Distant-source swell events cause coastal inundation on Fiji's Coral Coast

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12 million people

28 million square kilometres

20% of the world's EEZs

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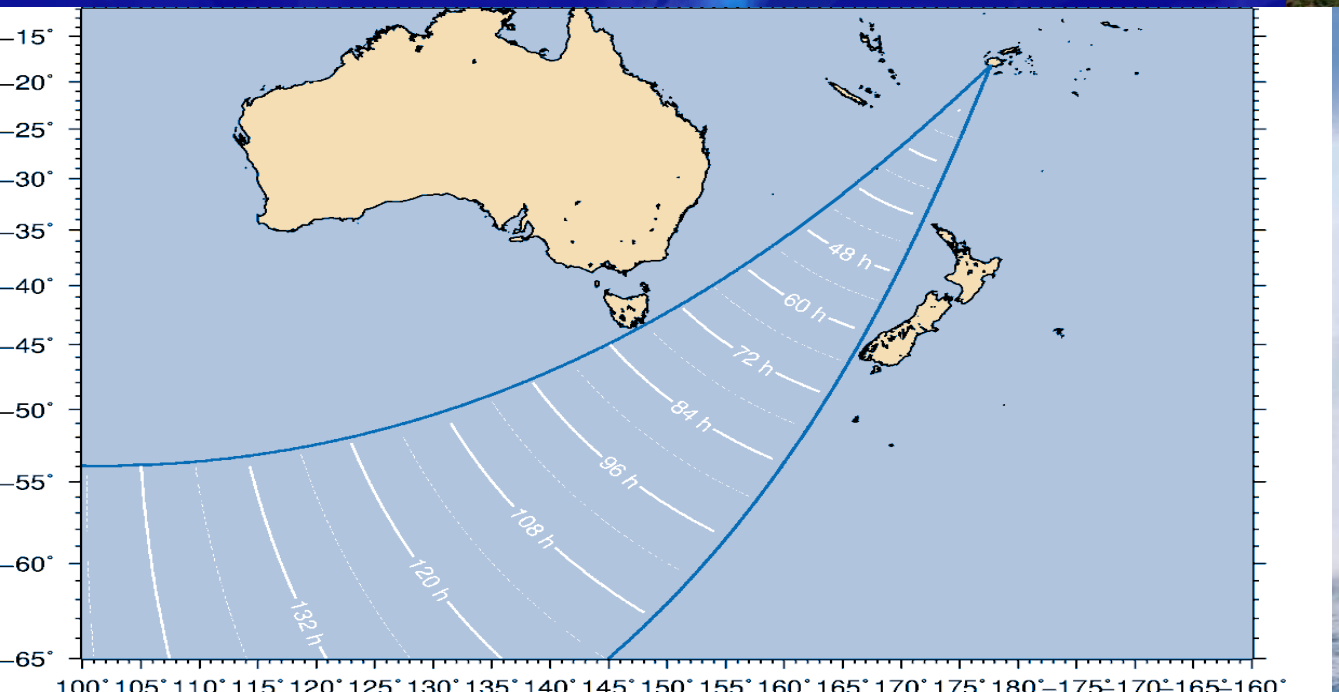
Coral Coast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Coast swamped

Sandy highway ... the waves reach the Queen's Highway as Ratu Ne makes his way to Vatukarasa Village yesterday.

Picture: ATU RASEA

TIDAL SURGE Giant waves flood hotel rooms

By FELIX CHAUDHARY

ONE school was closed and a village dwelling was damaged as tidal surges entered hotel rooms along the Coral Coast yesterday.

Nadiri Bay Khalsa School was closed yesterday after tidal swells uprooted trees and washed away fences while residents living in a house perched by the sea in Votualailai Village scrambled to safety after it was flooded with seawater, causing some damage to the dwelling.

"Early this morning from 5am to 8am, a series of waves washed through the school compound. A few coconut trees on the beach were uprooted and food crops in our school gardens were completely destroyed.

"As a result we instructed children that were arriving to school to return to their homes as a safety precaution," said Nadiri Bay Khalsa School headteacher Bir Chand.

At nearby Yadua Village, the tidal surge destroyed temporary shelters used as cooking houses as water raced 10m into the village.

Korolevu police reported that apart from the house flooding in Votualailai Village, there were no other significant events that occurred as a result of the tidal swells.

People living along the Coral Coast should expect more big swells over the next few days.

According to Coral Coast weatherman, Robert Kennedy, the tidal surges are brought about by a high pressure system in the South.

"In Fijian the word for what is happening is ua loka. This is a common occurrence during this time of the year," he said.

Mr Kennedy, owner and operator of Sandy Point Beach Cottages, said in the past the tidal surges broke seawalls and washed debris over the road.

"We have had bigger swells in the past," Mr Kennedy said.

The duty weatherman at the Meteorology Department in Namaka confirmed the swells were generated by a high pressure system to the South, intensified by high tides.

"We have issued a warning to people living along the coastal areas in Southern Viti Levu, Kadavu passage and Southern Lau Group."

At press time last night before high tide at 9pm, coastal villagers stood ready to move to higher ground if the waves intensified in size.

More on PAGES 2-3

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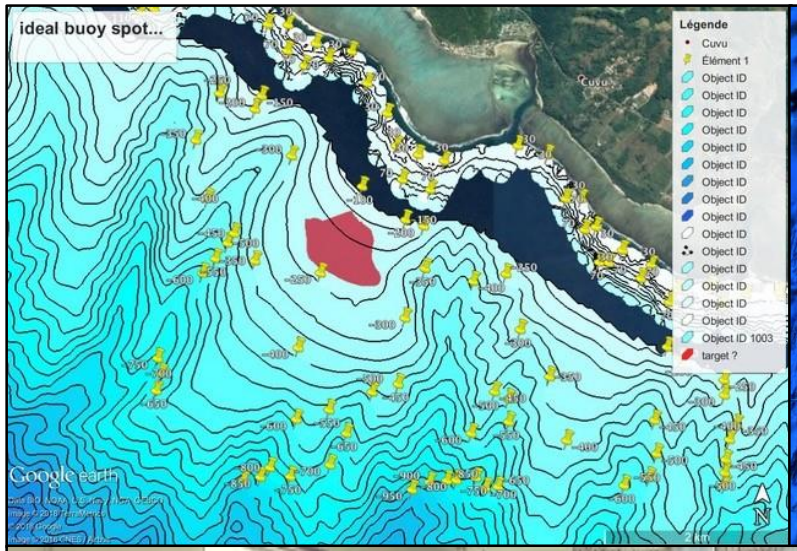
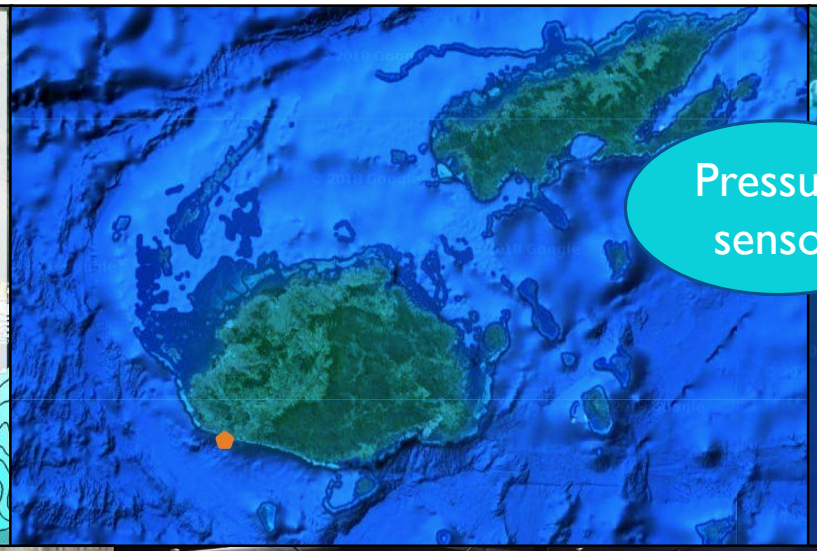
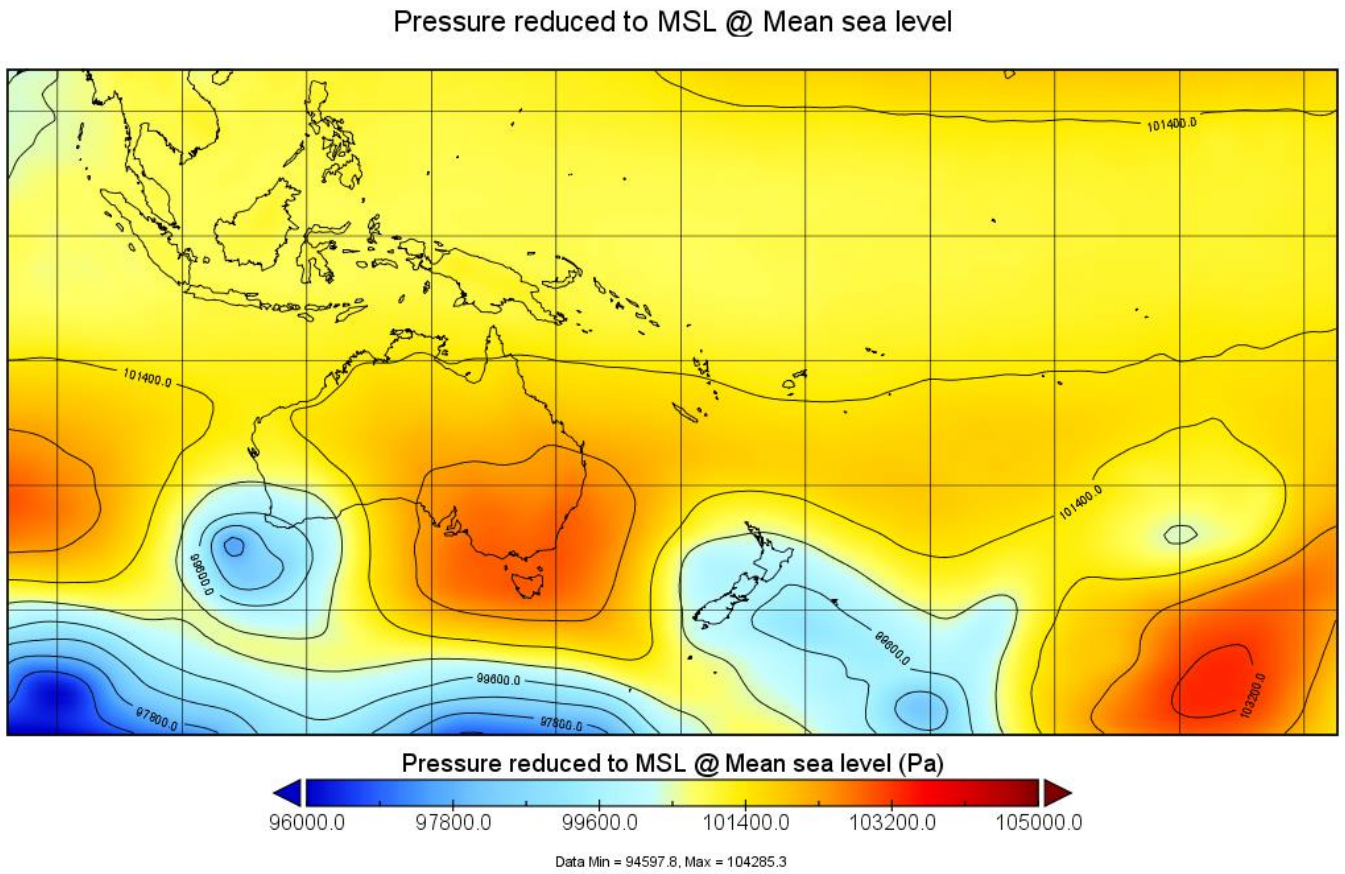
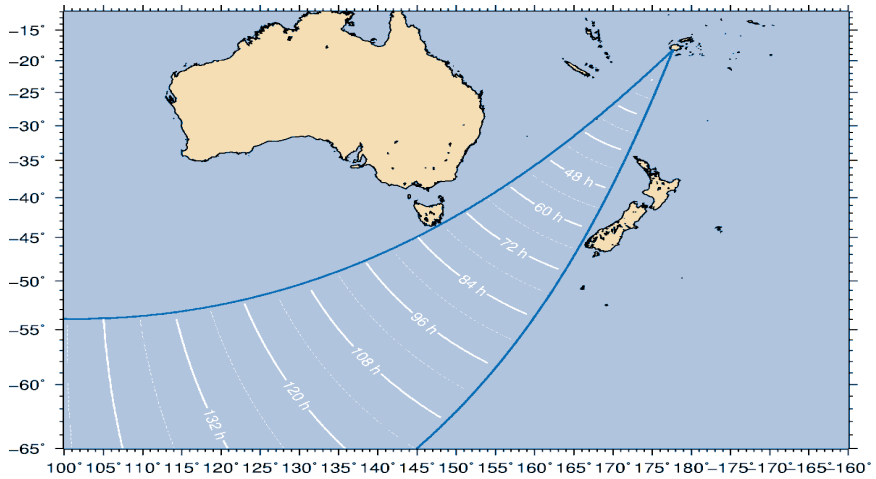
Swell inundation forecast system: observation and monitoring





Wave driven inundation - Fiji





21 May – 25 May 2018

Big wave event: 25th – 28th May 2018

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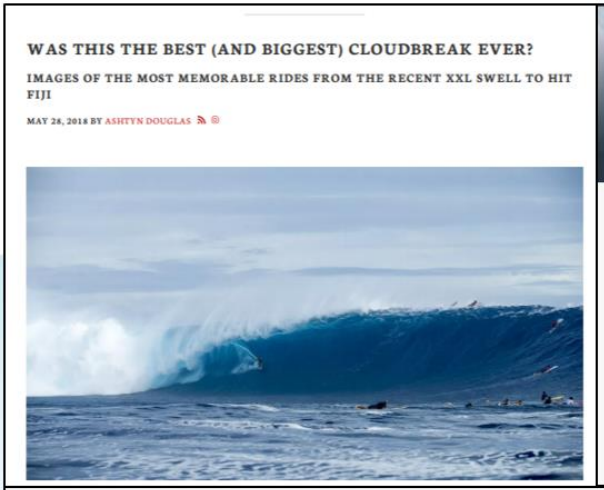

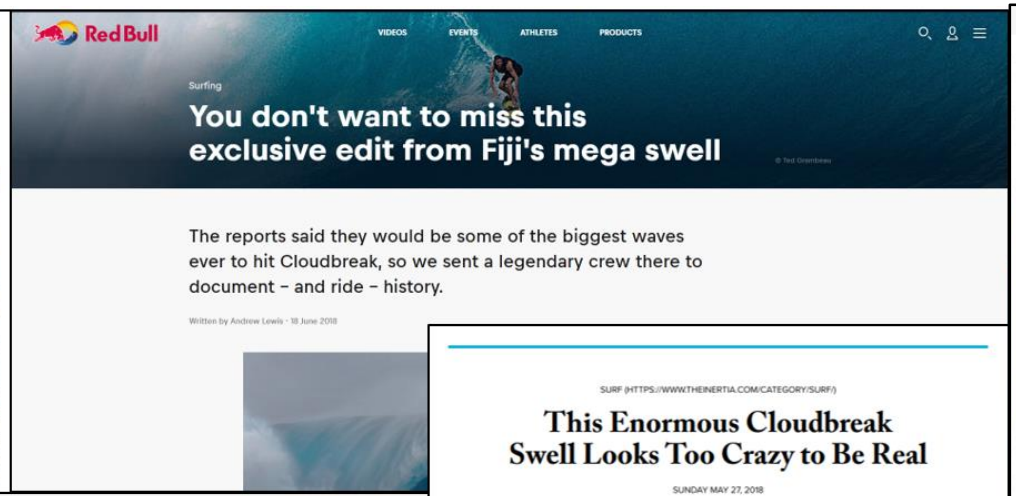

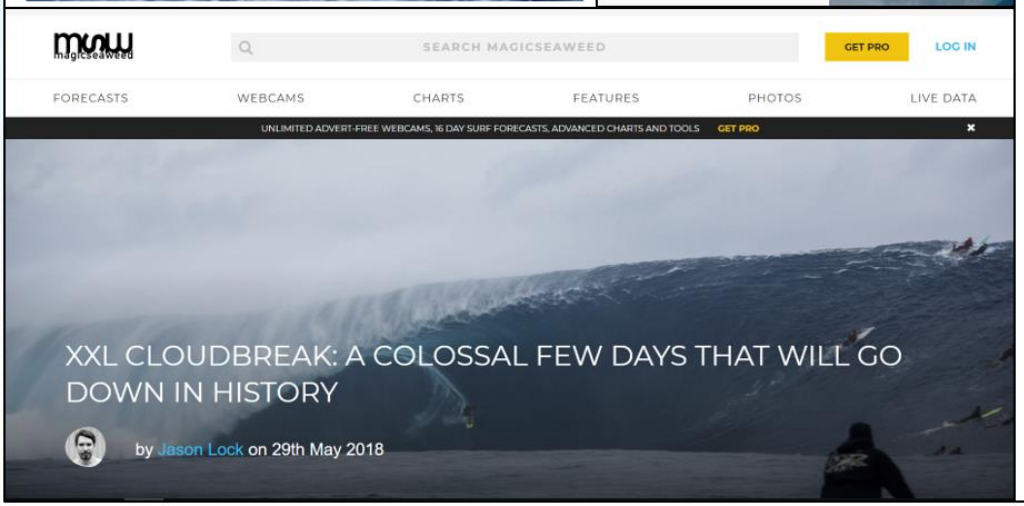

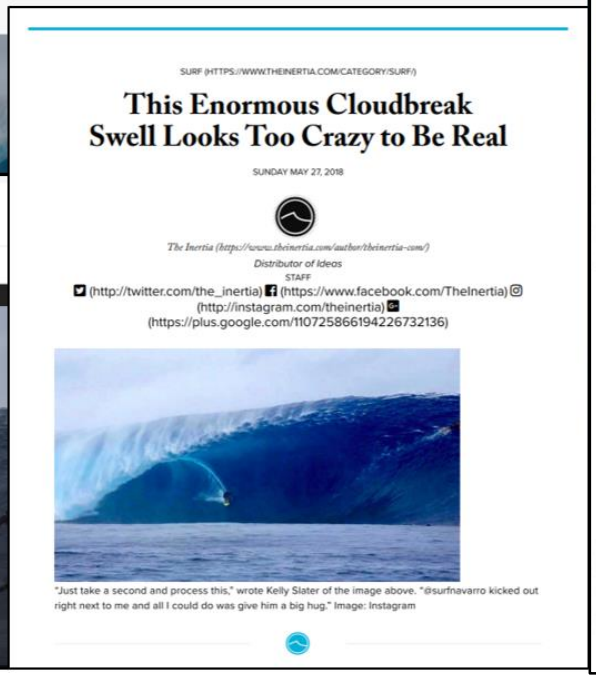

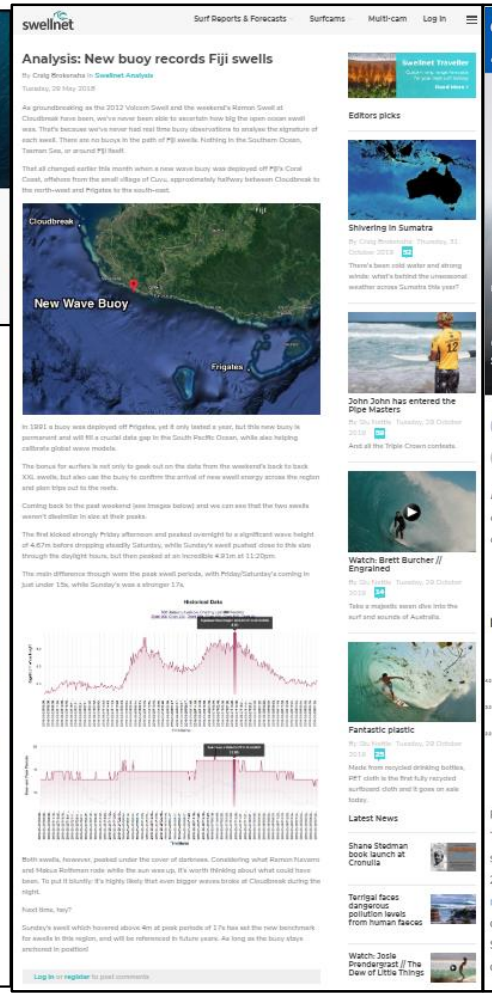

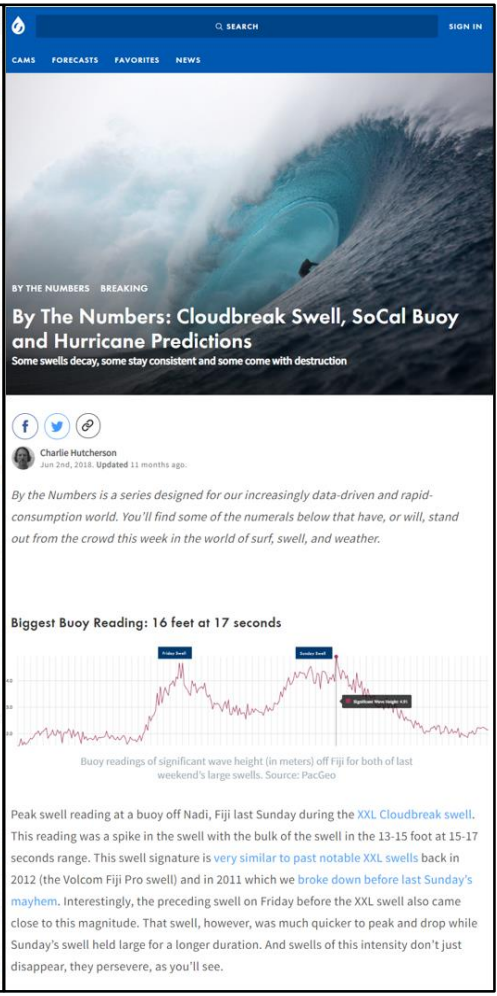

Inundation event: 25th – 28th May 2018

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Maui Bay – Infragravity Wave overtopping the elevated beach berm on 27th of May



Vatukarasa – Inundation of Queen's Road from infragravity wave on the 27th of May



Inundation event: 25th – 28th May 2018

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Tabuya villagers vacate village after two tidal waves

TIMOCI VULA | 28 May, 2018, 4:00 pm

The village of Tabuya in Nabukelevu after yesterday's tidal wave experience. Picture: SUPPLIED/Pelesio Robanakadavu

TWO separate incidences of tidal waves were experienced by villagers of Tabuya, Nabukelevu in Kadavu yesterday, forcing villagers to flee their homes.

The first tidal wave hit between 4am and 5am, and a stronger one occurred at around 5pm, which village headman Ipileli Cokanasiga said was around a metre high.

Speaking from his island home yesterday, Mr Cokanasiga told Fiji Times Online that after the first tidal wave hit, all men in the village were mobilised to assist in taking all women and children to safety.

He said there were three homes located on the opposite side of a river that ran in between the village and the settlement called Nabale.

Mr Cokanasiga said the tidal wave that occurred in the evening gushed through the whole village, and also flooded three homes.

Today, all villagers remain at Nabale following advice from Police until it was safe.

More in tomorrow's edition of The Fiji Times and in our E-Edition.

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Sea Flooding Causes Kadavu Families To Evacuate. Low Pressure, High Pressure System Brings Big Waves, Heavy Rain

Children seen jumping into the Qaula River and swimming across as the river currents and water level rise on May 27 2018. Photo: Ashna Kumar

May 28 09:24 2018

by Maika Bolatiki, SUVA
0 Comments

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Tabuya villagers in Kadavu have moved to higher grounds after big swells hit the village at around 5am yesterday.

Village spokesperson Epeli Cokanasiga said three houses were swamped by floodwaters but the occupants were safe.

Mr Cokanasiga said they were closely monitoring the weather reports.

The Fiji Meteorological Services report on May 26, 2017 for the forecast to midnight tonight for the Fiji group explained the situation in Kadavu.

The report said that a high pressure system together with a low pressure system to the far southwest of Fiji would generate and direct moderate to heavy southerly swells towards the group.

It said that for low lying coastal areas of Kadavu, Beqa, Vatulele, Southern Lau Group, Mamanuca Group, Southern and Western Viti Levu sea flooding was likely to occur especially during high tides.

In Qaula Settlement, Lami, just outside Suva, villagers faced flash flooding right up to the bridge.

The *Fiji Sun* visited the area yesterday noting that children were swimming and were at risk.

During a press conference in Nadi yesterday Fiji Meteorological Services director, Ravind Kumar advised the public to take precautions.

He said the trough of low pressure was expected to bring flash floods in low lying areas causing roads to go underwater, tidal (swells) waves in low lying maritime areas and thunderstorms.

The low pressure at the time this story went to press lay just West of Fiji but was moving towards the group.

"It is expected to bring heavy rain, squally thunderstorms with strong and gusty winds over the country from tonight (last night) and continue until tomorrow (today)," Mr Kumar said.

Mr Kumar said there was a high chance of flash flooding where the occurrence of persistent localised heavy falls was expected.

"The risk of flash flooding is elevated during the high tide, coinciding with damaging heavy swells that is predicted," he said.

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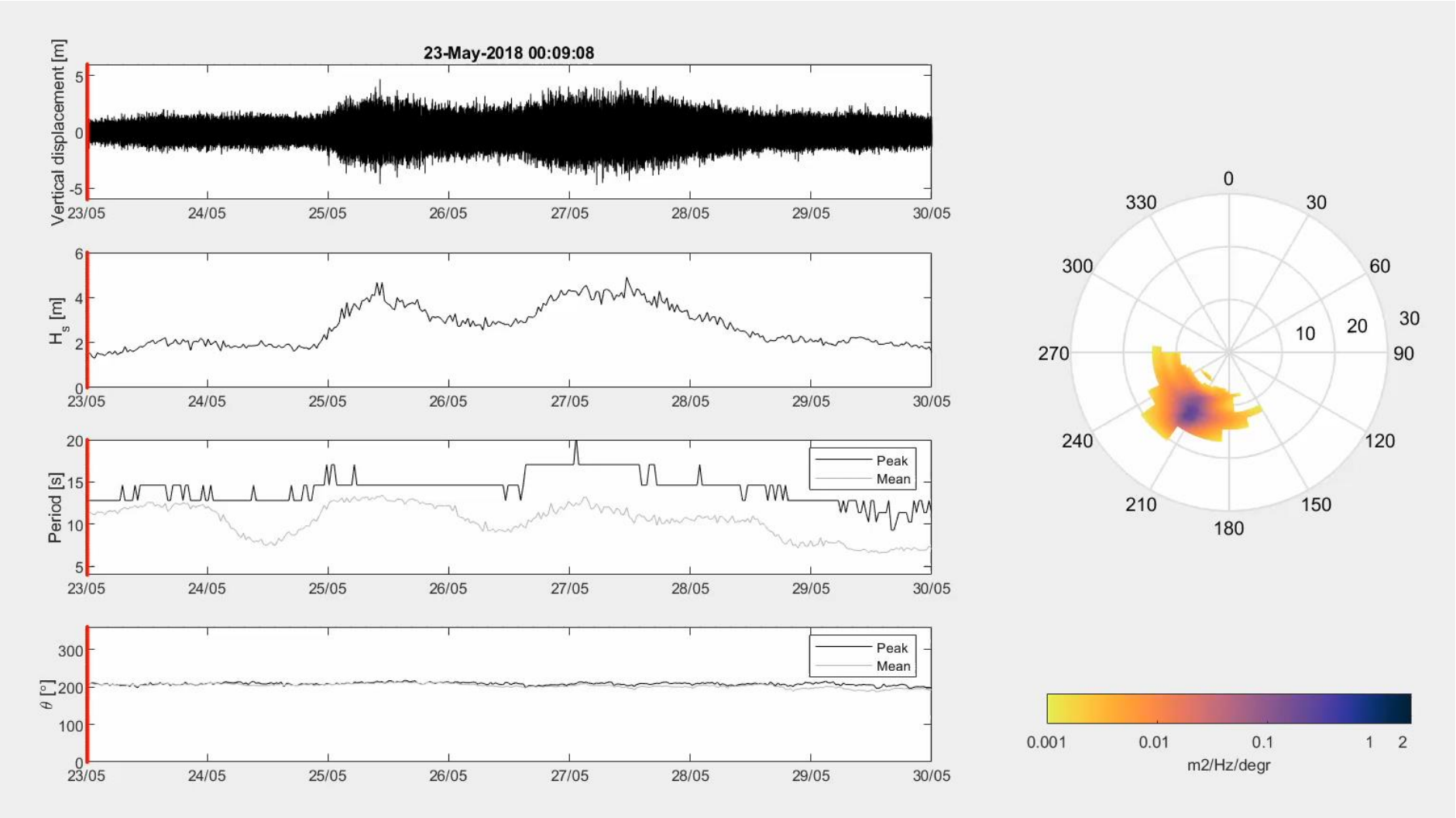
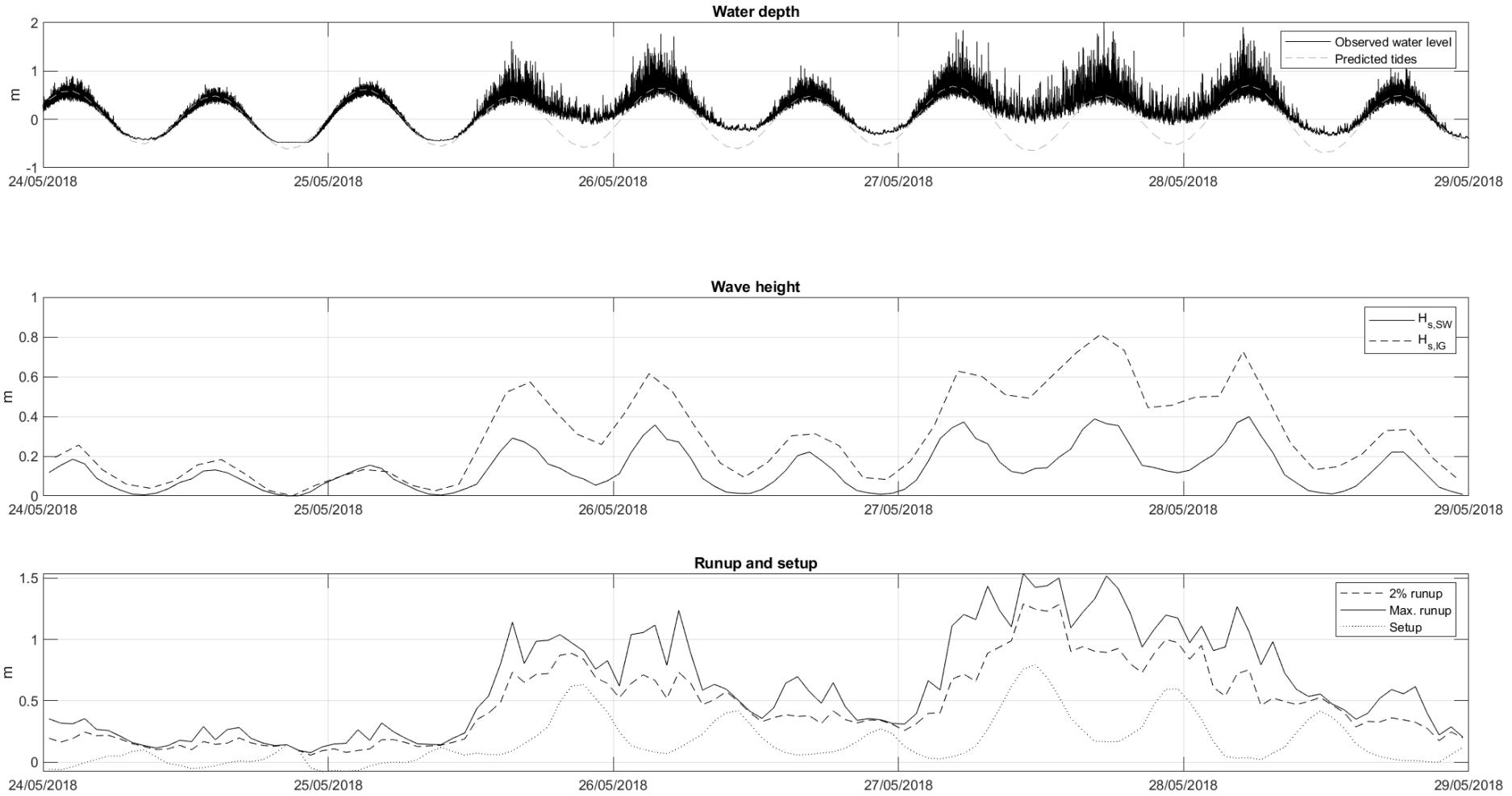
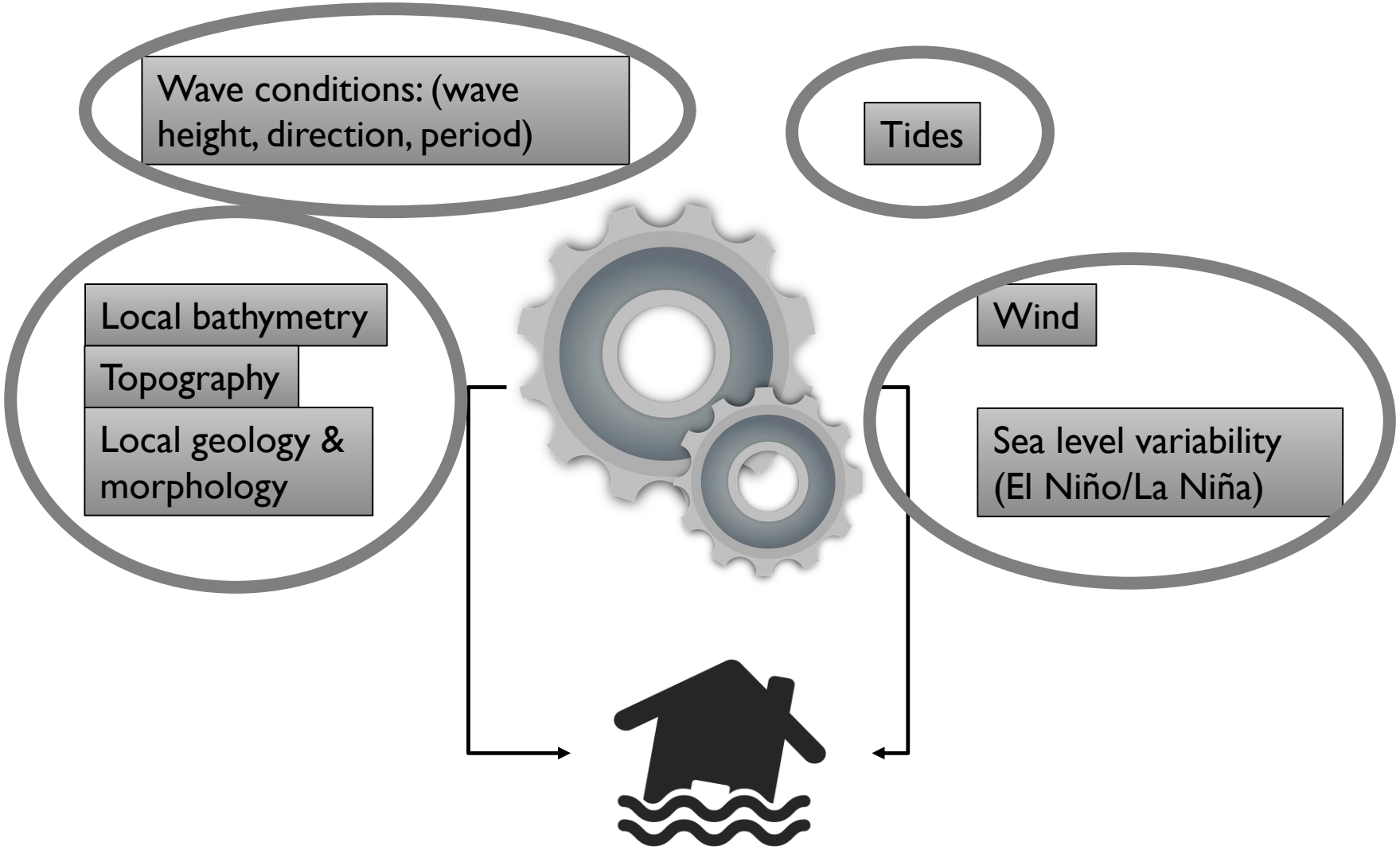
Offshore wave buoy observations



Nearshore pressure sensor observations



Wave-driven coastal inundation



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Waves

Tides

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Global models & observations

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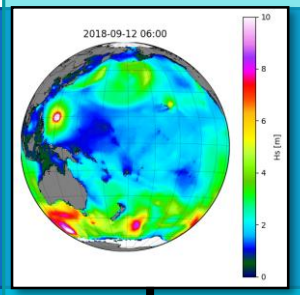
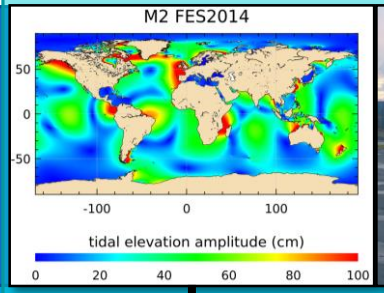
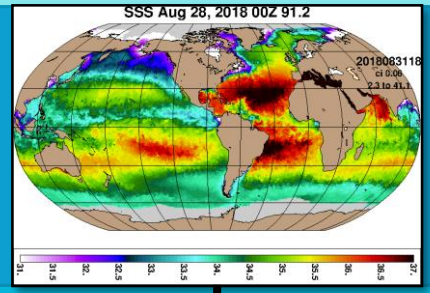
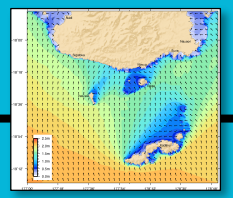
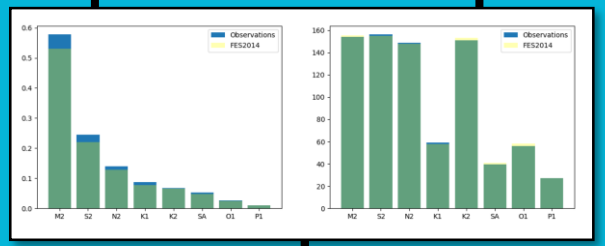
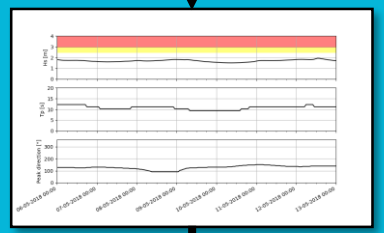


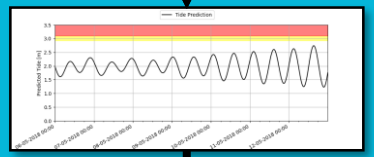


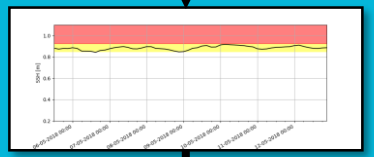


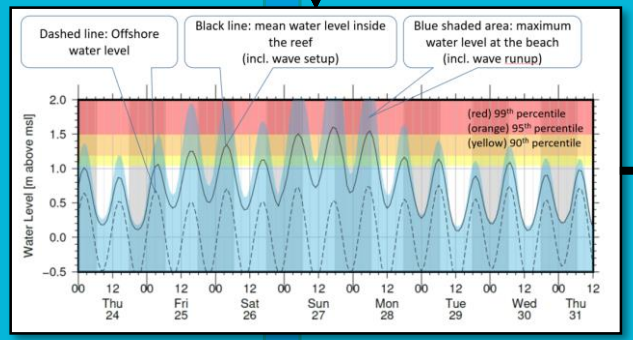


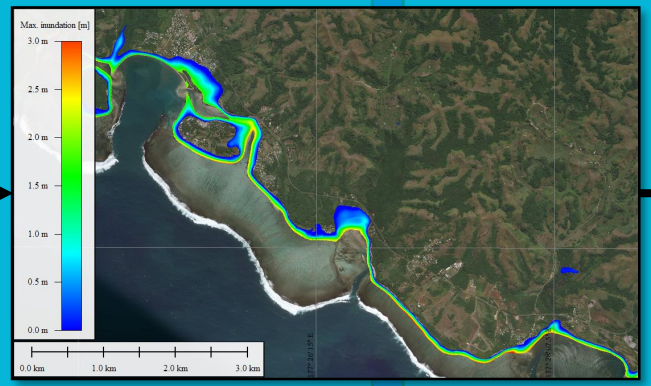






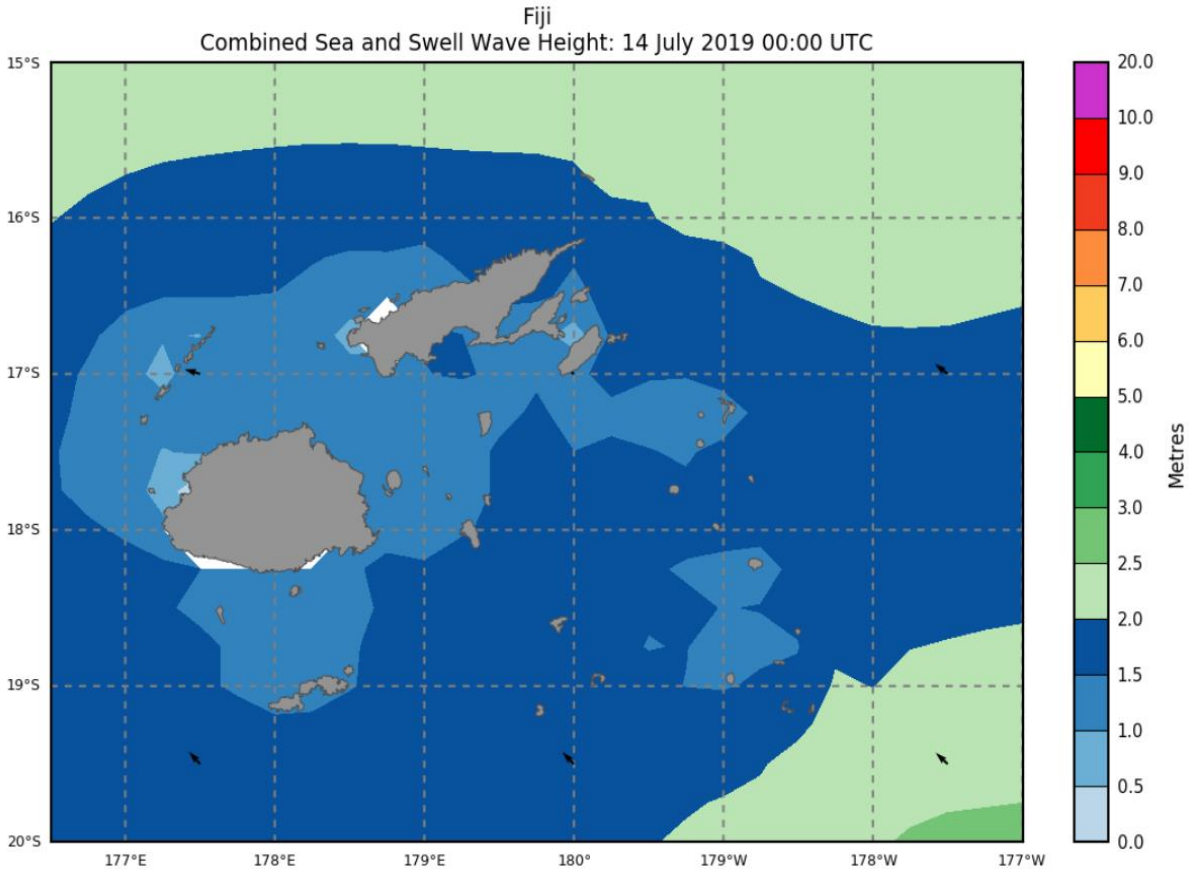




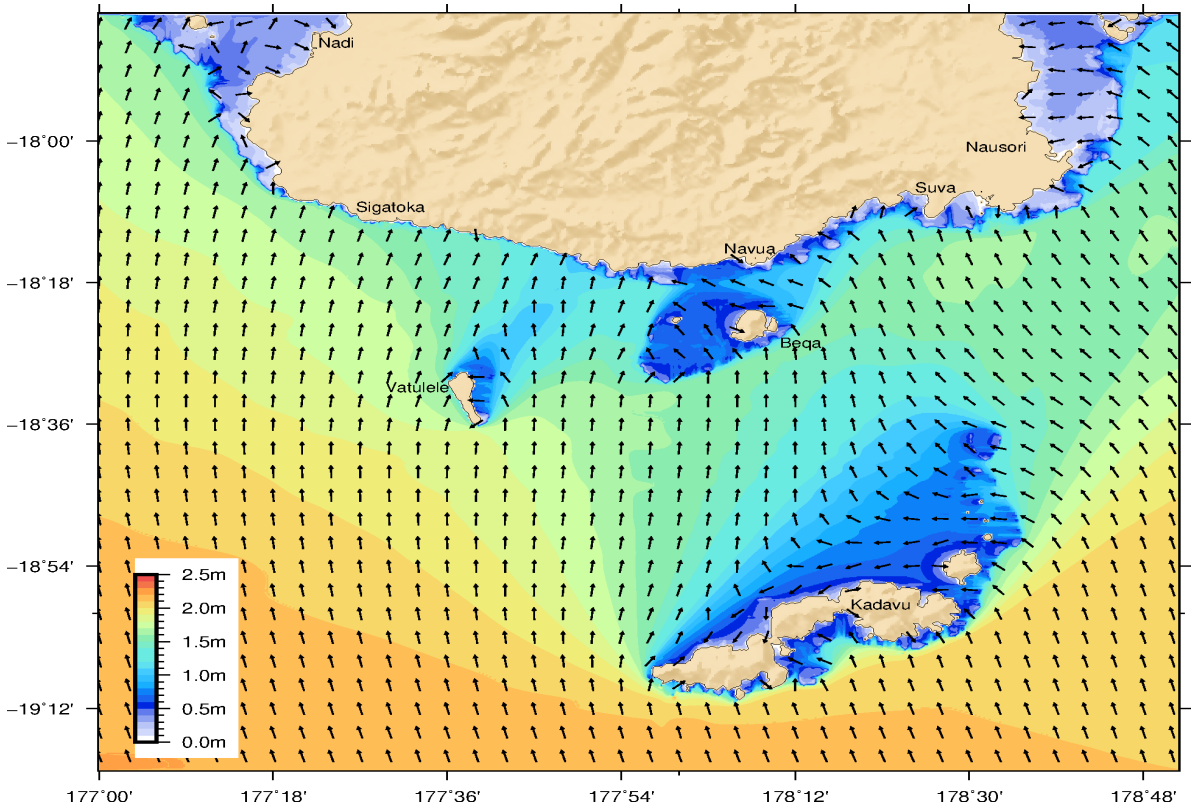


Swell inundation forecast system: Offshore wave conditions

Global WW III wave forecast

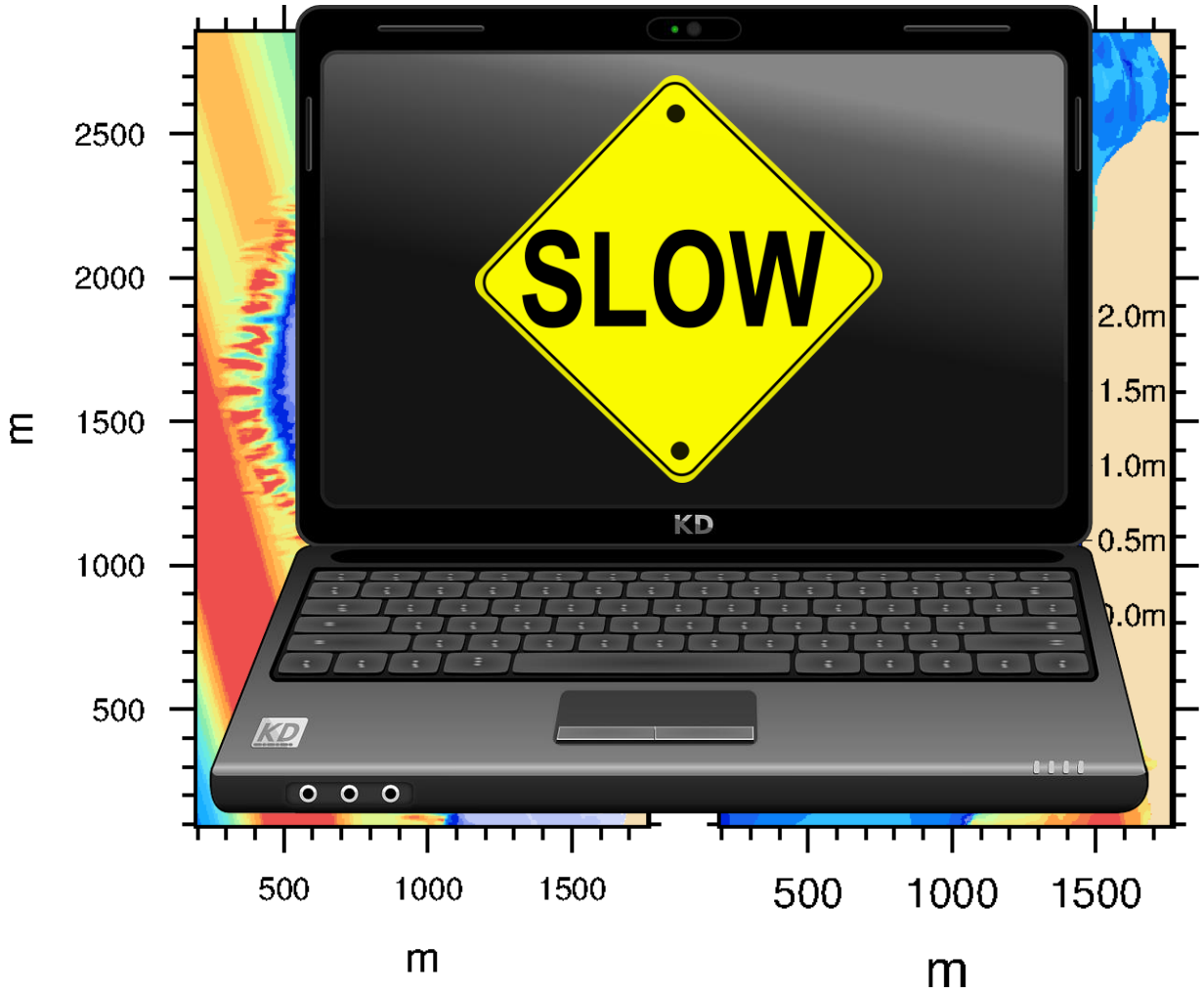


Fiji's downscaled wave forecast

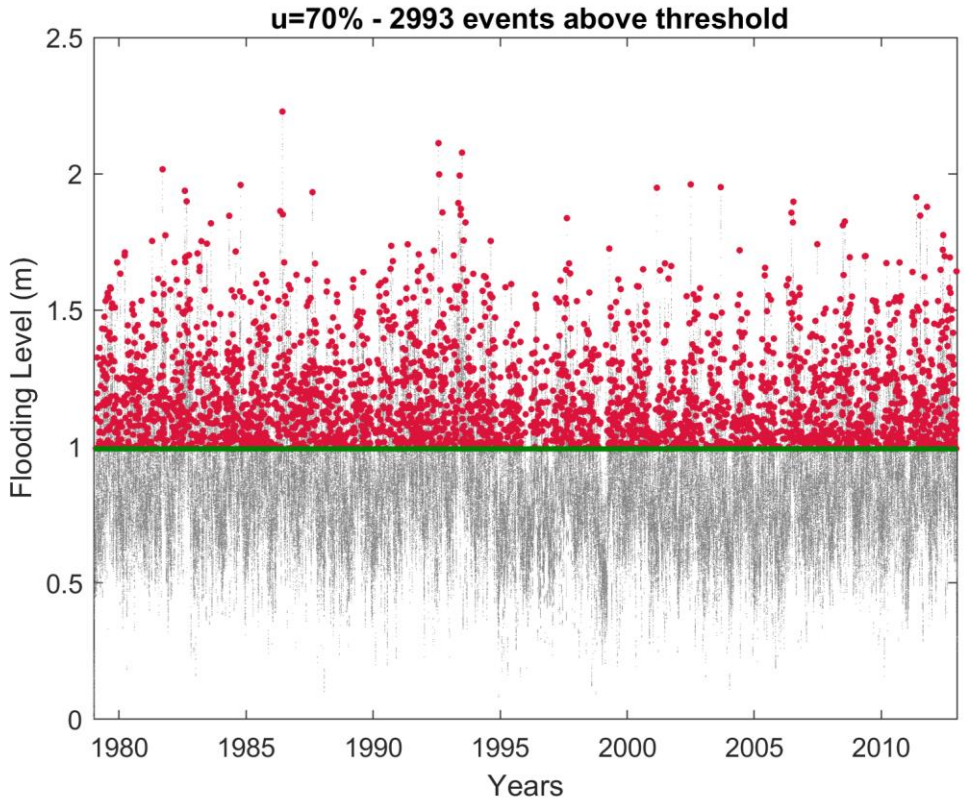


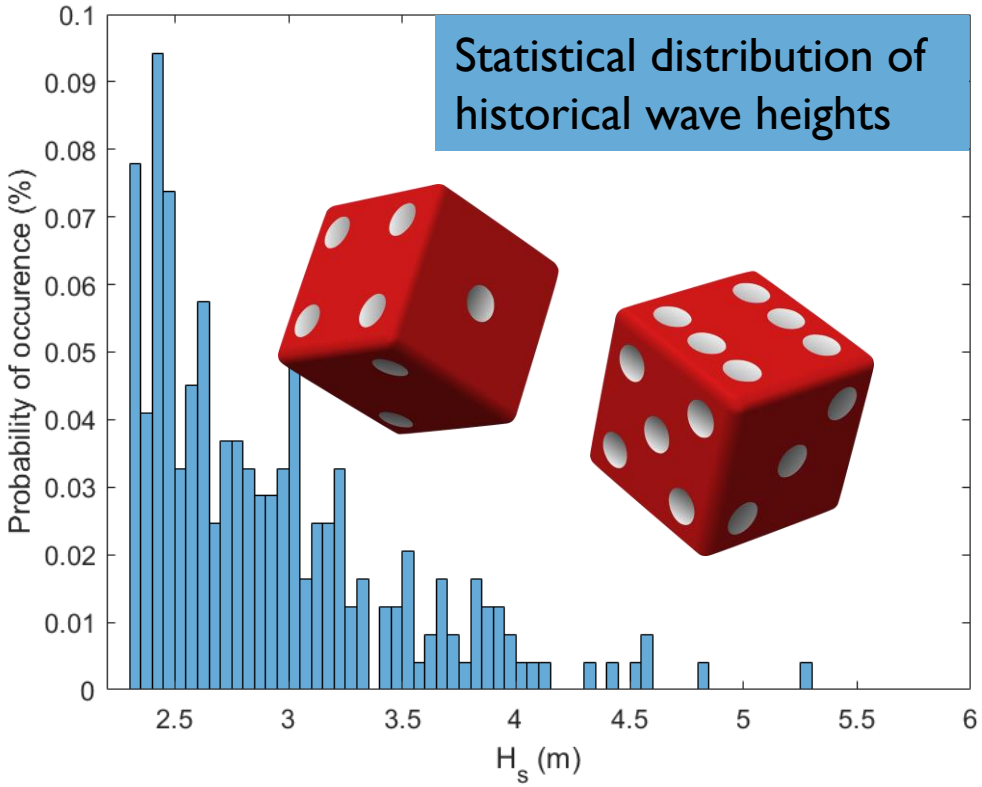
- Run operationally 4 times daily 00z 06z 12z 18z
- Provide 7 day forecast

Swell inundation forecast system: Inundation model (Xbeach)



Swell inundation forecast system: Inundation model (Metamodel)





Swell inundation forecast system: Inundation model (Metamodel)

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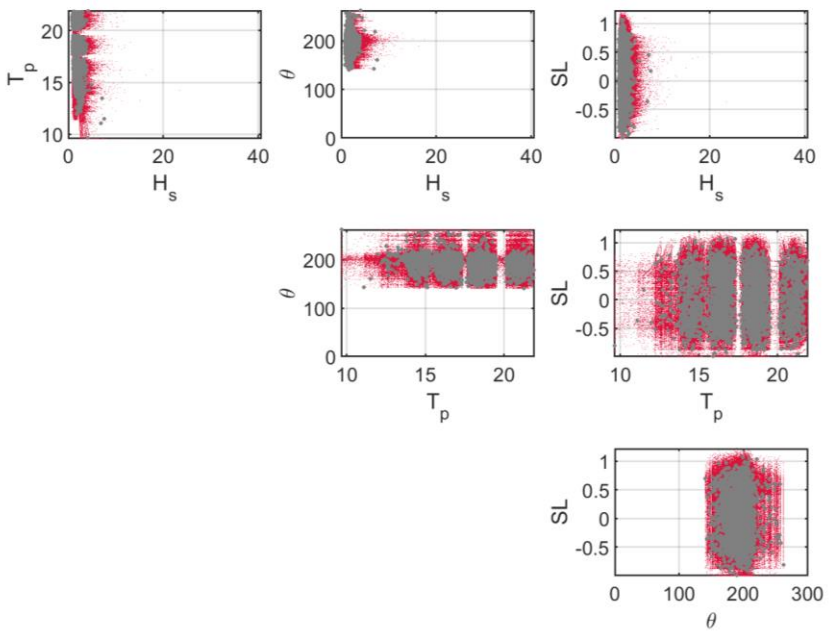
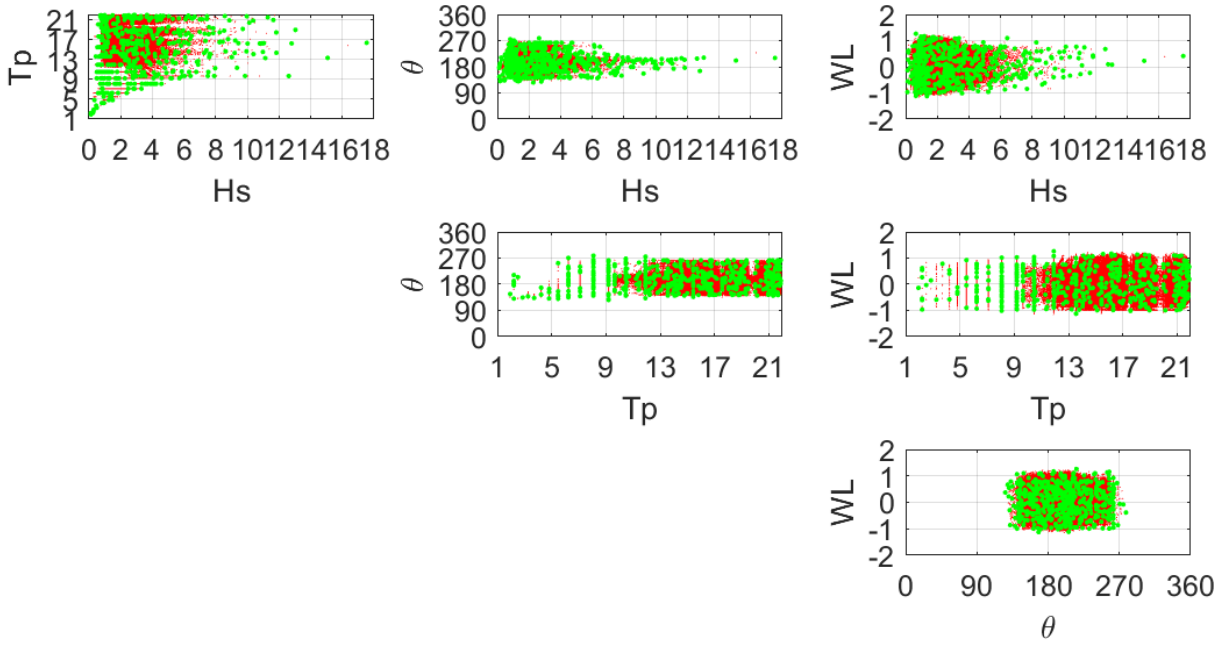
Create 10,000 years of artificial wave and sea level conditions



Select 500 representative scenarios using MDA



Swell inundation forecast system: Inundation model (Metamodel)

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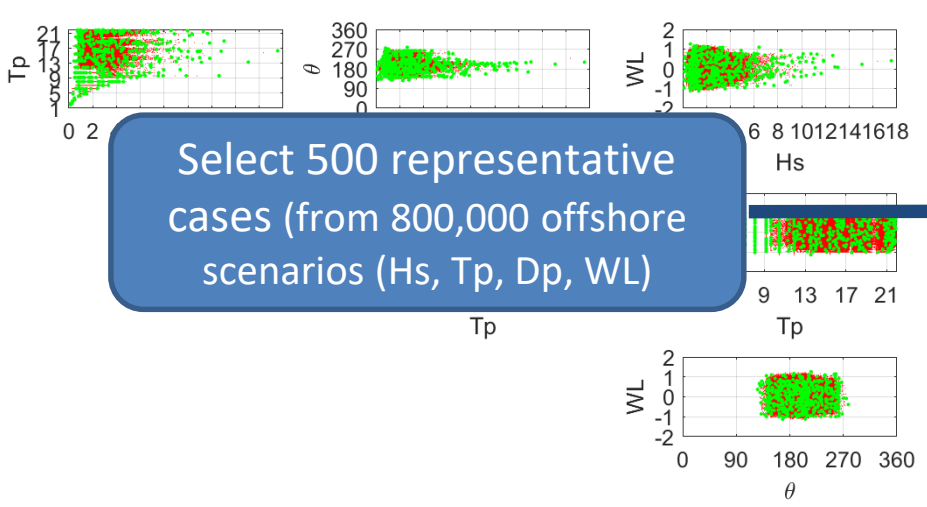
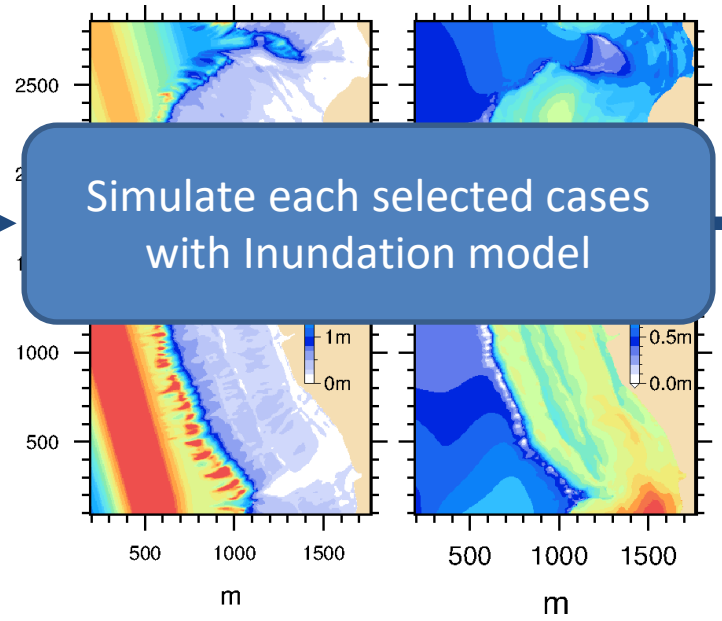
Maximum Dissimilarity Algorithm



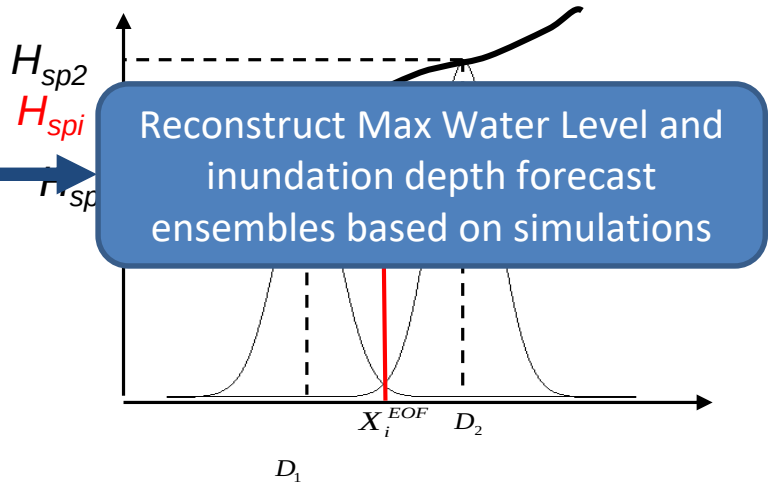
Select 500 representative cases (from 800,000 offshore scenarios (Hs, Tp, Dp, WL)

Dynamic Modelling (Xbeach Surfbeat)



Simulate each selected cases with Inundation model

Radial Basis Functions (RBF)



Reconstruct Max Water Level and inundation depth forecast ensembles based on simulations

Swell inundation forecast system: Inundation model (Metamodel)

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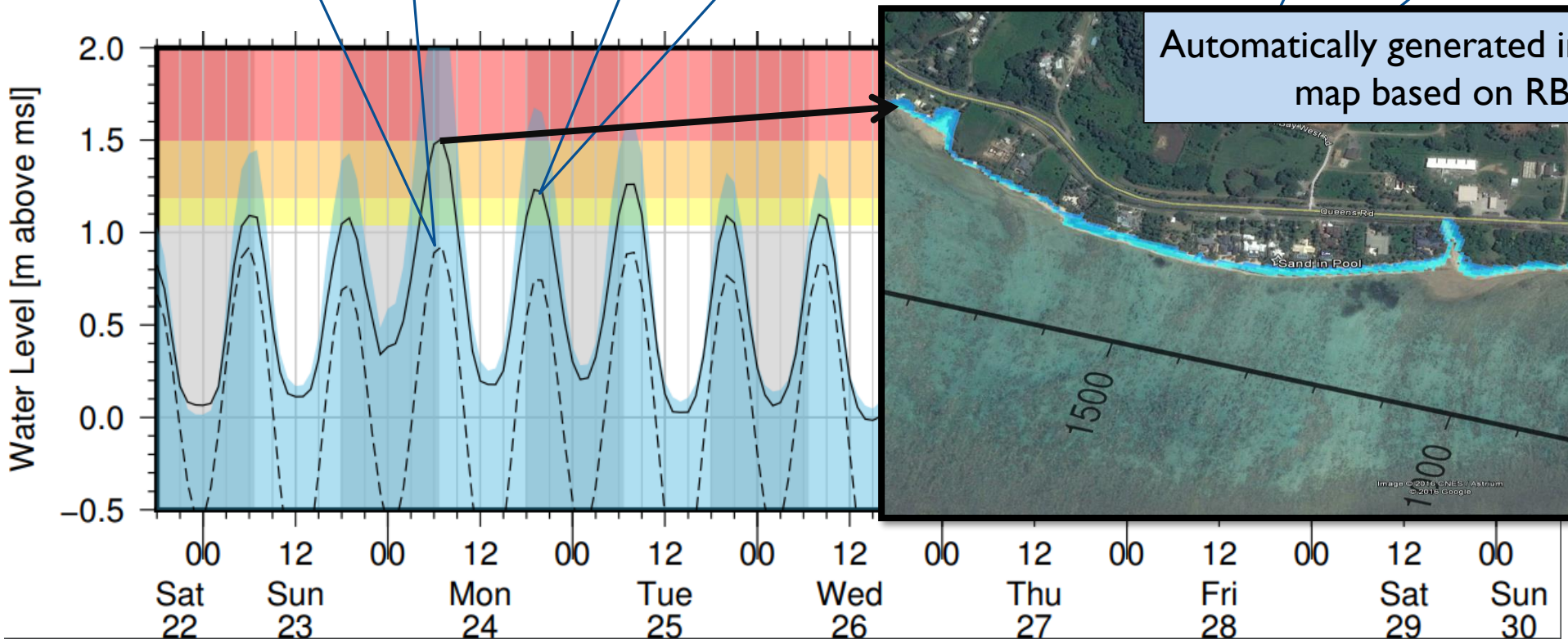
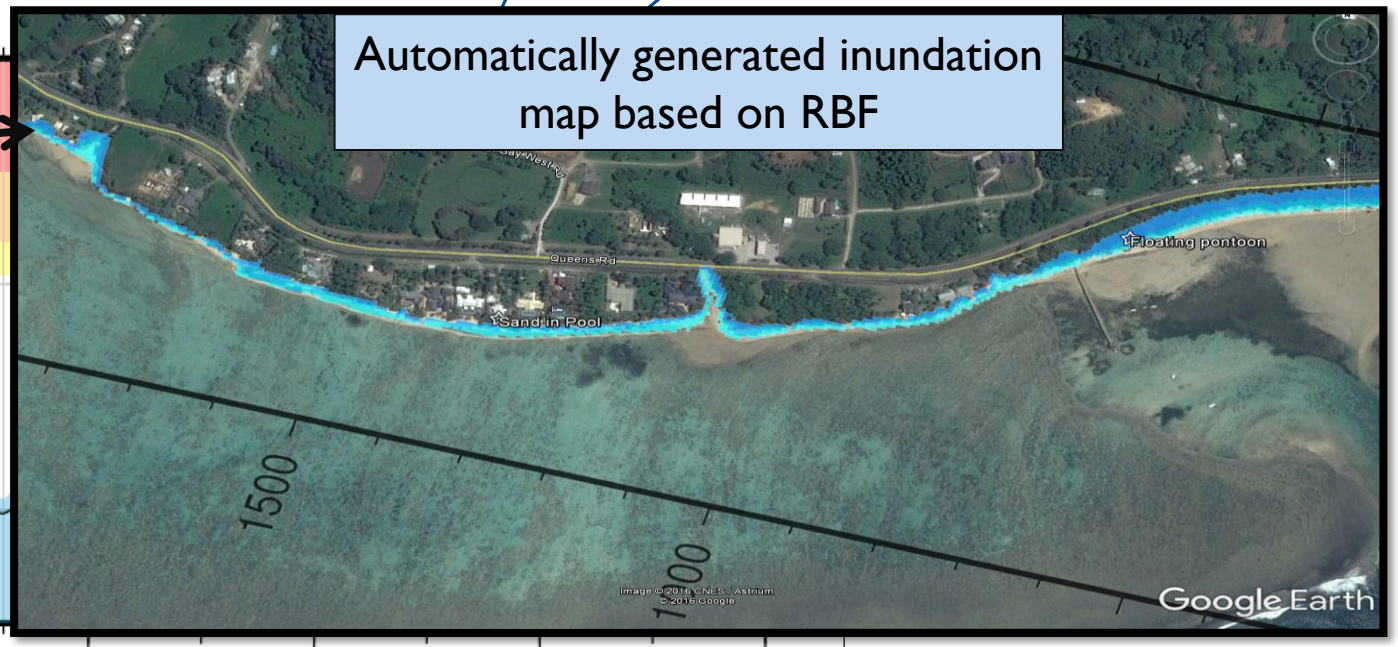
Dashed line: Offshore water level (tide + SL anomaly)

Black line: mean water level inside the reef (tide, sea level anomaly and wave setup)

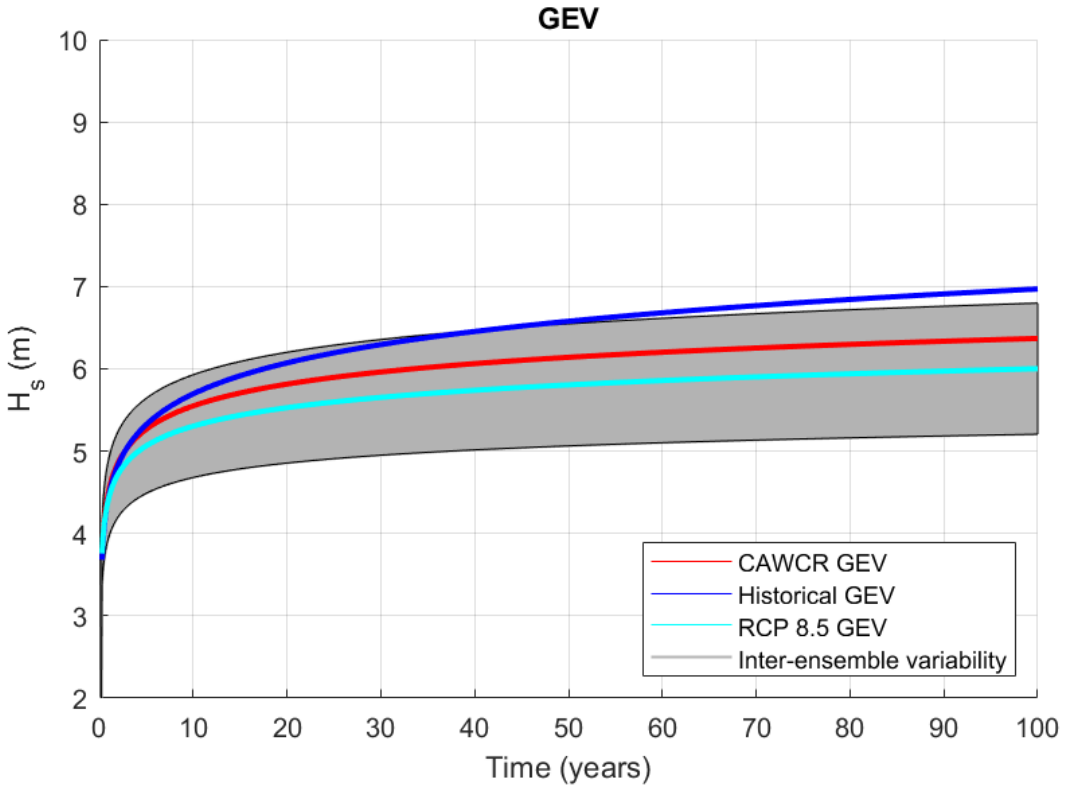
Blue shaded area: max. water level at the beach (tide, SL anomaly, wave setup, infragravity wave and swell)





http://phpstack-15188-38272-117120.cloudwaysapps.com/Forecast/Maui_Bay-WL.pdf

Changes in wave climate



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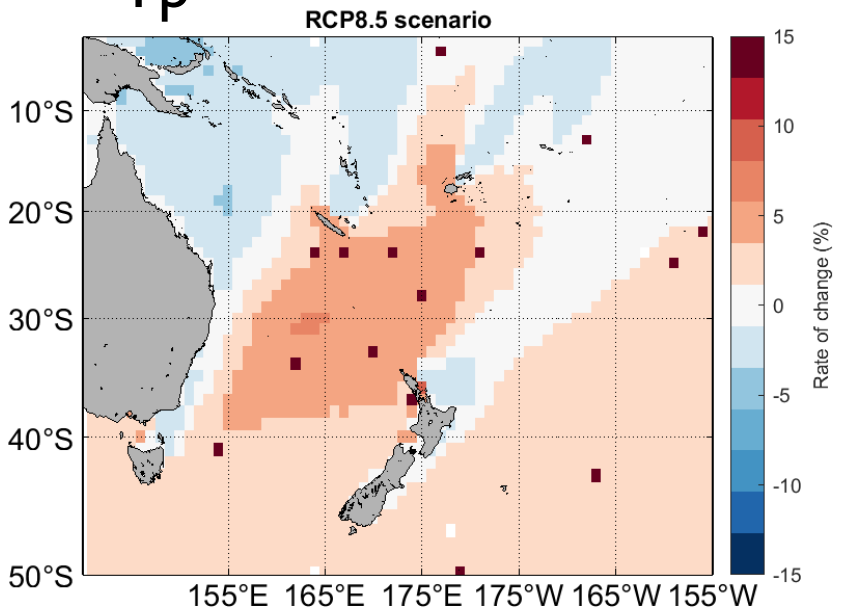
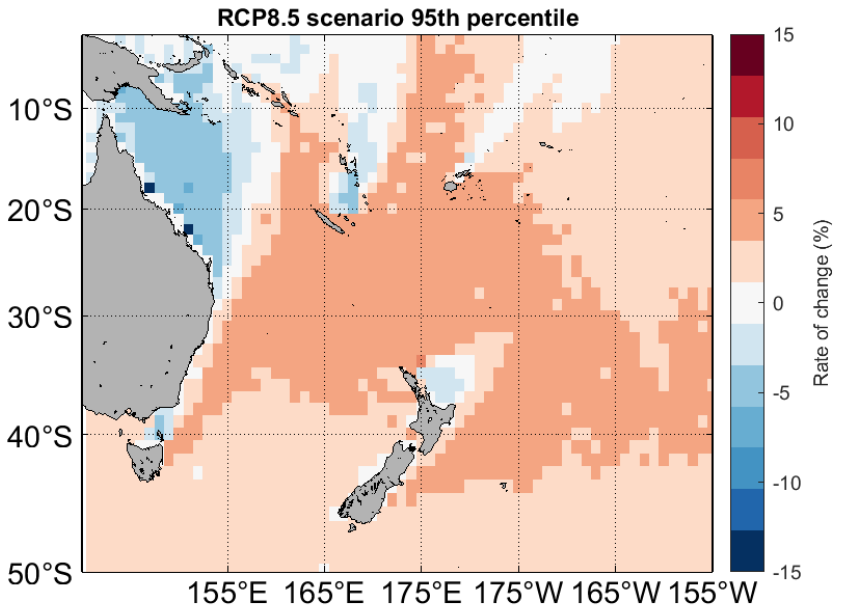
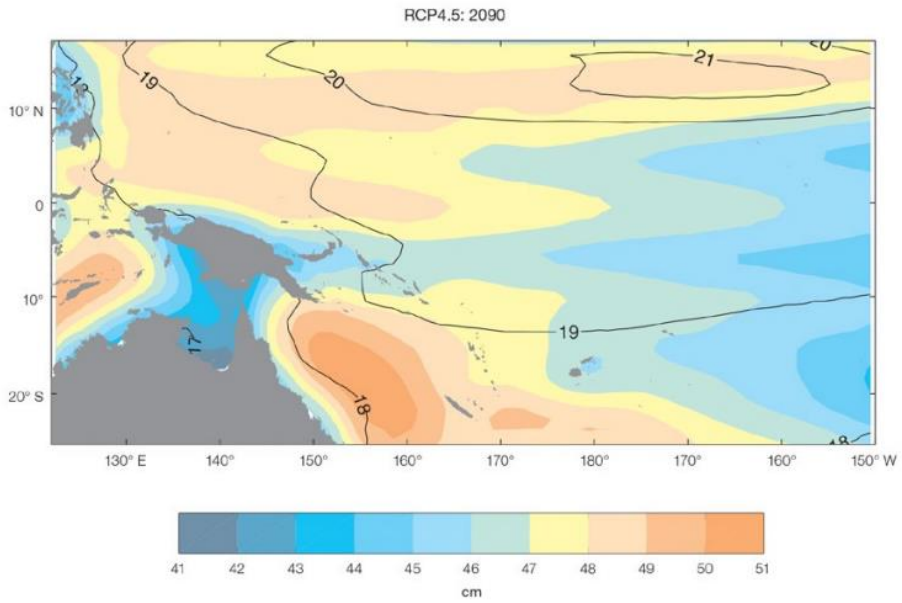




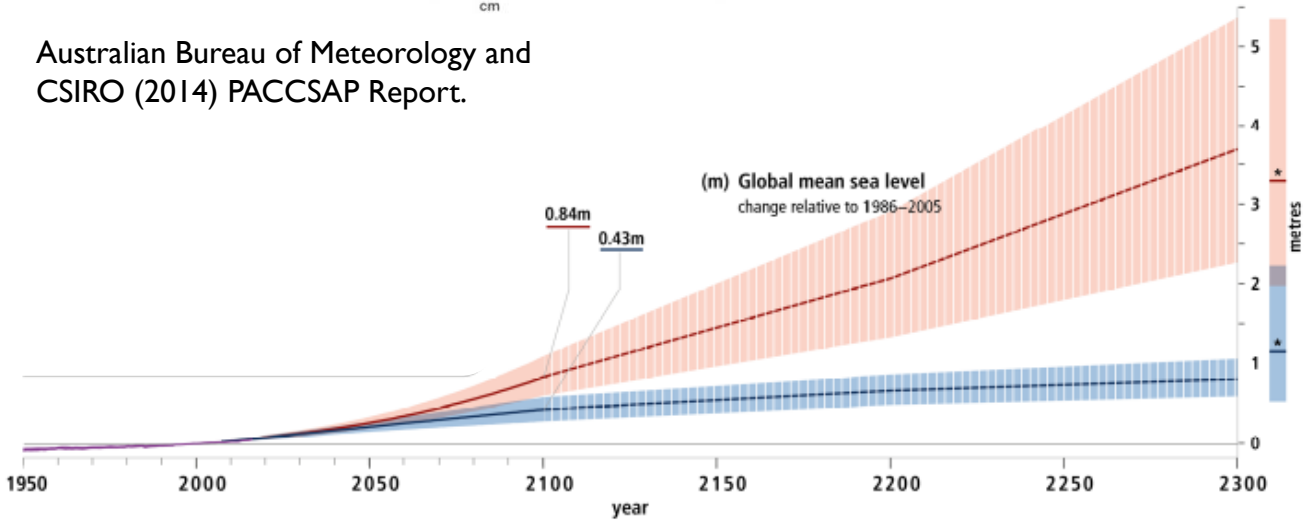
CAWCR hindcast - Durrant et al., 2014.

Climate simulations - Hemer et al., 2013.

Changes in sea level

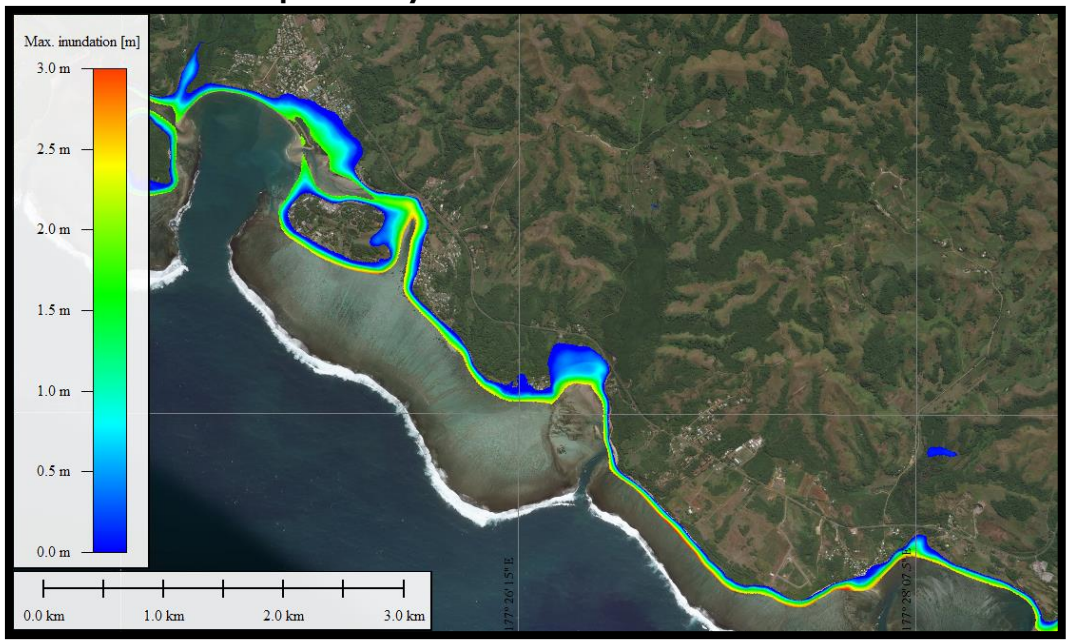


Australian Bureau of Meteorology and CSIRO (2014) PACCSAP Report.



IPCC, 2019: Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate

Inundation map – May 2018



Inundation map – May 2018 (RCP8.5 – 0.84 m SLR)

Conclusions

- Empirical solutions are not suitable for complex fringing reef environments.
- Total runup (IG waves) should be considered in inundation forecast systems/hazard assessments.
- Role of IG waves will increase with climate change.
- Meta-models provide a good solution when limited by computational resources.

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