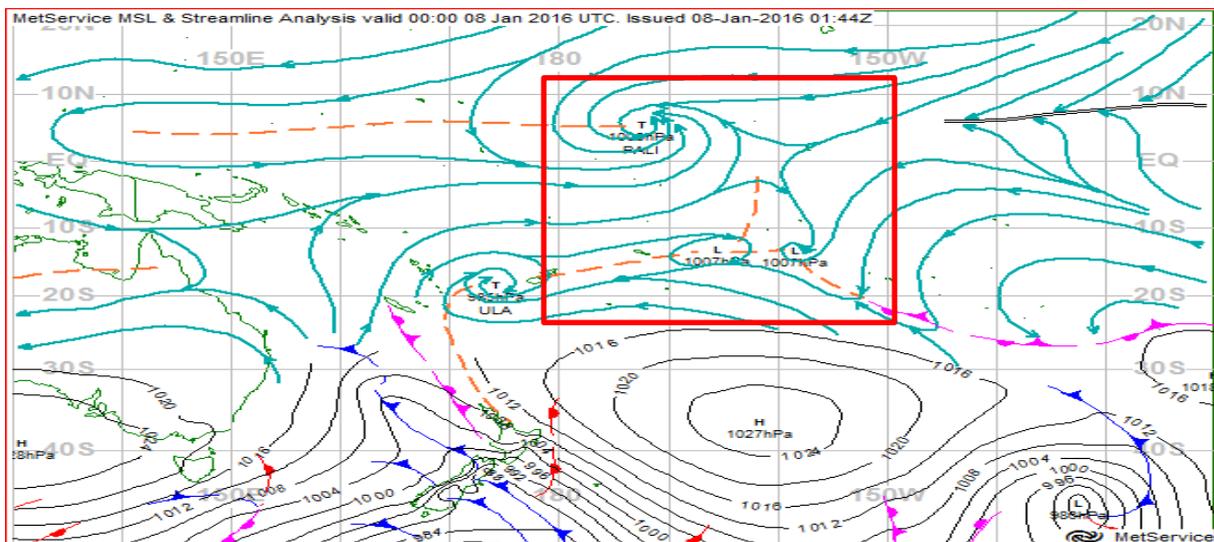


**The Kiribati Meteorological Services' Brief Report on Waves affecting Christmas Island – 9<sup>th</sup> January 2016**

**Background**

At this time of the year, the Strong El Nino continues to dominate the climate of most countries within the Pacific Ocean (COSPPac Monthly Climate Bulletin December 2015). This would mean warmer waters over Kiribati with an increase in likelihood of experiencing westerly winds and a slight increase in sea level. On the 9<sup>th</sup> of January, Large waves were observed by the tide gauge on Christmas Island. According to tide predictions for Christmas Island, this date also coincided with the spring tide. Also during this period, streamline analysis from the New Zealand Met Service and NOAA showed Cyclonic systems and westerly winds west of Christmas Island (figure 1).



t

Figure 1: New Zealand MetServices' streamline analysis showing cyclonic systems and associated westerly winds.

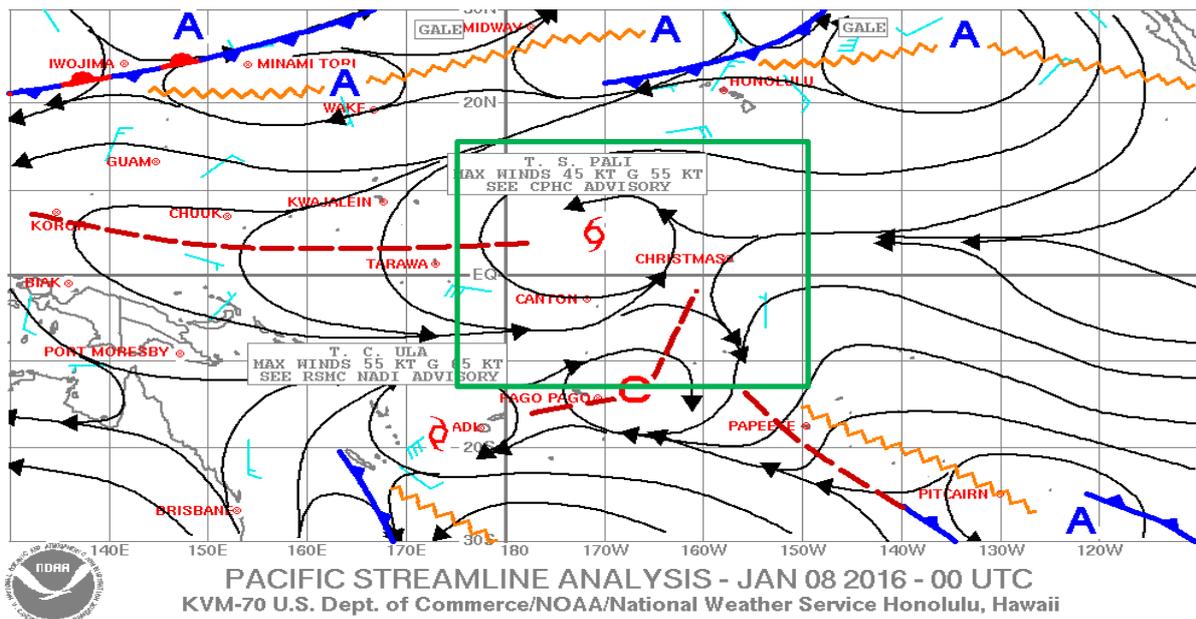


Figure 2: NOAA's streamline analysis showing cyclonic systems and associated westerly winds.

## Forecast and Observation

### Forecast Models

Forecast guidance (SWFDDP South Pacific Guidance Charts) showed large wave of 2.5-3m to impact the Phoenix and Line Islands. It also showed areas of Strong winds associated with TC Pali situated west of the Line Islands.

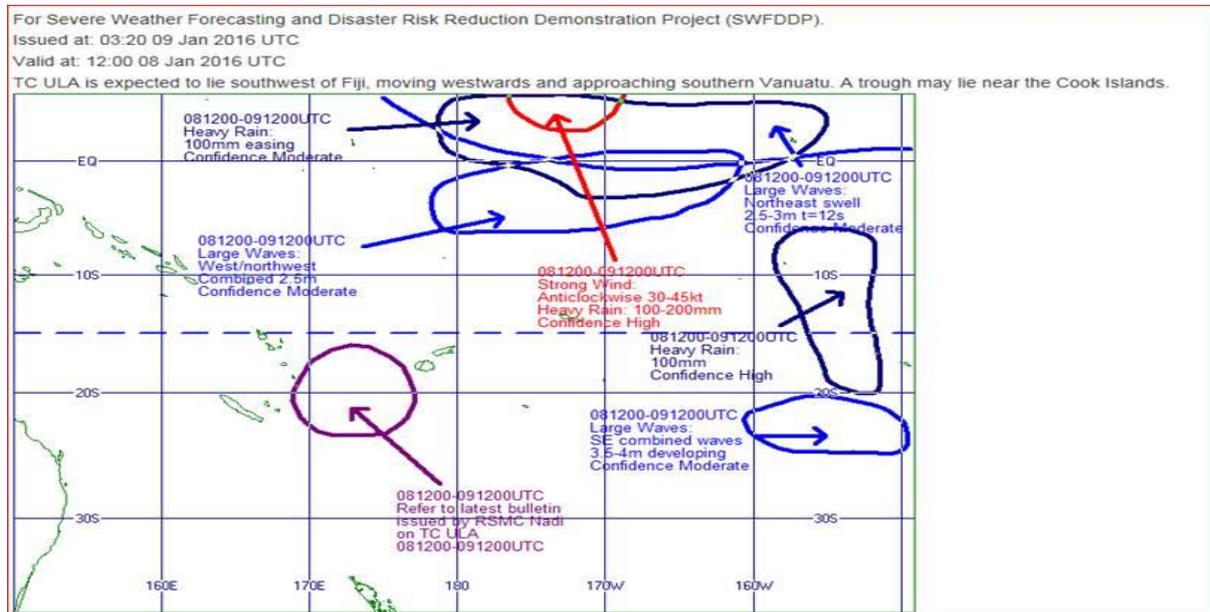


Figure 3: SPG chart showing areas of strong wind and large waves

The ECWMF Significant wave height forecast also showed a high confidence of waves greater than 2m to affect the Phoenix and Line islands.

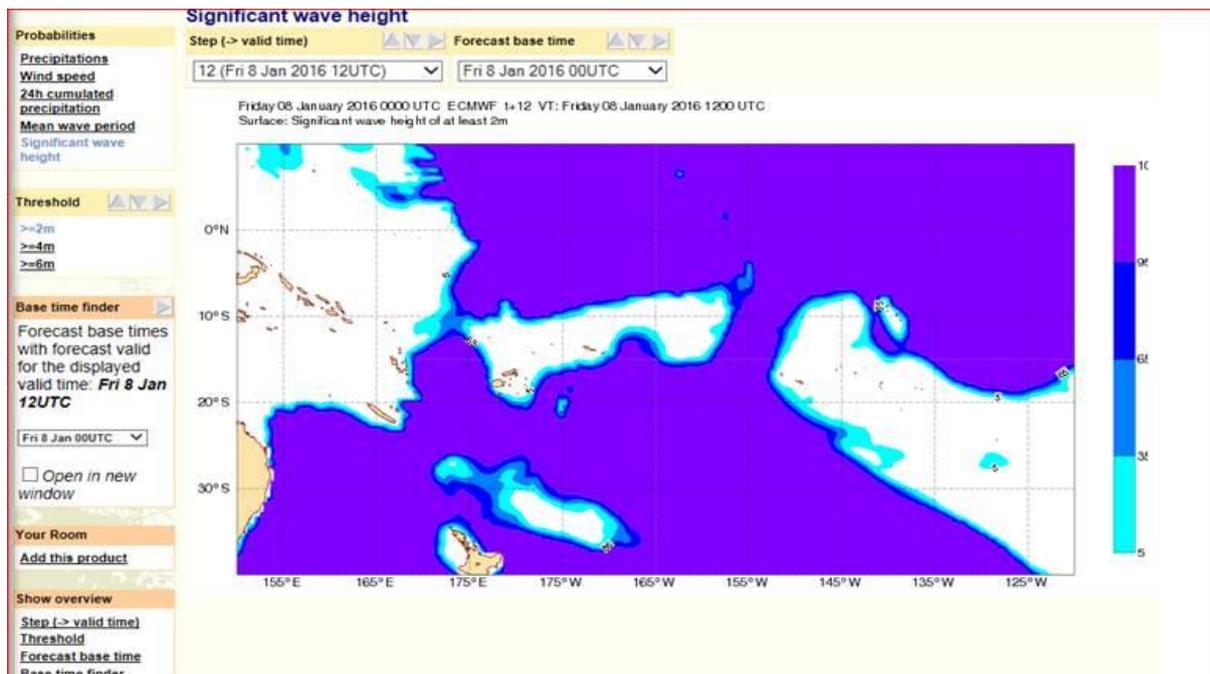
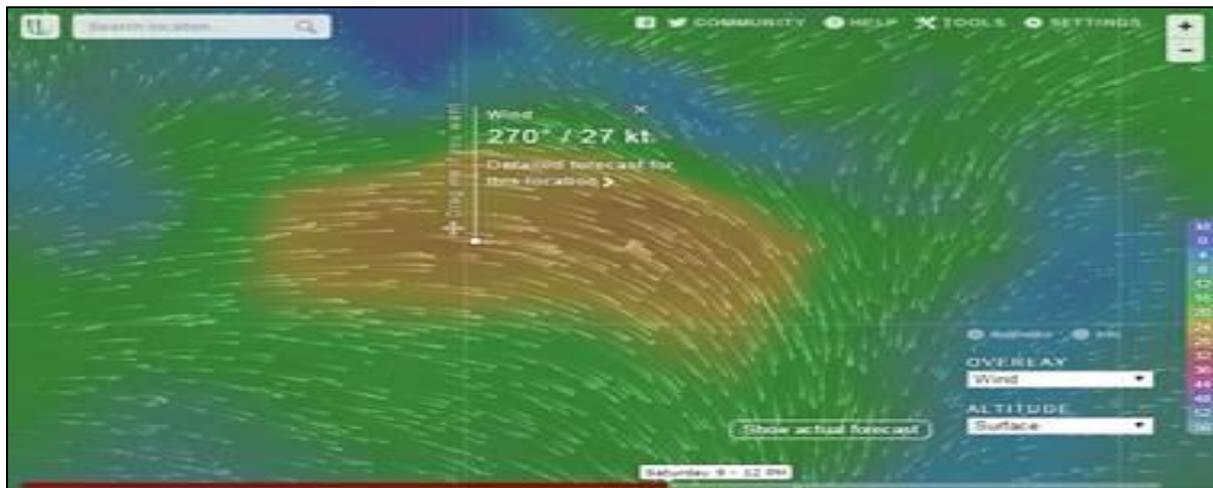


Figure 4: ECWMF significant wave height forecast showing a high confidence of waves greater than 2m

Global wind models also forecast winds of up to 27 knots in the region.



Based on the consensus of several wind and wave models, the Kiribati Meteorological Services Issued advisories on Gusty winds and Swells for the Phoenix and Line Islands from the 1<sup>st</sup> and 6<sup>th</sup> of January respectively.

### Observation

Wind observation (ASCAT composites) showed equatorial westerly wind bursts between 25-35kts west of the Line Islands.

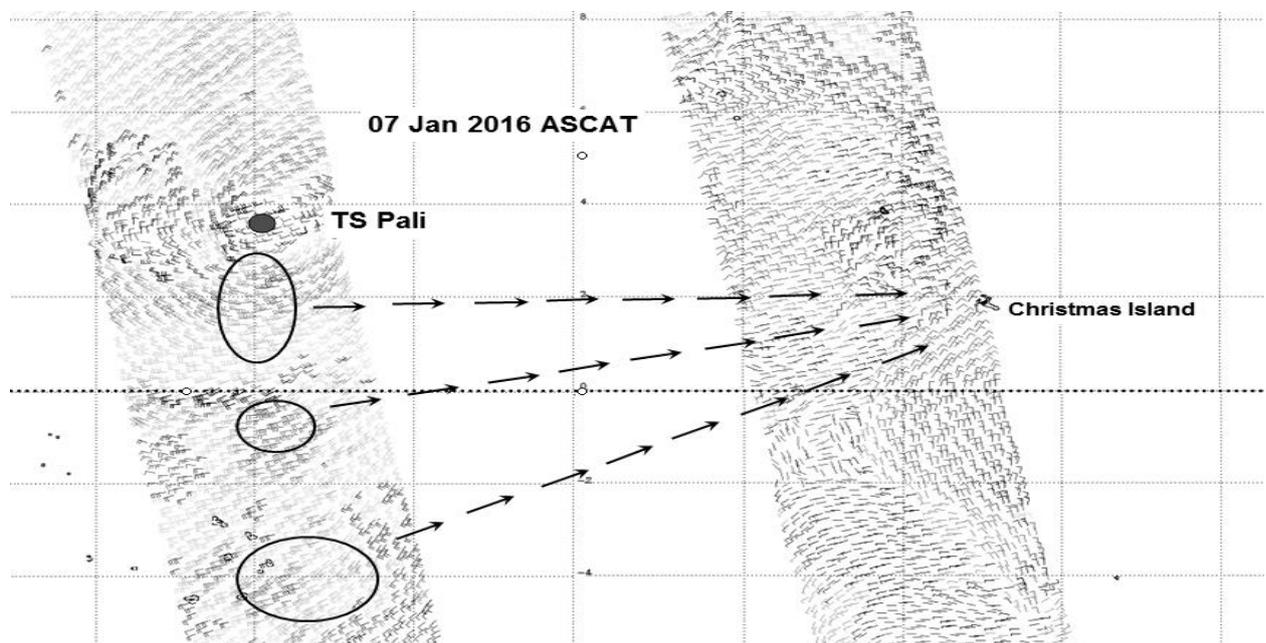


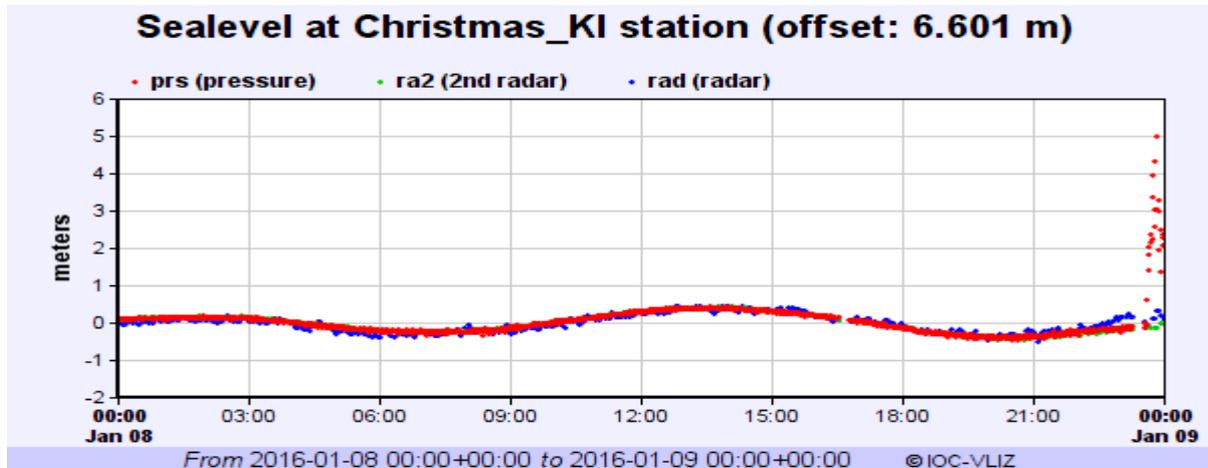
Figure 5: ASCAT pass showing strong winds west of the Line Islands.

The METAR observations from the Kiribati Meteorological Station in Christmas also showed winds gusting to 37kts.

```
METAR PLCH 092000Z 28004G37KT 9999 FEW017CB BKN040 OVC100 29/28 Q1012 RMK +SHRA=
```

Figure 6: METAR report from Christmas Island showing winds gusting to 37kts

Sea level plots/observations from the tide gauge at Christmas Island showed heights of approximately 5m above the normal tide on the 9th of January 2016 *\*(The data still need verification from University of Hawaii)\**.



### Cause of the large waves

The large waves could be accredited to several factors. Firstly, as ENSO is still in strong El Nino Phase, Sea levels are expected to be slightly higher than normal. Furthermore, the period coincides with spring tide. In addition to these factors, there were equatorial wind bursts and strong winds associated with TC Pali of speeds between 25-35kts. Winds of such speeds could create local waves of 3-4m. Finally, shoaling as waves move from deeper waters to shallower waters could also enhance the heights of the waves.

Thus, the event was a combination of the slightly higher than normal sea level (due to El Nino and Spring tide) coinciding with waves generated from the strong winds within the region, which may have possibly been enhanced through shoaling.