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Application of GNSS CORS for Disaster Management

Zulfikar Begg
Ocean Science Officer
zulfikarb@spc.int

Geoscience Energy and Maritime Division (GEMD)
Pacific Community (SPC)

References Frame in Practice Seminar
Operational Aspects of GNSS CORS
Suva-Fiji

Extreme events in the region

TC Ian-2014



TC PAM-2015



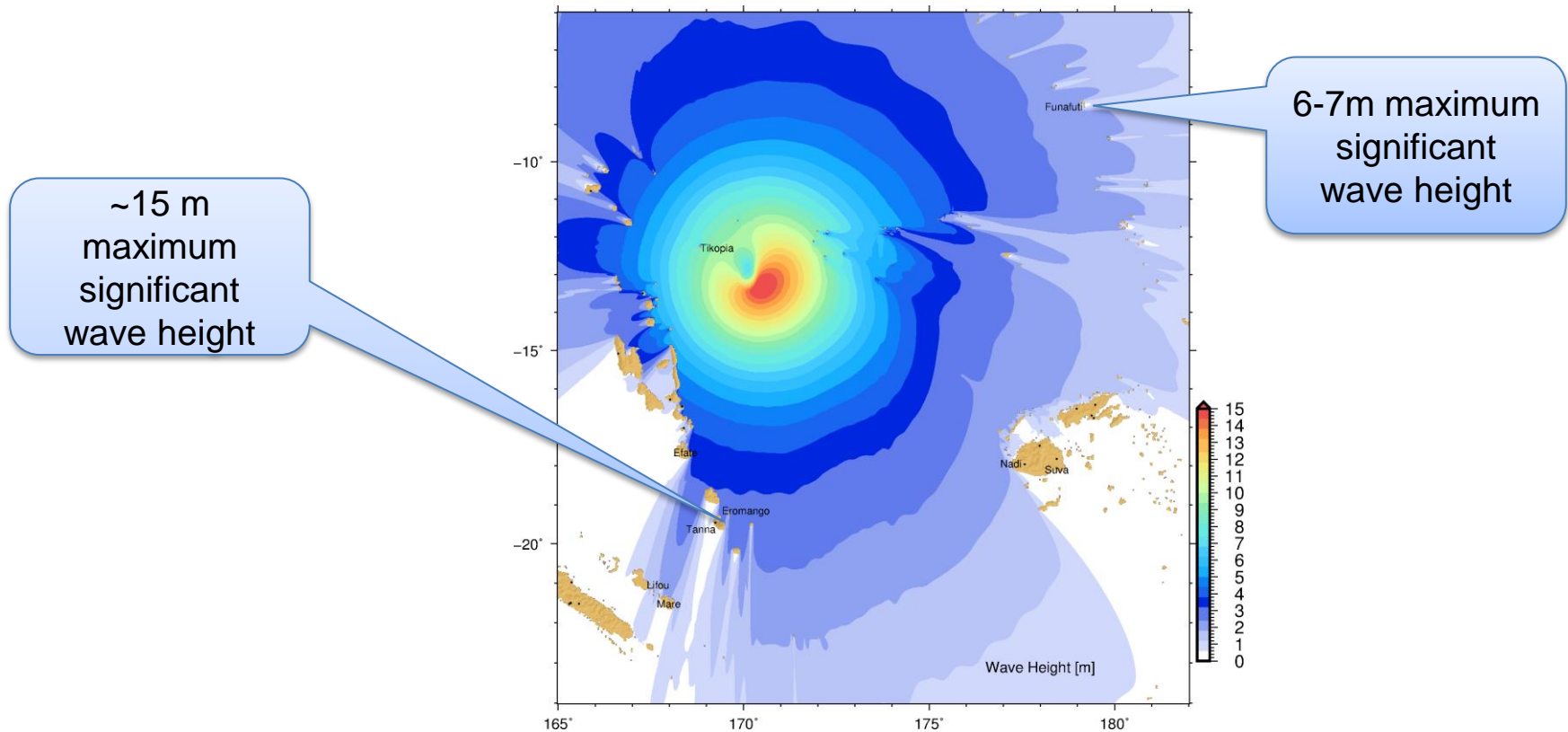
TC WINSTON-2016



TC GITA-2018



TC PAM 2015

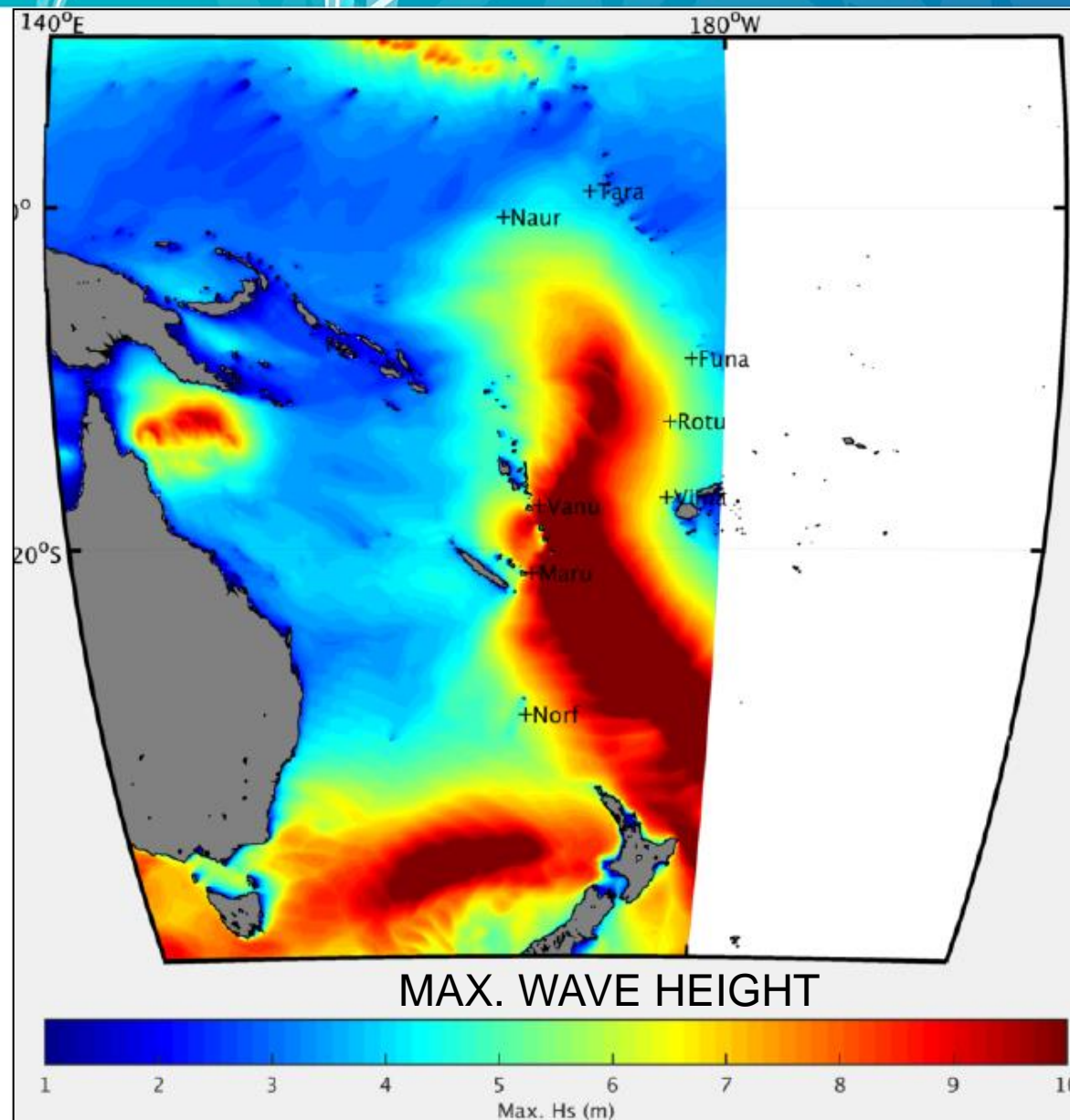


March 2015 simulated wave heights

Tropical Cyclone PAM



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Tuvalu:

- AU\$ ~14M
- 25% of TV 2013 GDP
- 41% population affected
- 90% damage on crops in 3 Islands, 30% damage on crops in 4 Islands

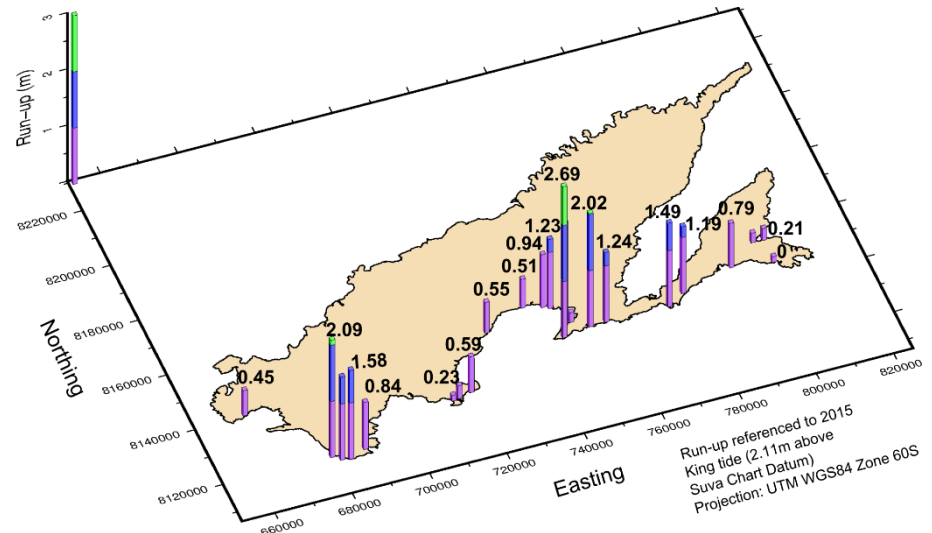
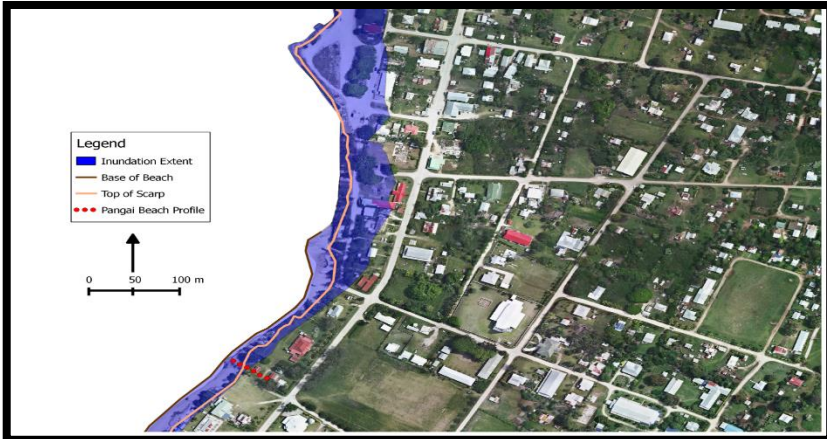
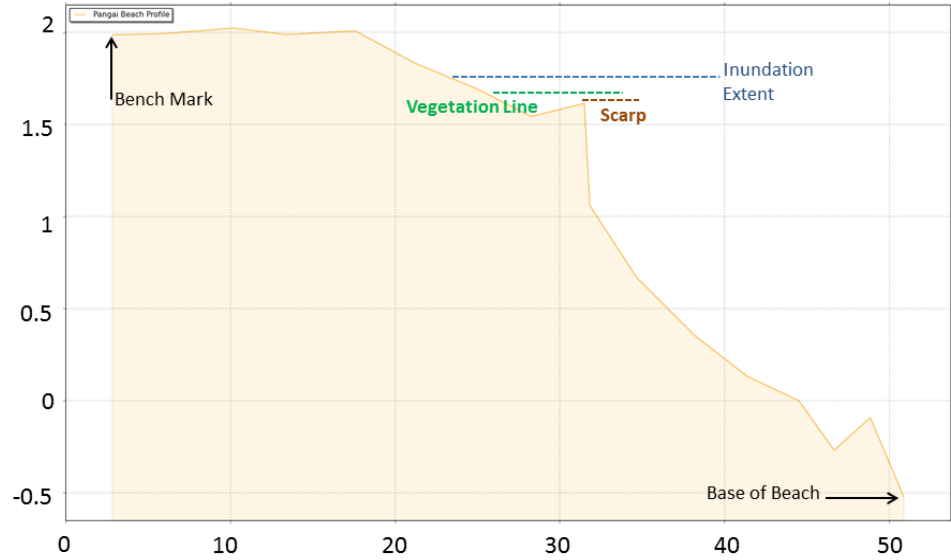
Vanuatu:

- **16** death
- **65,000** people displaced
- **>50%** population affected (166,000)
- **17,000** buildings affected
- **AU\$ ~619M** – Damage and Loss
- **64.1%** of GDP
- Livelihood of more than 80% of rural population affected.

Other country affected: New Caledonia, Solomon Island, Kiribati, New-Zealand.

Source: Ron Hoeke,
CSIRO, 2015

Post Disaster Rapid Assessments



Post Disaster Rapid Assessments



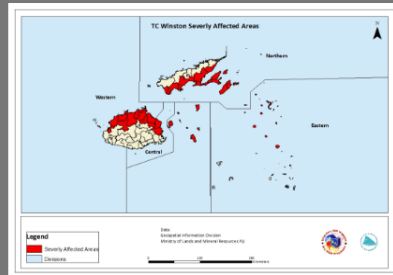


Post Disaster Rapid Assessments





Cyclone Winston Spatial Data Resources



Severely Affected Areas



We need your help!

A Tomnod Crowd Sourcing campaign has been established to identify the damage resulting from Tropical Cyclone Winston. Please identify the remote communities where help is needed using high resolution satellite imagery provided by DigitalGlobe™.

www.tomnod.com



Relief and Aid Tracker
Across Agencies



VanuaGIS Winston Emergency
Ministry of Lands, Fiji



Areas With No Post-Disaster
Imagery Yet

Damage Assessment Maps

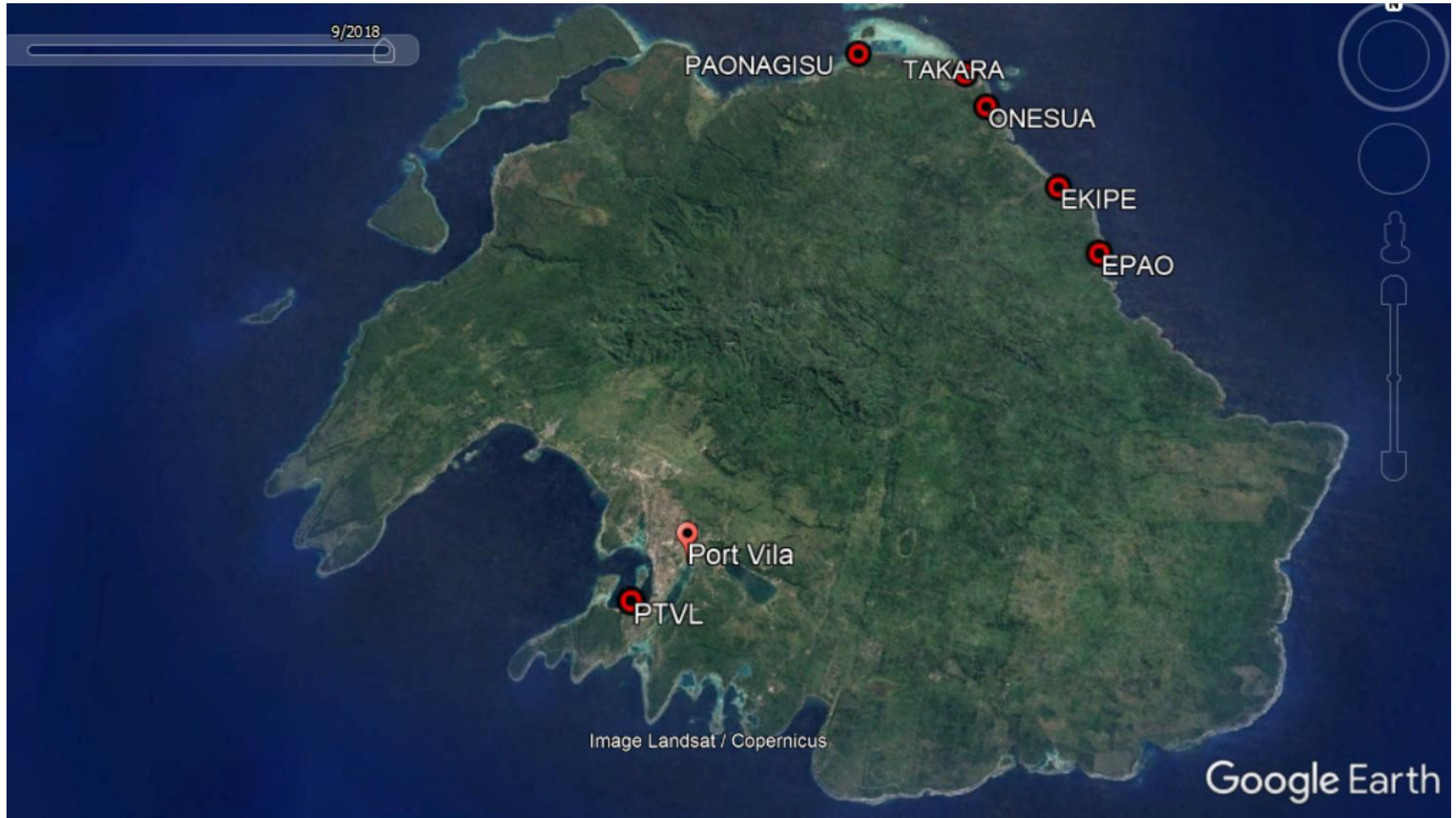
Buildings Assessed	6881	Buildings Intact	4766
Buildings Damaged	3078	Buildings Destroyed	2650
Buildings Missing	78	Areas Assessed	153

[For detailed breakdown and further information, please download this [Access Database](#)]

<http://winston.gsd.spc.int/>



Post Disaster Technical Assessments

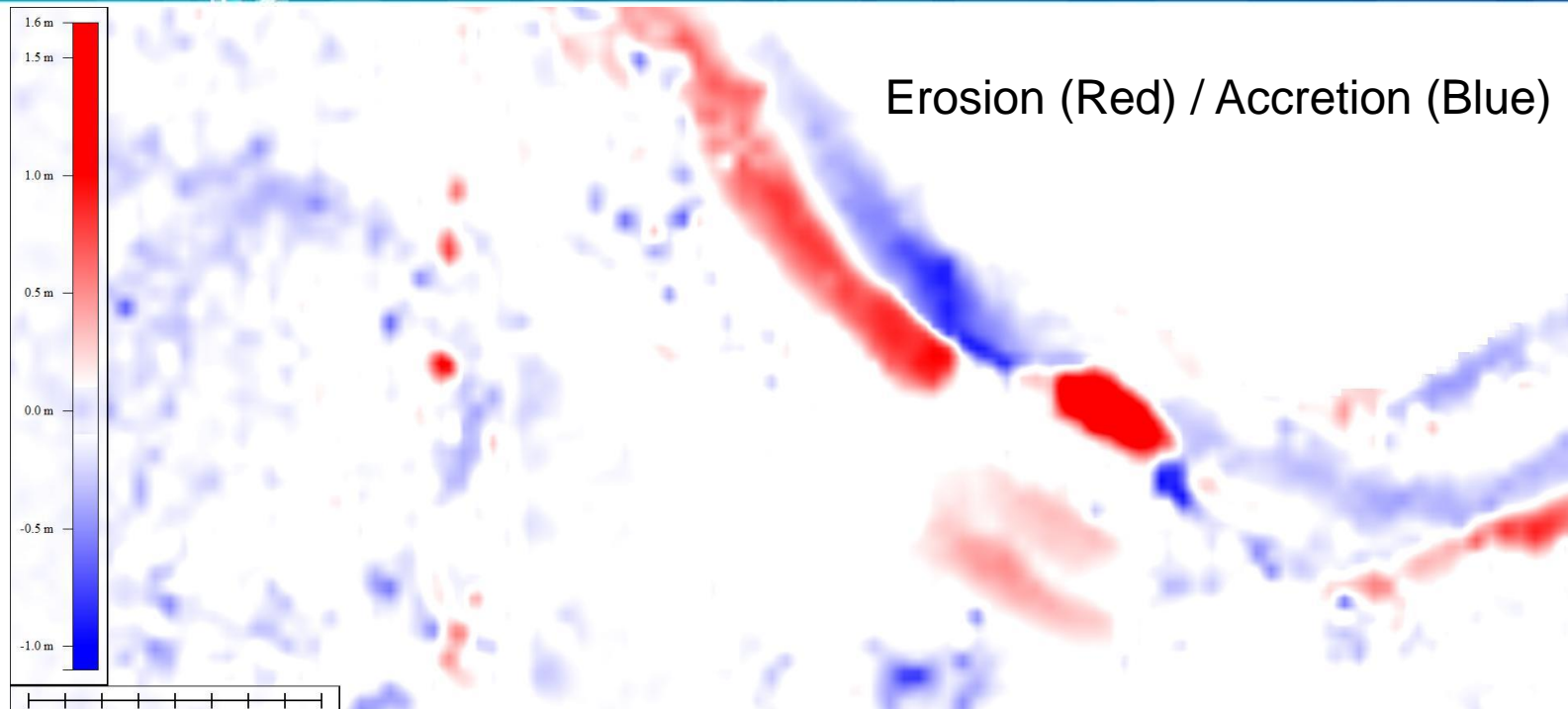




TC PAM : Before / After

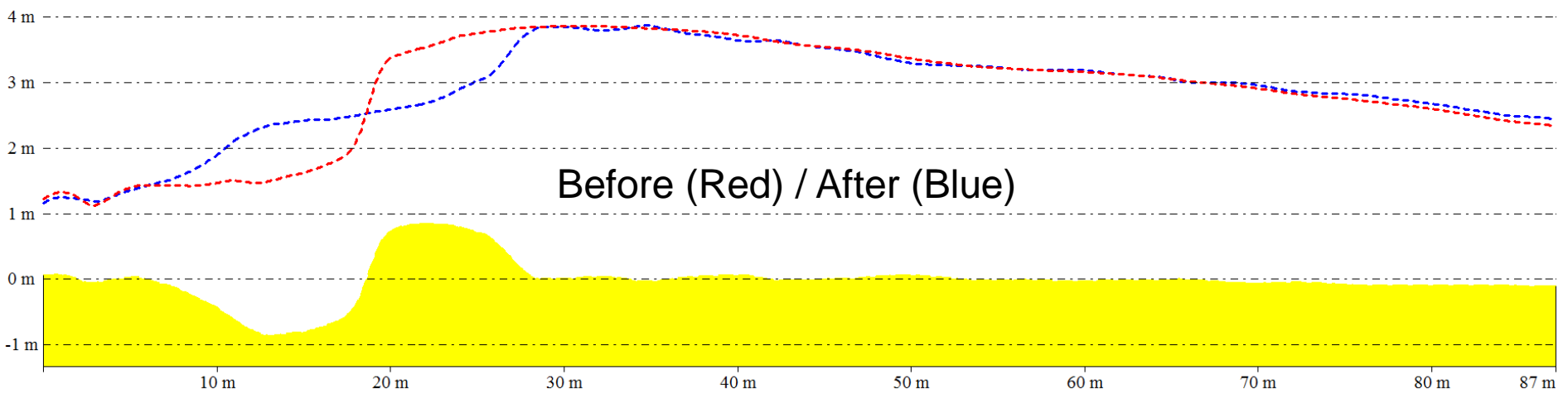
using Aerial photograph taken during LiDAR campaign (2012)





From Pos: 17° 32' 08.1867" S, 168° 26' 59.0776" E

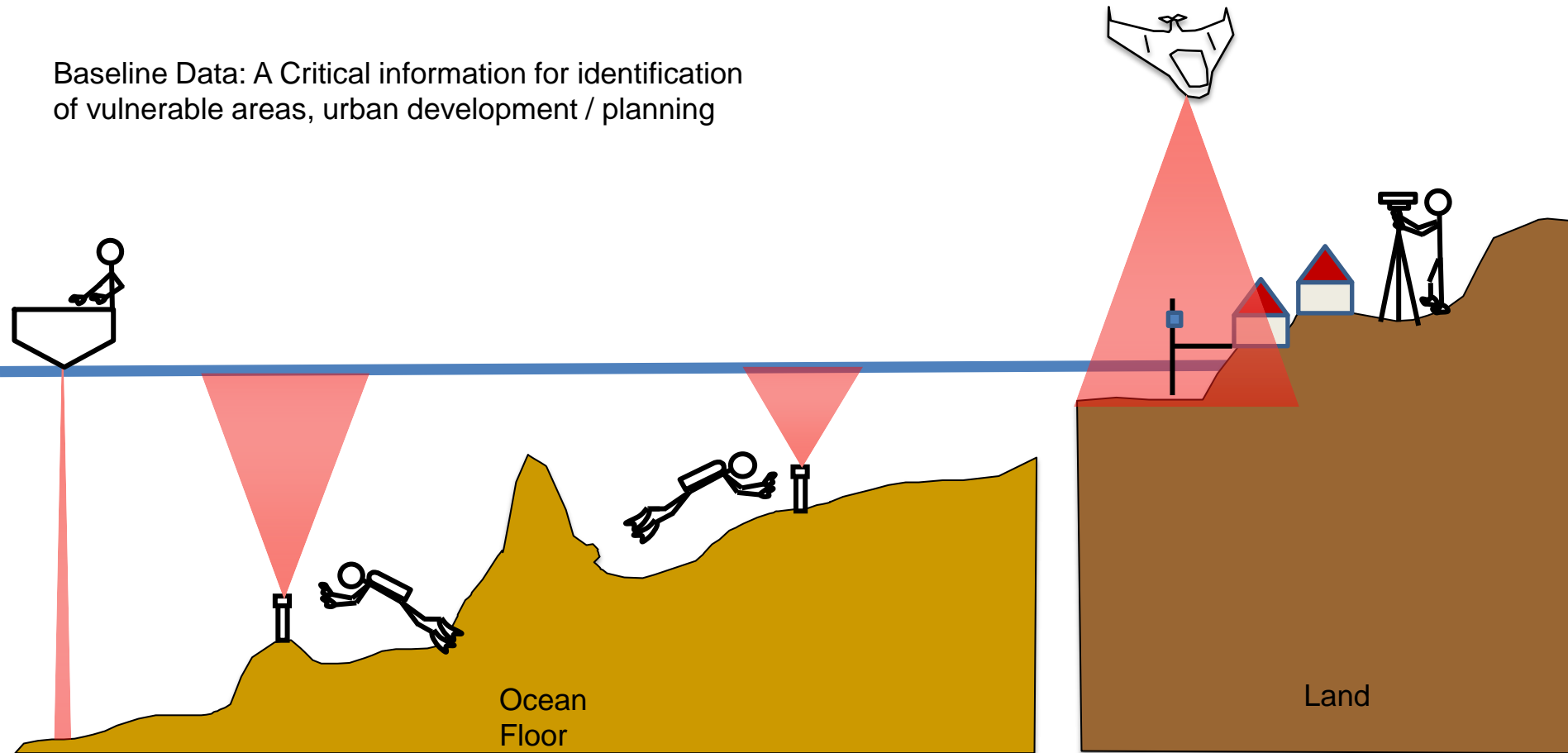
To Pos: 17° 32' 10.3167" S, 168° 26' 57.1281" E





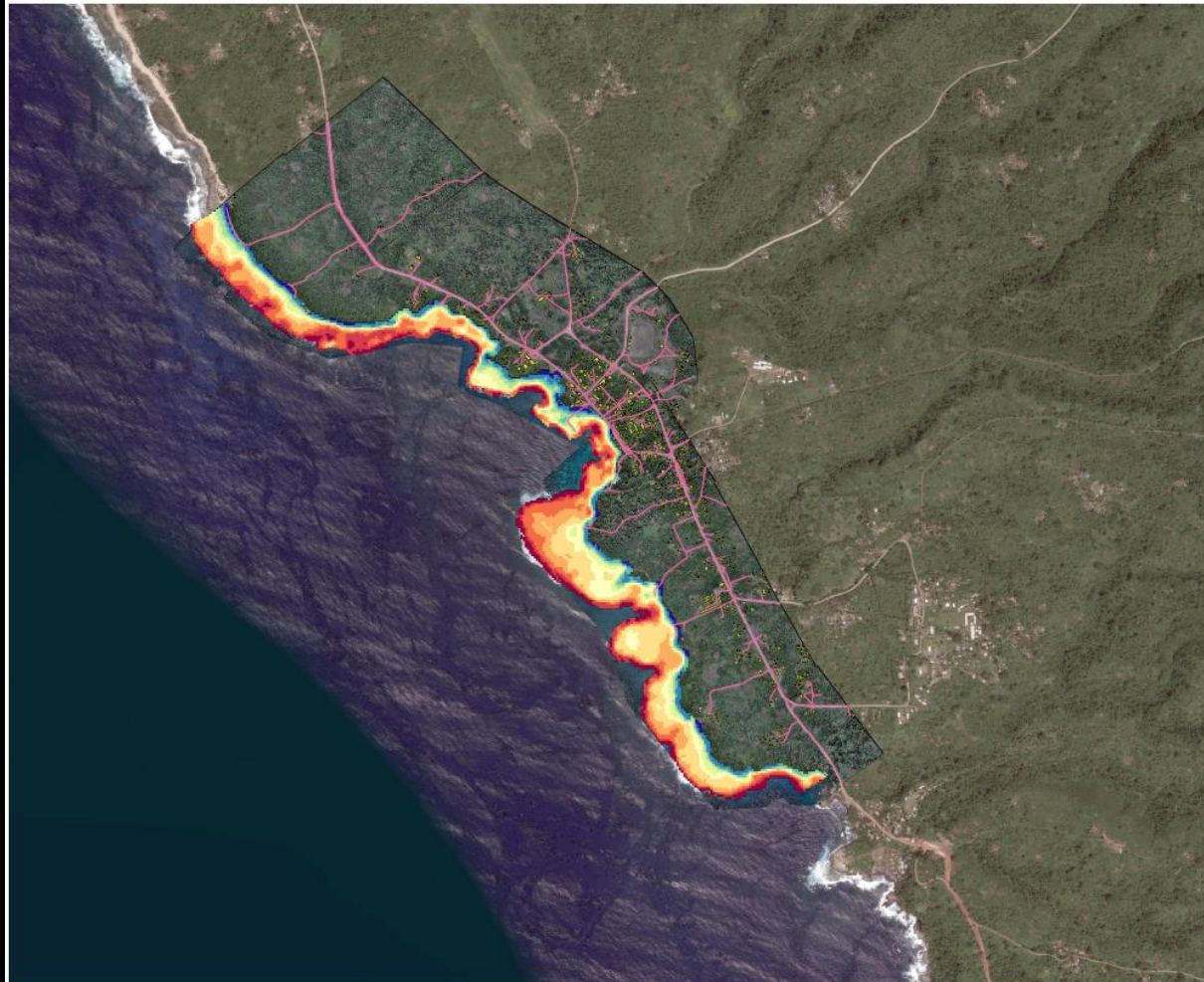
Scientific/Technical Research-Hazard Assessment, EWS etc

Baseline Data: A Critical information for identification of vulnerable areas, urban development / planning





Tropical Cyclone Inundation Map 25 year Return Period Lenakel, Tanna Island - Vanuatu



Legend

Max - Inundation depth (m)

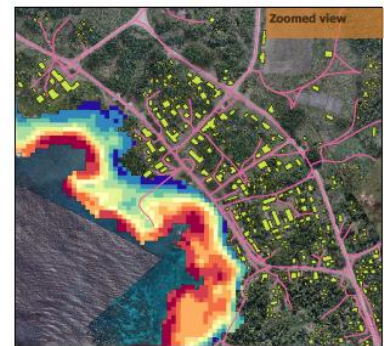
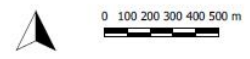
<= 0.156
0.156 - 0.541
0.541 - 0.925
0.925 - 1.31
1.31 - 1.69
1.69 - 2.08
2.08 - 2.46
2.46 - 2.85
2.85 - 3.23
3.23 - 3.62
3.62 - 4

Sea level rise scenario:
SLR: 0m (present day)

Projection:
Coordinate system: GCS WGS 1984 (zone 59 South)

Other data sources:
Orthophoto 2007
Orthophoto 2016 (from UAV survey)
Building layer & Roads digitised from UAV orthophoto acquired from the UAV survey 2016

Scale: 1:10,000 @ A2





FIJI METEOROLOGICAL SERVICES
GOVERNMENT OF REPUBLIC OF FIJI

MEDIA RELEASE No.74

4pm, Thursday 24 May 2018

DAMAGING HEAVY SWELL ALERT FOR COASTAL AREAS OF FIJI
AND
HEAVY RAIN ANTICIPATED FROM SUNDAY EVENING

A damaging heavy swell alert is now in force low lying coastal areas of Kadavu, Vanuale, Southern Lau and Mamanuca Groups, Southern and Western Viti Levu.

A low pressure system to the south of Fiji and a high pressure advancing over Tasman Sea is generating and directing moderate to heavy damaging swells towards the Group.

The swells are expected to become damaging from Saturday as they travel northwards from the Tasman Sea towards the Group. The peak waves of about 3.5 to 4.5 meters are expected over open waters. There is very high chance that the waves riding on top the high tide can over wash into the vegetation line, causing inundation on coastal low-lying areas of Kadavu, Vanuale, Southern Lau and Mamanuca Groups, Southern and Western Viti Levu. The damaging heavy swells will gradually start easing from Monday night.

Wave conditions can be risky for mariners such as fishing and sea transportation on coastal reefs especially those operating smaller vessels should avoid navigating in these conditions. Similarly for those using Queens Road along Coral Coast should remain alert for occasional over wash of roads during high tides this weekend.

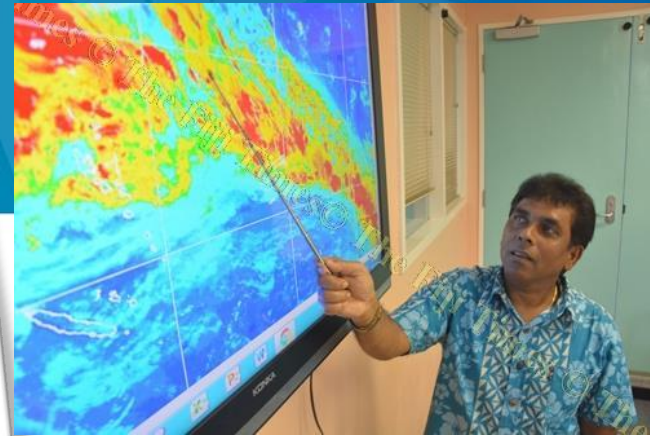
All communities living near the coasts and other sea users, particularly in Kadavu, Vanuale, Southern Lau and Mamanuca Groups, Southern and Western Viti Levu are advised to be vigilant and to exercise extreme caution for occasional sea flooding especially Sunday evening and Monday morning during high tides.

Meanwhile, a trough of low pressure with an associated low is expected to affect the country from Sunday evening. This system is anticipated to bring periods of rain, heavy at times and squally thunderstorms over most places from Sunday night till Monday. Strong and gusty winds can be expected. Persistent localised heavy rain may cause flash flooding of low lying areas. Therefore, communities living in low lying and flood prone areas are advised to remain alert and take appropriate precaution if and when necessary.

The current situation will be closely monitored and any alert and warning will be issued as and when appropriate. All communities are advised to remain updated with the latest weather information and take alerts and warnings seriously.

For more details and the latest on weather, please contact the National Weather Forecasting Centre on 6736006, 9905376 or visit the Fiji Meteorological Service's website, www.met.gov.fj.

ENDS.



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User-focused communication, 24 May: Impact-based forecasting, that includes hazard and vulnerability information

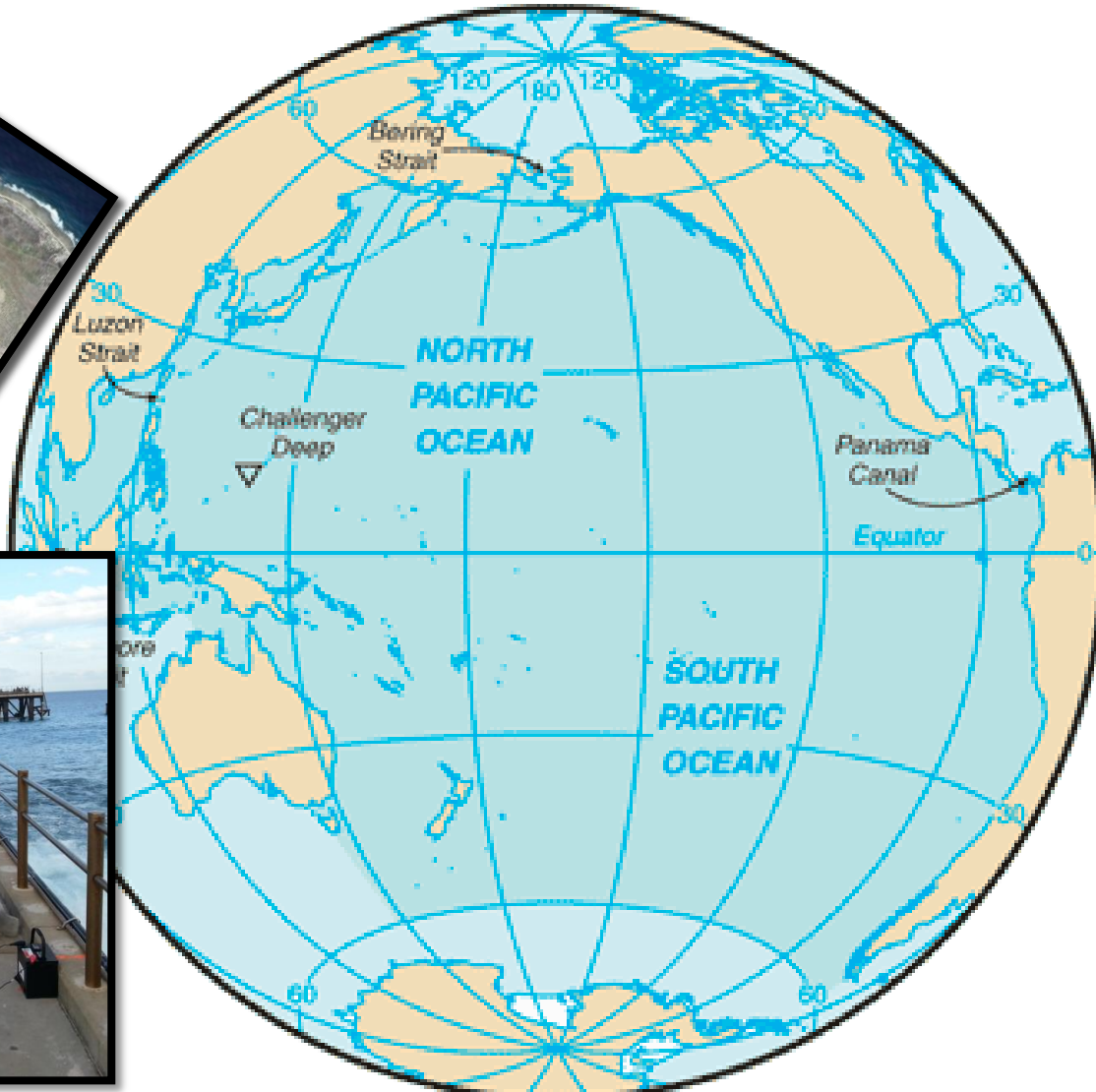
*"There is very high chance that the waves riding on top the high tide can **over wash into the vegetation line**, causing **inundation on coastal low-lying areas**"*

*"Similarly for those using Queens Road along Coral Coast should remain alert for **occasional over wash of roads during high tides this weekend.**"*

El Nino Impact-Kiritimati

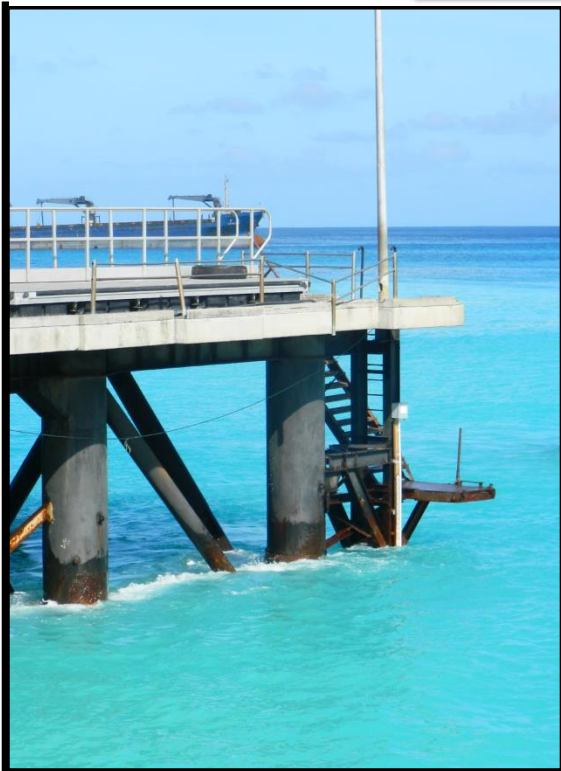


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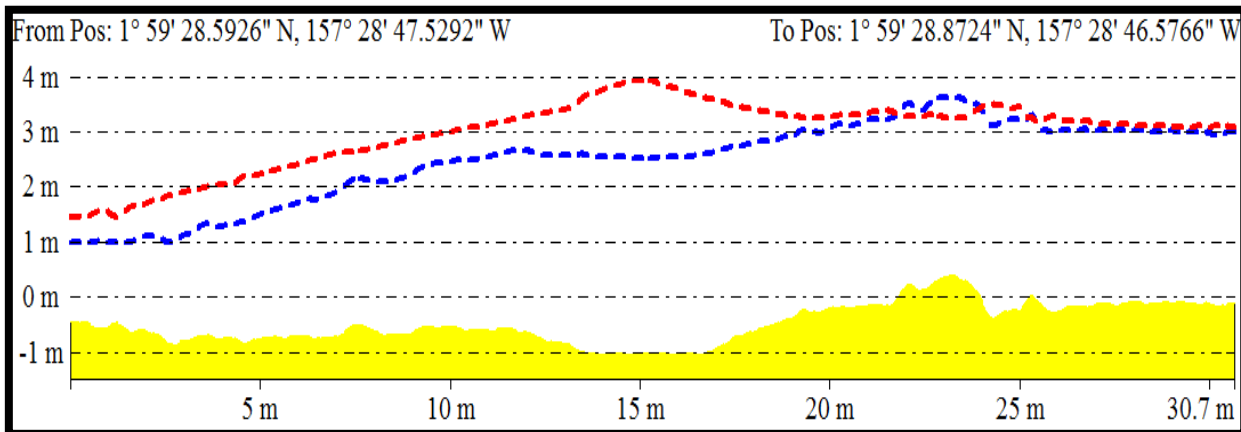
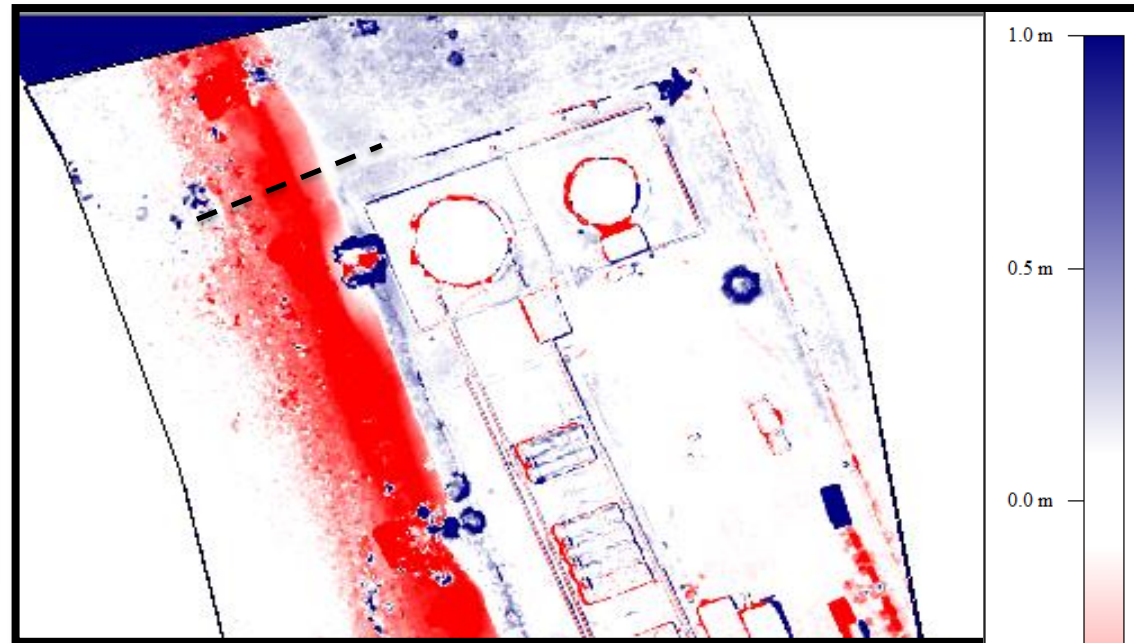
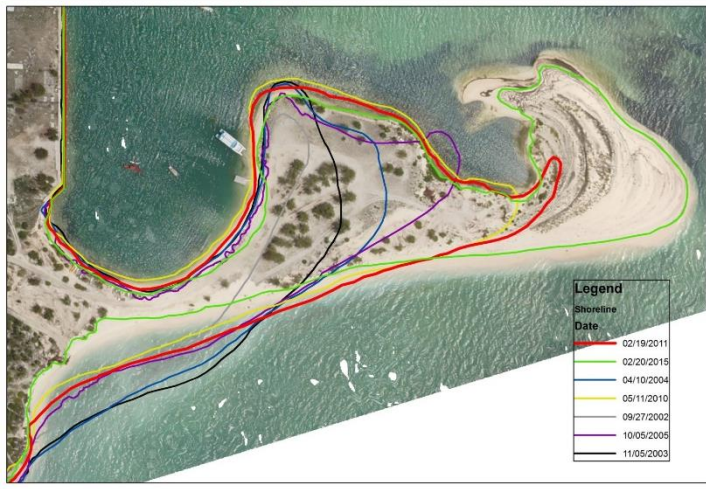
Baseline data collection

Geodetic data



Water
Level

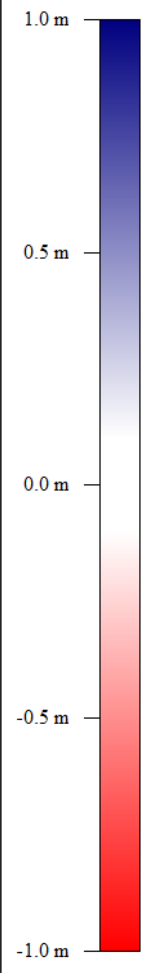
Coastal Impact driven by 2016 El Niño at Koil, Kiritimati





ACCRETION

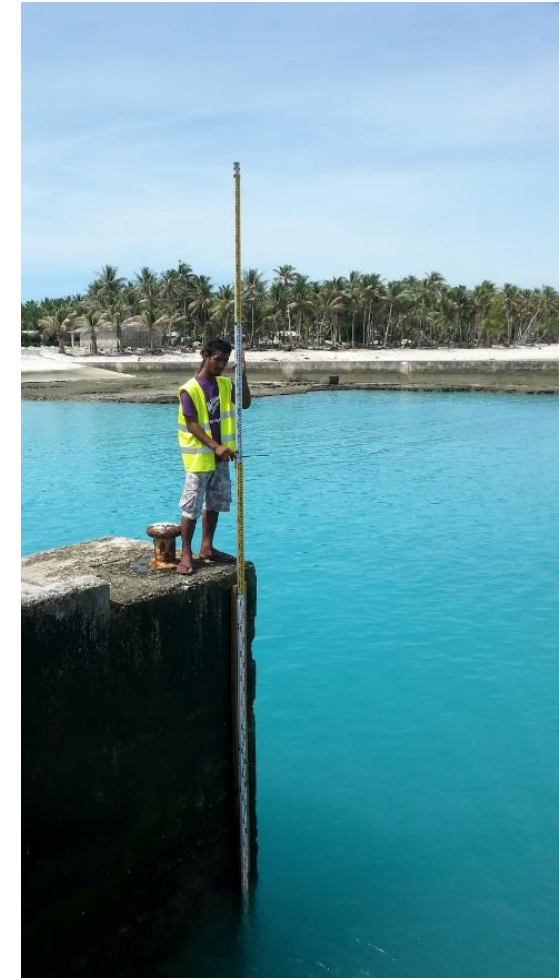


EROSION



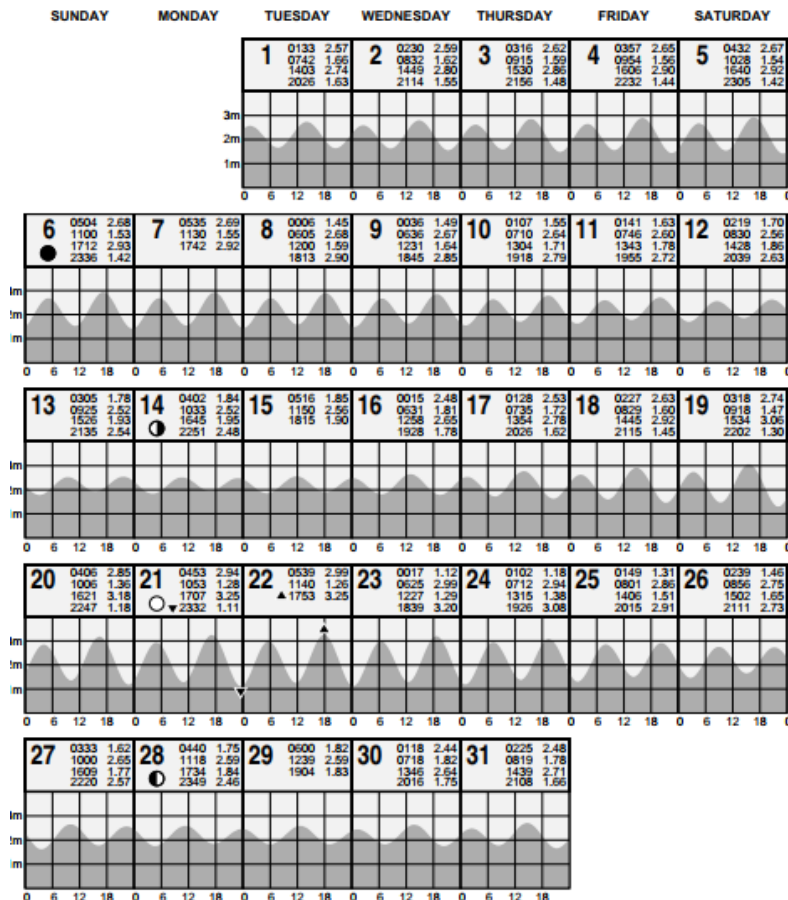
2015 Beach Profile 
2016 Beach Profile 

Investigation of Groundwater Resource: Vaitupu-Tuvalu



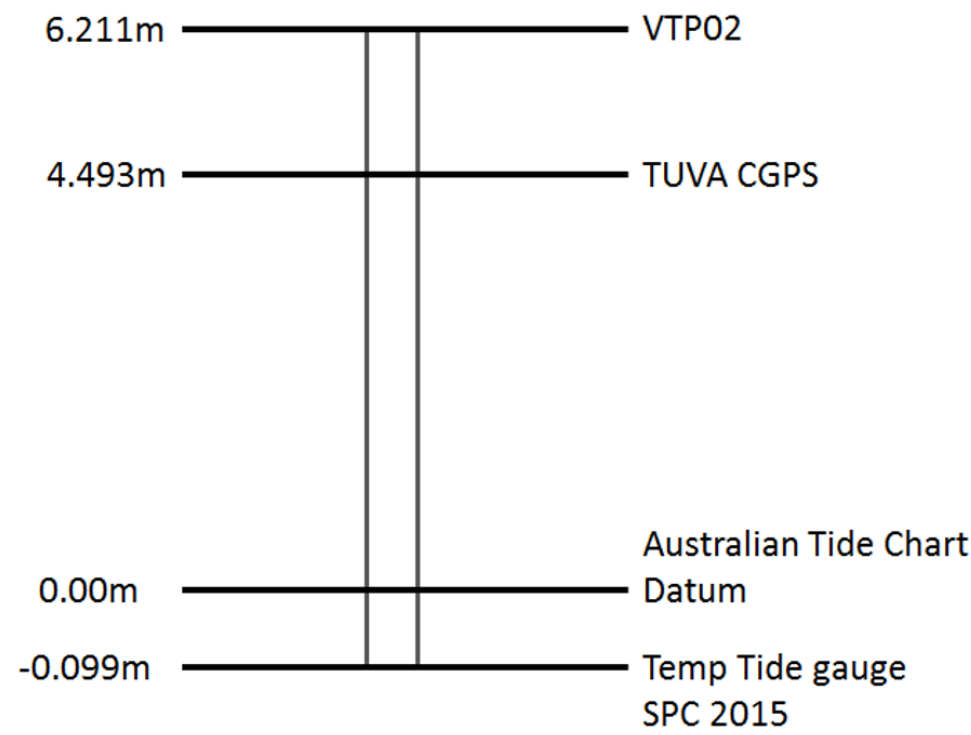
TIDAL PREDICTIONS FOR TUVALU - VAITUPU

JANUARY 2019 Local Standard Time



- ▲ Highest tide of the month
- ▼ Lowest tide of the month
- New moon
- ◐ First quarter
- ◑ Full moon
- ◒ Last quarter

© Copyright: Commonwealth of Australia 2016, Bureau of Meteorology
Disclaimer: These tide predictions are prepared in good faith believed to be correct. They are not necessarily a local hydrographic chart datum. No warranty is given in respect to errors, omissions or suitability for any purpose.



Prediction datum is 4.493 metres below TUVA CGPS

Prediction datum is 4.493 metres below TUVA CGPS



There are more than **1500 Islands** in our Pacific island countries.

1



The average island is **90 km² in size** and you could walk around it in one day.

2



50% of the population in the Pacific live within 5 km of the coast.

3



50% of all islands are highly or very highly sensitive to future climate-ocean processes and sea-level rise.

4



Coastal change has the potential to severely impact island populations and economies.

5



Vinaka/Thank you

zulfikarb@spc.int