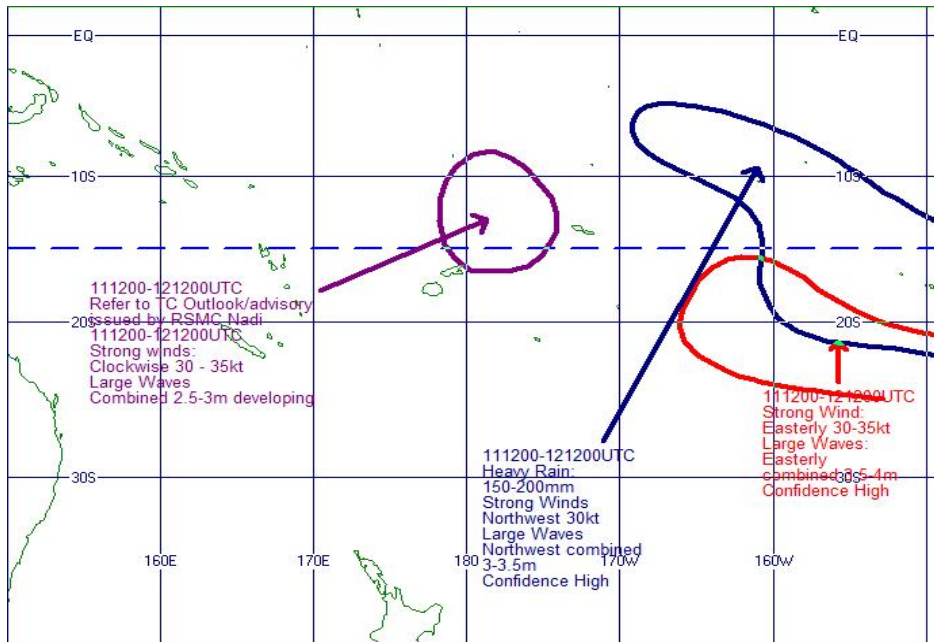
**TC Evan was named at 0000 UTC on 12 December 2012**

**Comment:** TC Outlook/Advisories started up about 48 hours before Evan was named.

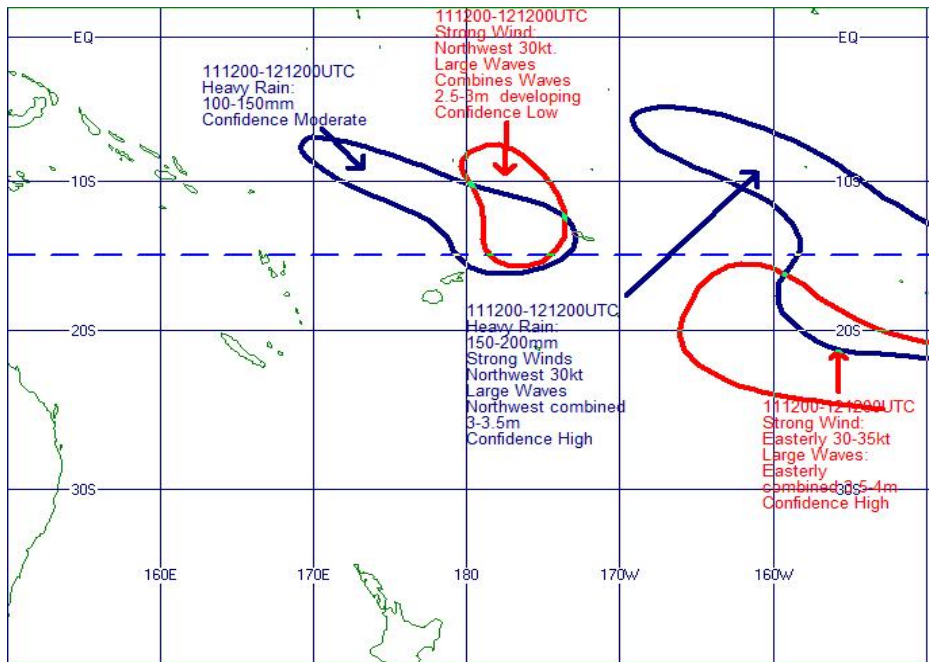
**1400 UTC issue on 11-Dec-2012 (starting day for this event)**



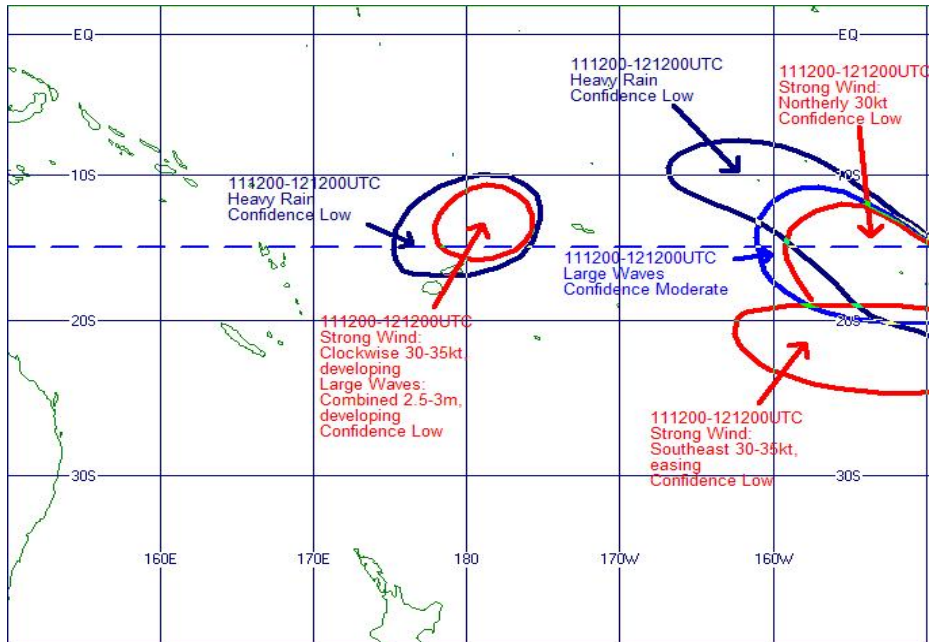
**1400 UTC issue on 10-Dec-2012 (day before start of the event)**



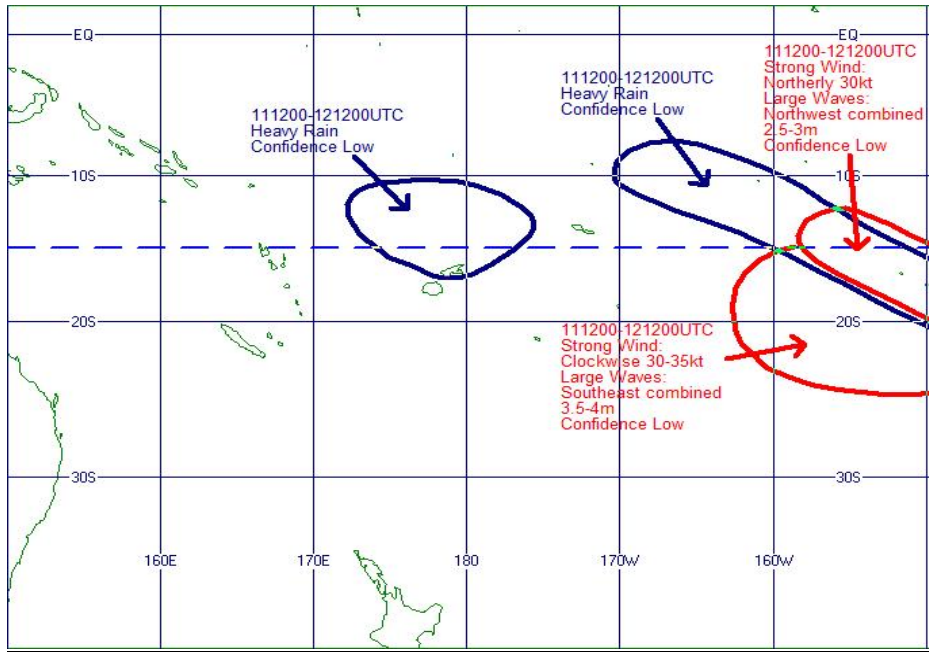
**1400 UTC issue on 9-Dec-2012 (2 days before start of event)**



**1400 UTC issue on 8-Dec-2012 (3 days before start of event)**



**1400 UTC issue on 7-Dec-2012 (4 days before start of event)**

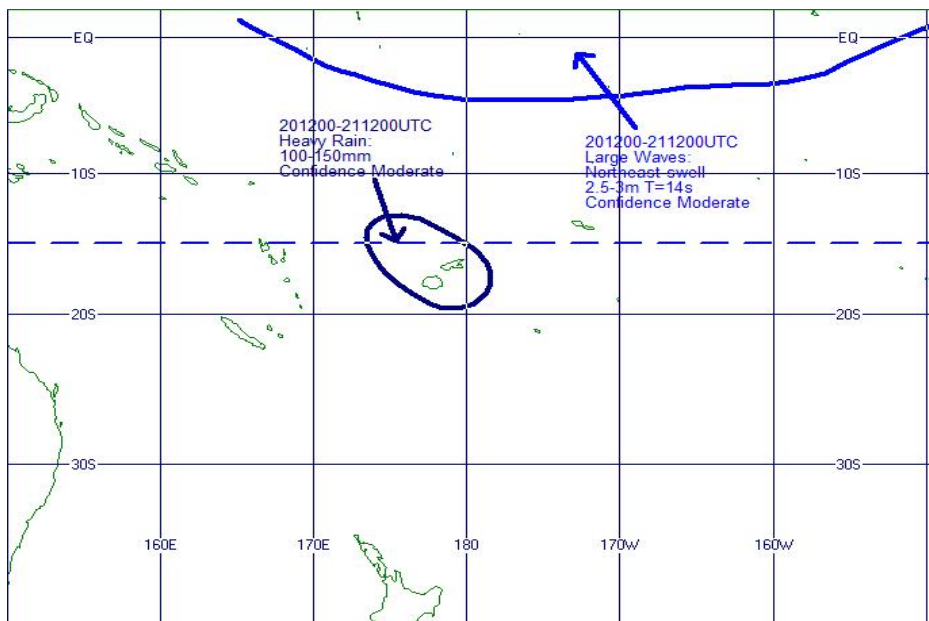


**B. Non-tropical cyclone events**

**HEAVY RAINFALL over Fiji 21-22 February 2013 – 100-120mm in the busiest 24-hour period.**

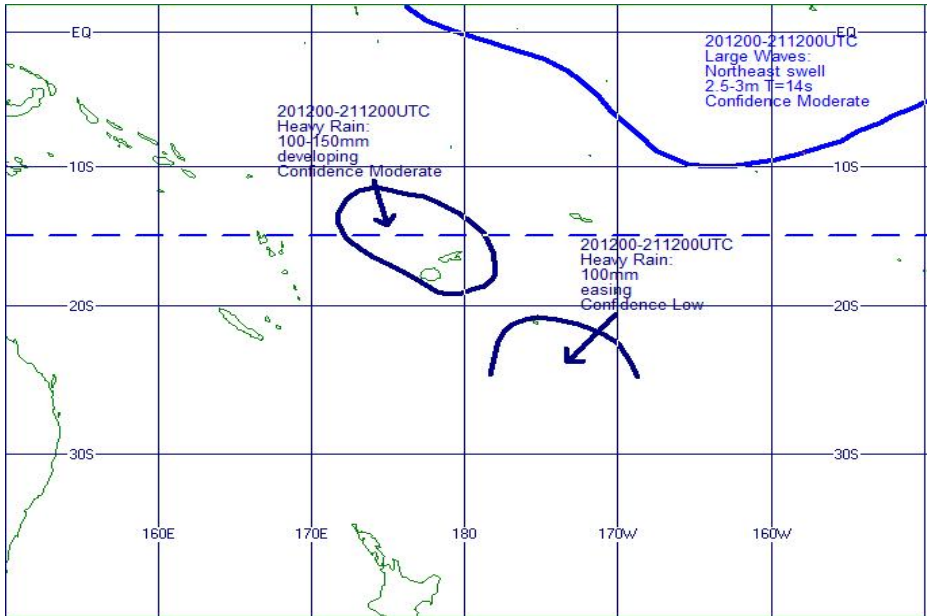
**Comment:** Significant surface flooding in Lautoka exacerbated by blocked drains.

**1400 UTC issue on 20-Feb-2013 (starting day for this event)**

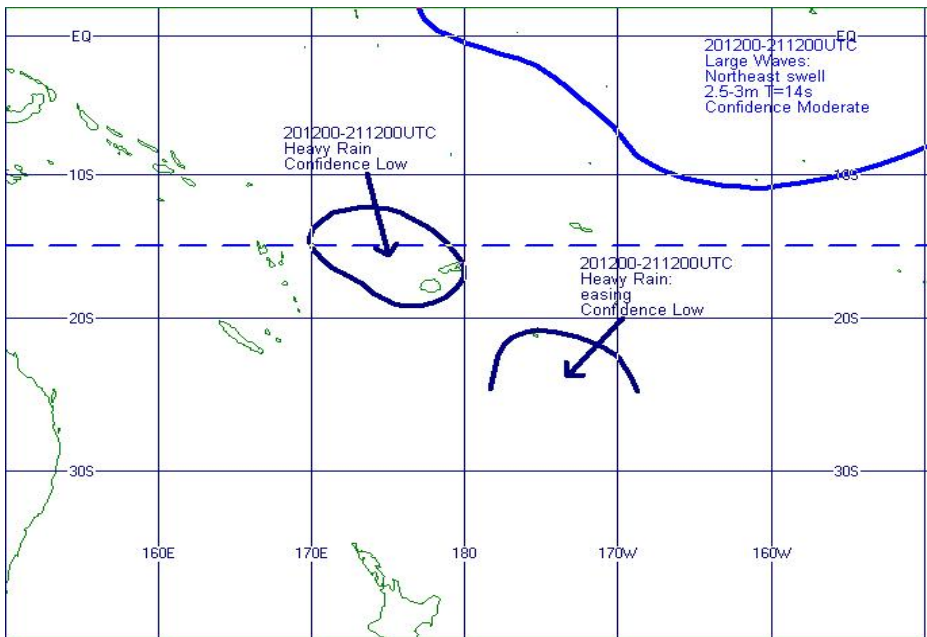




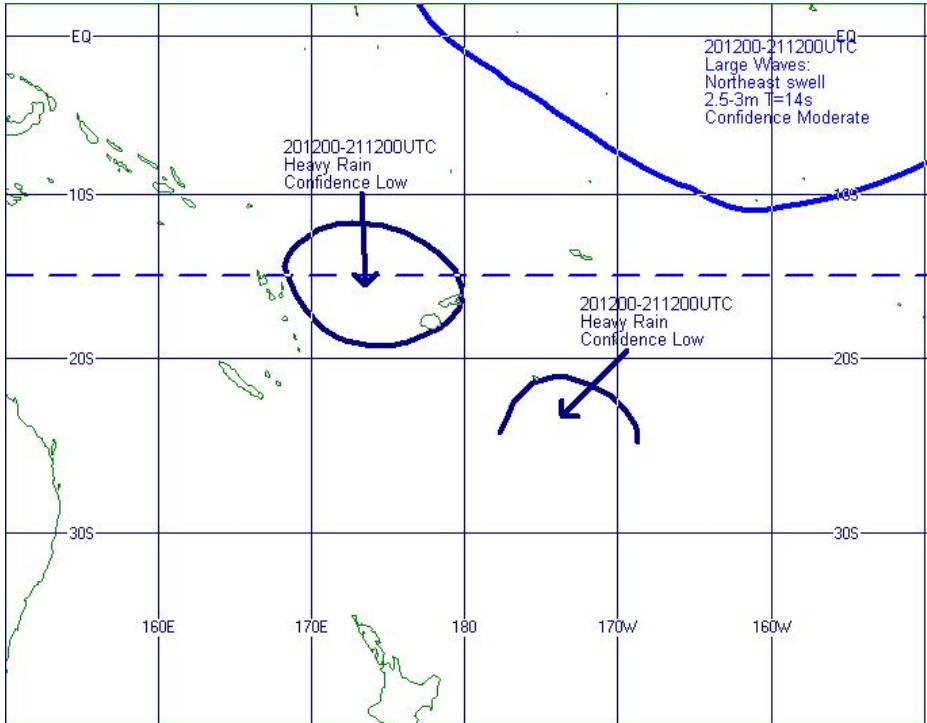
**1400 UTC issue on 19-Feb-2013 (day before start of event)**



**1400 UTC issue on 18-Feb-2013 (2 days before start of event)**



**1400 UTC issue on 17-Feb-2013 (3 days before start of event)**



**1400 UTC issue on 16-Feb-2013 (4 days before start of event)**

