



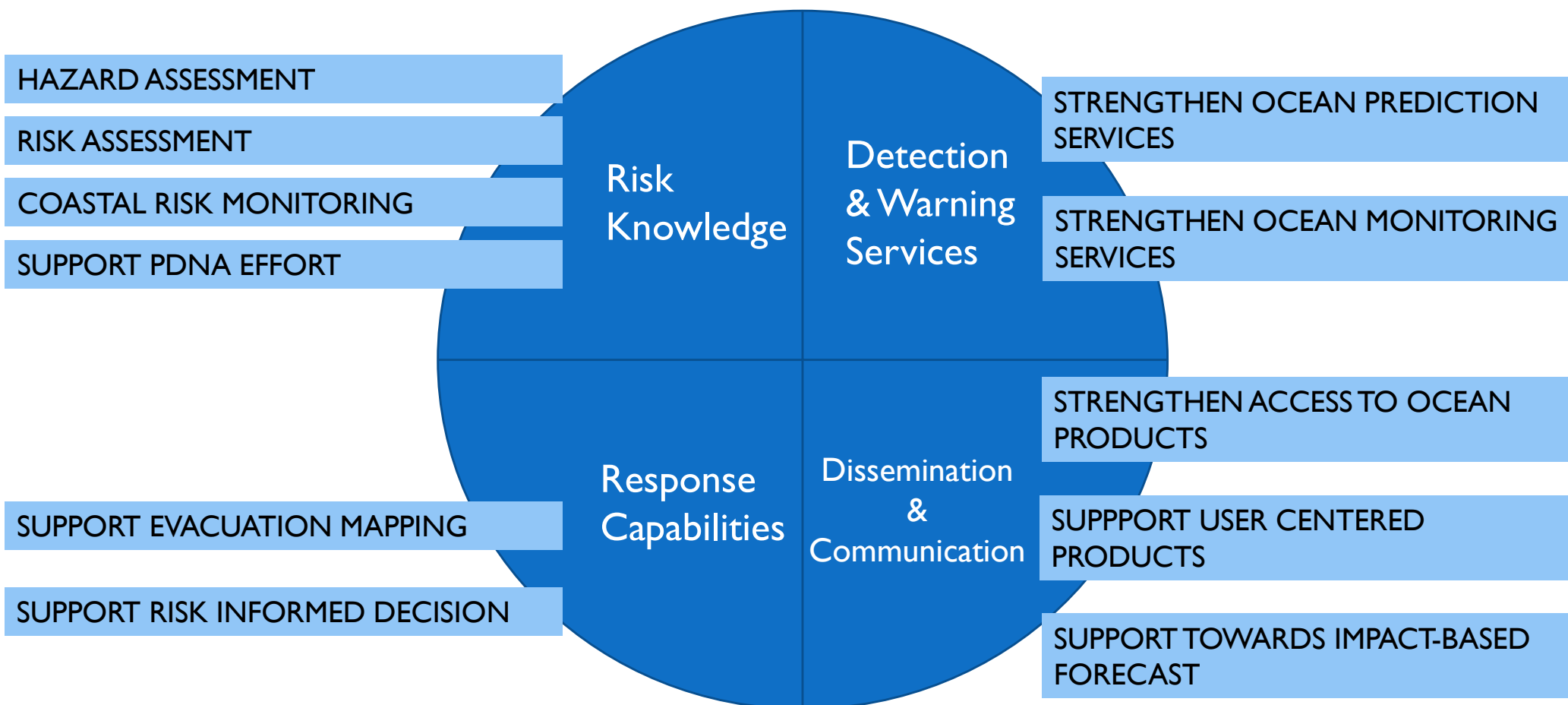
Pacific
Community
Communauté
du Pacifique

OCEAN PREDICTION TOOLS TO STRENGTHEN NAVIGATIONAL SAFETY AND SAR

OCEAN & MARITIME PROGRAMME,
GEOSCIENCE, MARITIME AND ENERGY DIVISION

Ocean Prediction and Monitoring Team
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SCOPE OF WORK: STRENGTHENING EARLY WARNING SYSTEM CAPACITY



THE PACIFIC OCEAN PORTAL

<http://oceanportal.spc.int/>



A one stop shop for:

- Global, regional ocean prediction products
- Realtime ocean data
- Ocean Hindcast (wave, current) product
- Regional Ocean knowledge products

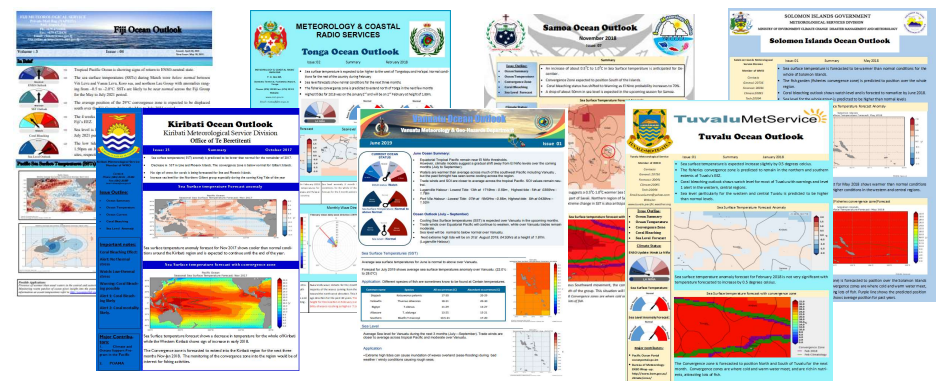
Service driven



Training prog. & Stakeholder engagement



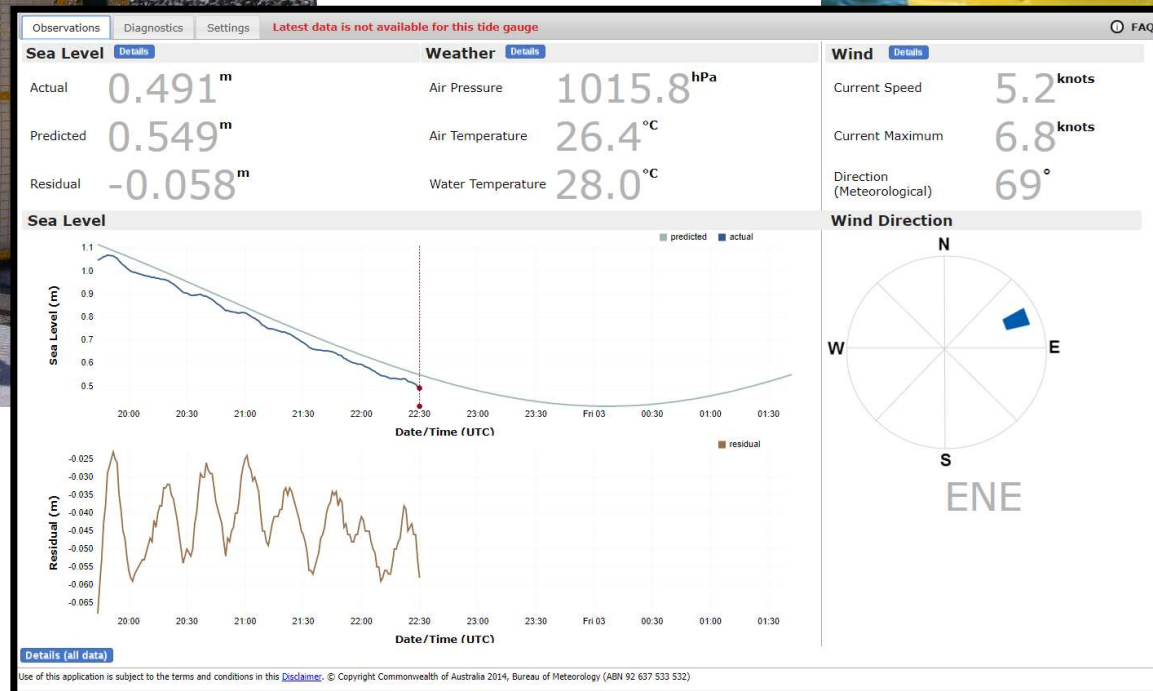
Supports Ocean outlook production in NMHS



TOOLS: REAL TIME MET-OCEAN OBSERVATION



Tide Gauge

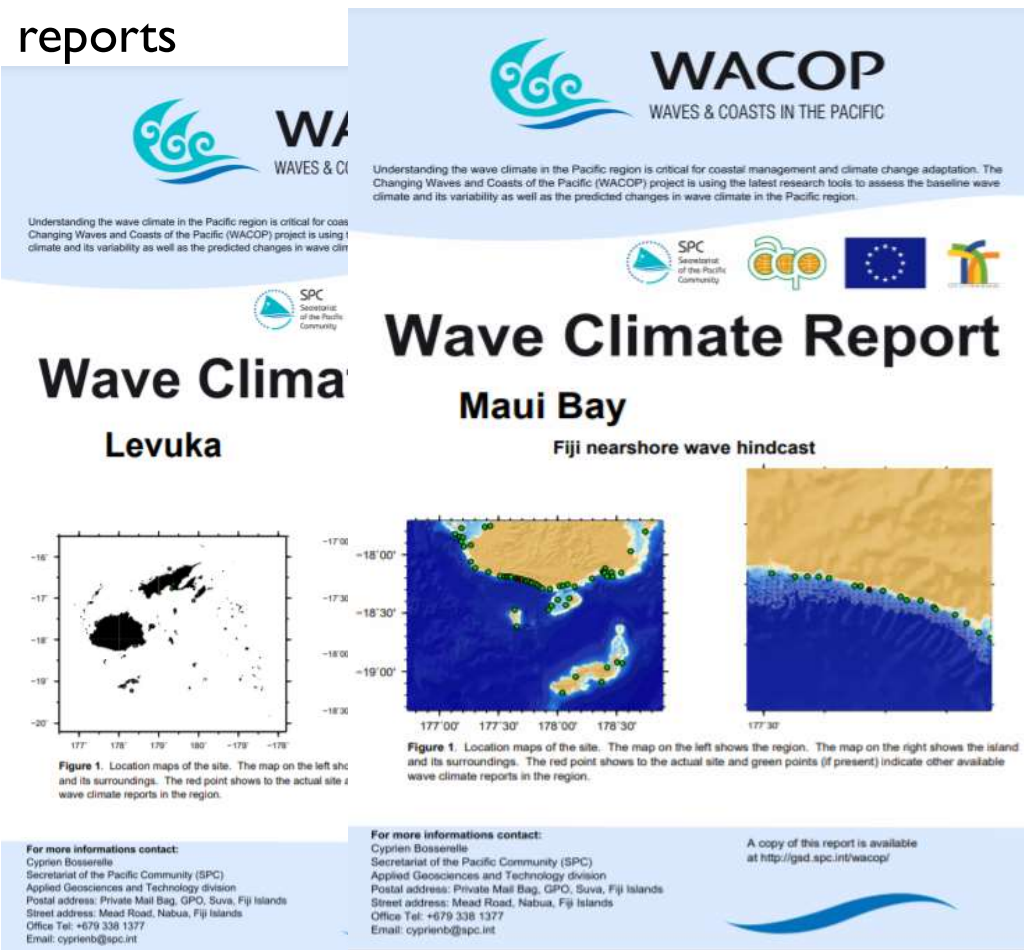


Wave Buoy

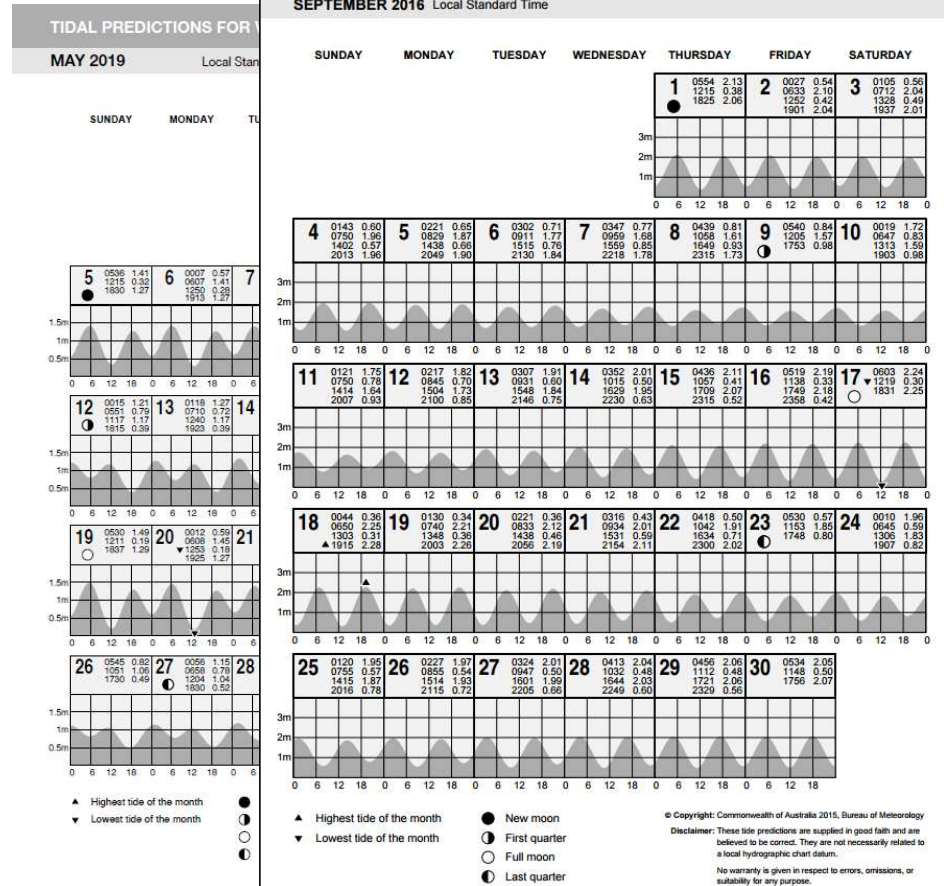
OCEAN KNOWLEDGE PRODUCTS



Wave climate reports

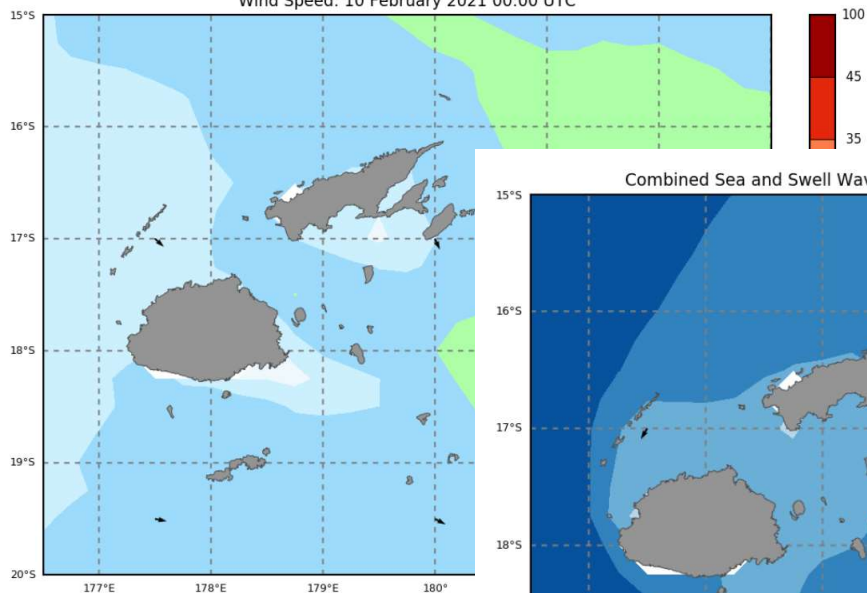


Tide Calendars

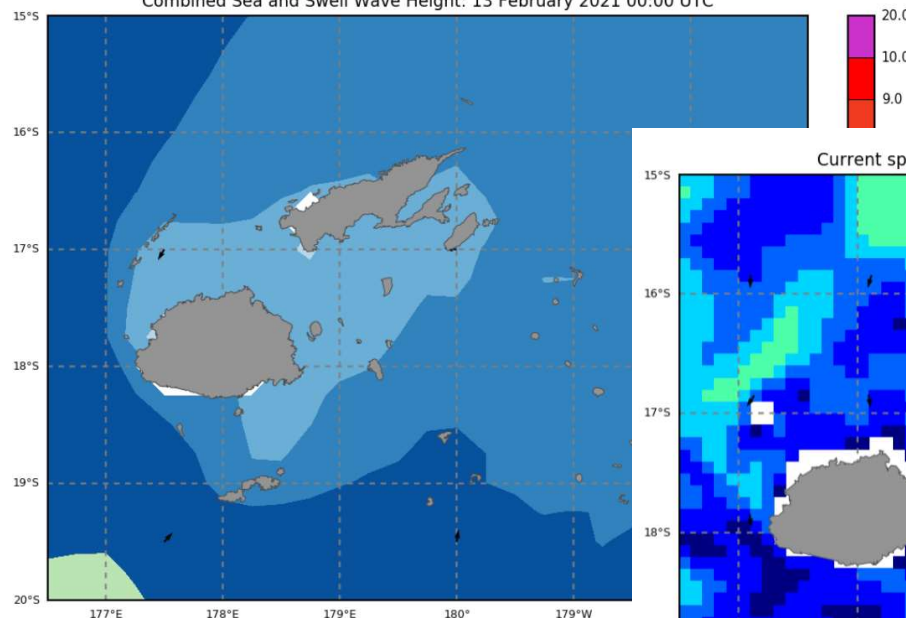


GLOBAL AND REGIONAL OCEAN FORECAST PRODUCTS

Wind Speed: 10 February 2021 00:00 UTC

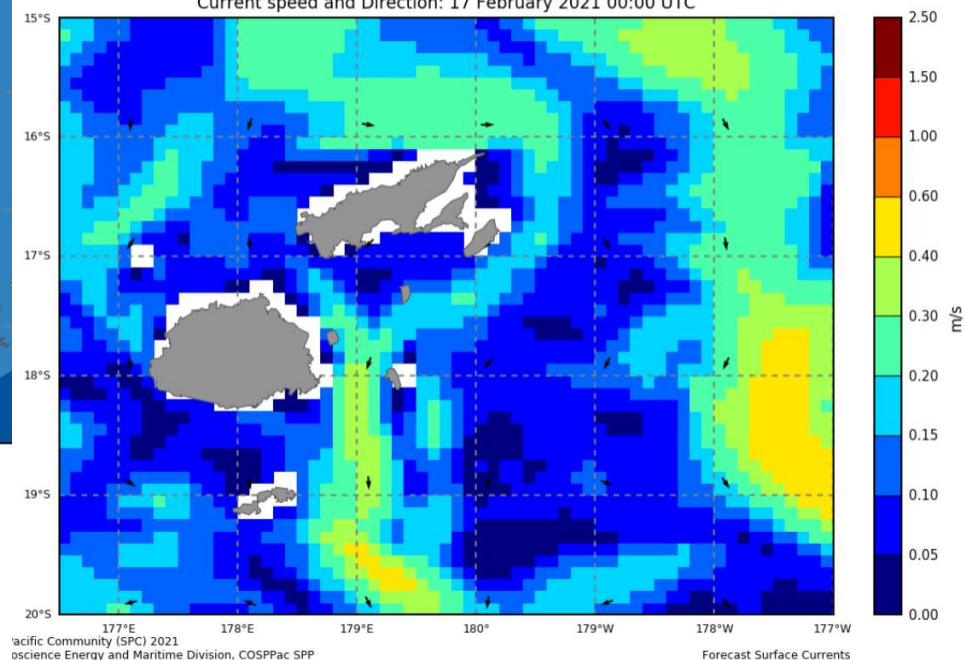


Combined Sea and Swell Wave Height: 13 February 2021 00:00 UTC



Ocean Current Forecast

Current speed and Direction: 17 February 2021 00:00 UTC



Wind Forecast

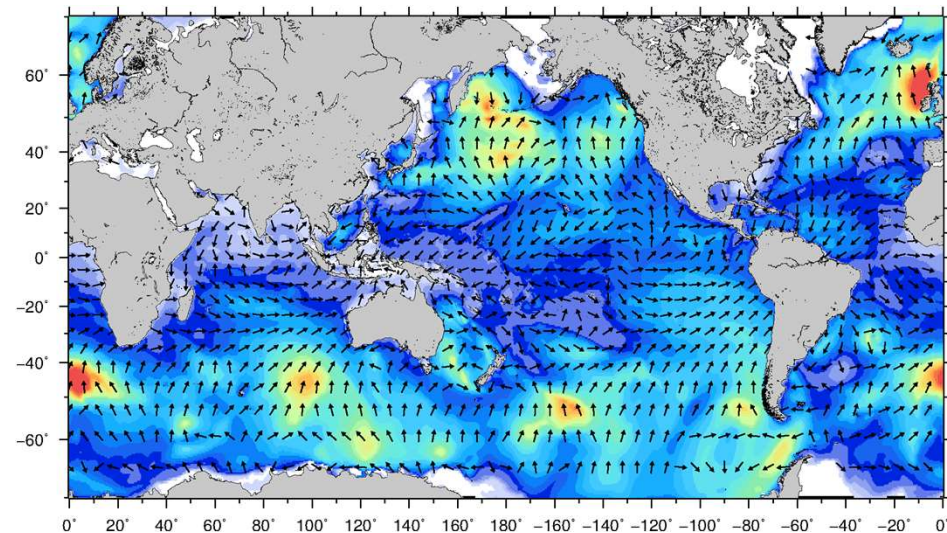
Wave Forecast

Forecast Surface Currents

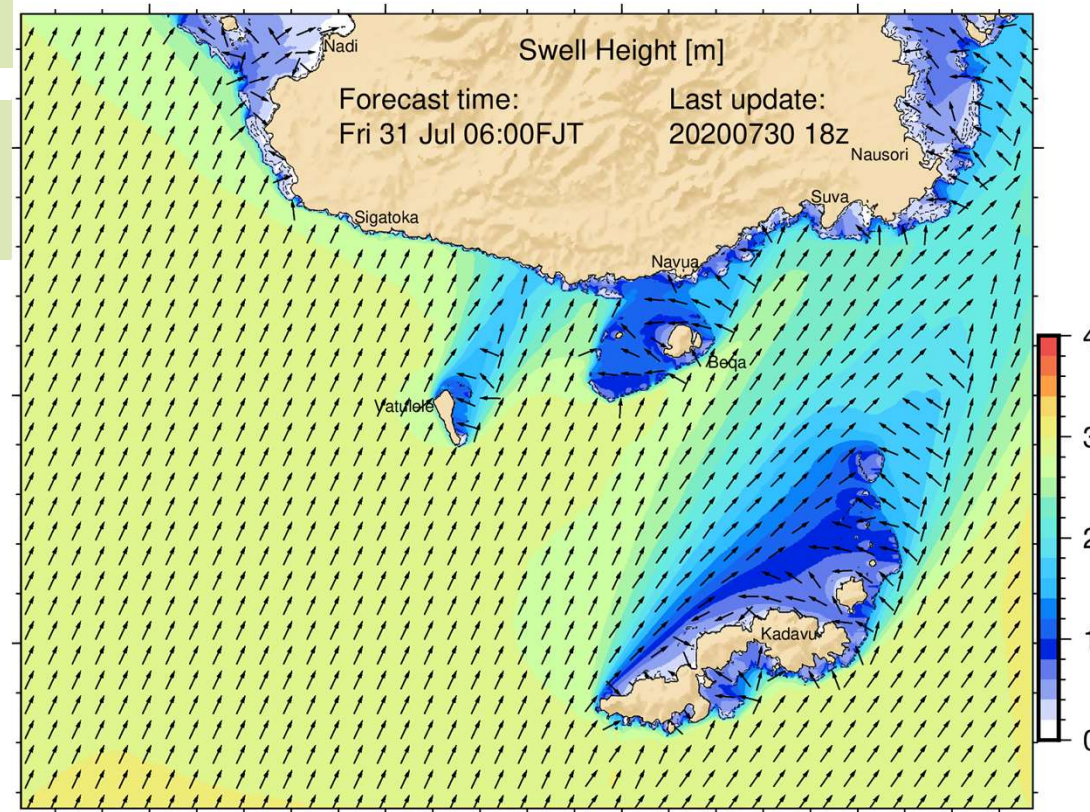
GLOBAL TO LOCALISED, ACTIONABLE INFORMATION

Global Wave Forecast: - A $H_s=3.2\text{m}$ South Westerly Wave
- A 15 Knots South Easterly Wind

What ocean state to expect between Kadavu and Suva?
Between Vatulele and Vitilevu?
Is there a risk for inter-island shipping in Lau?

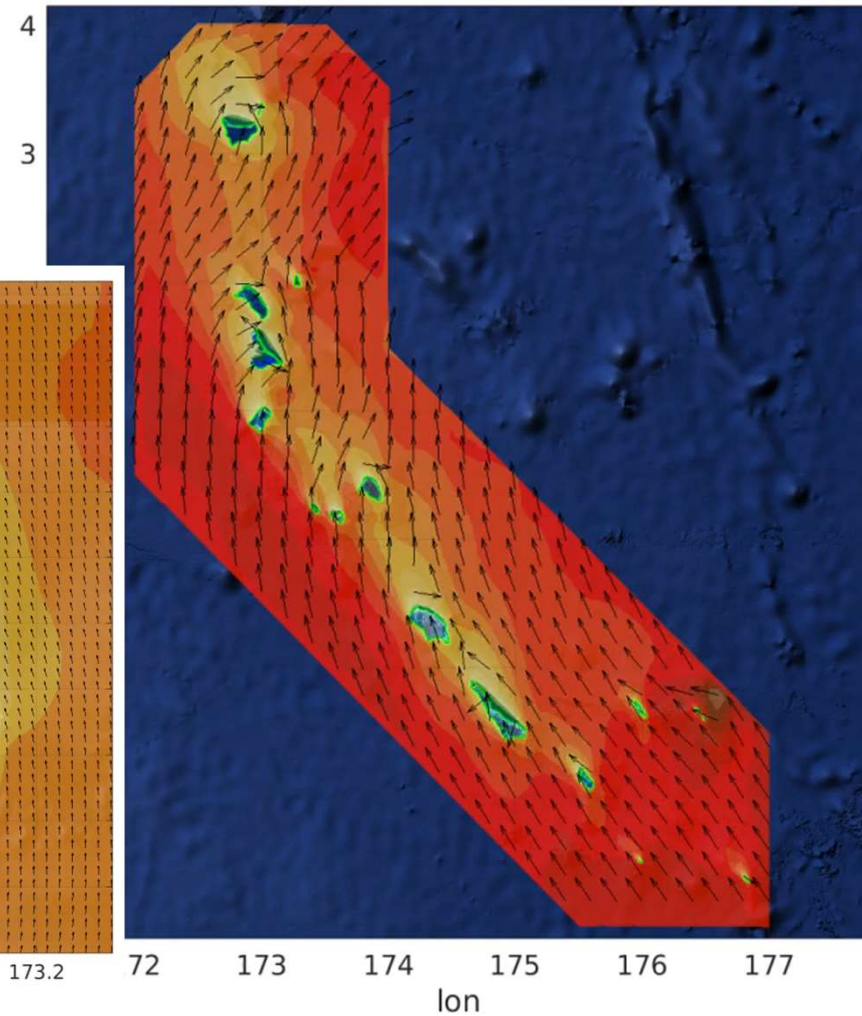
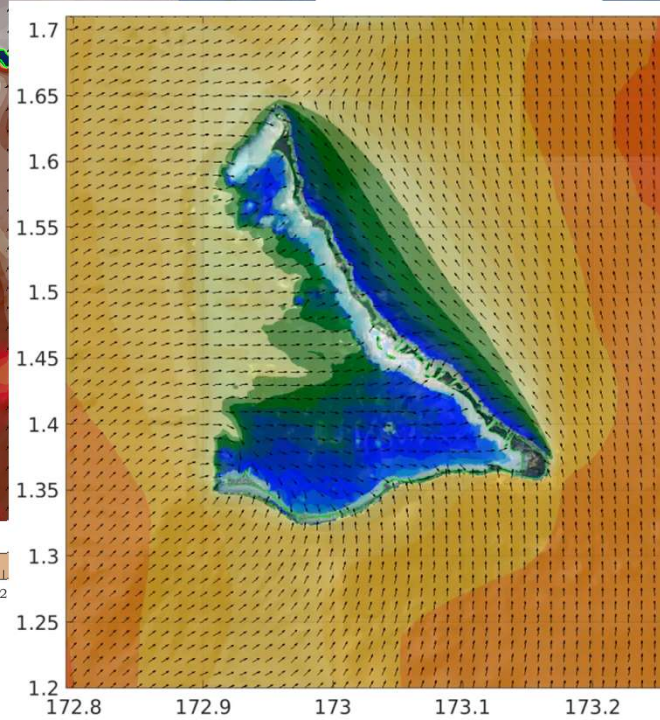
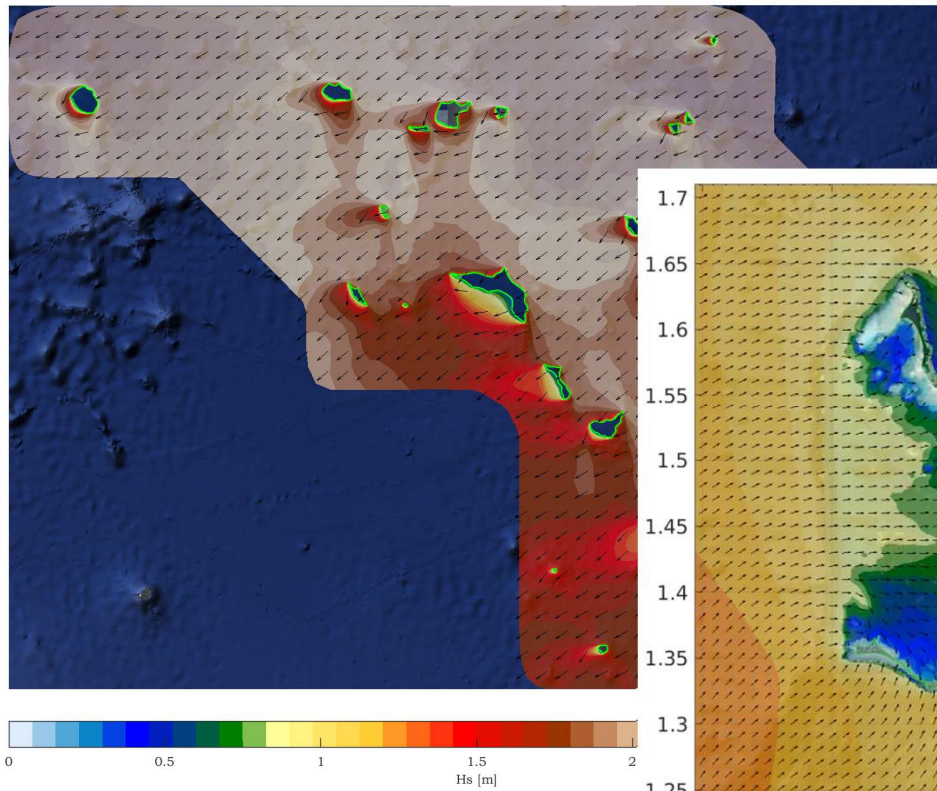


GLOBAL WAVE FORECAST



LOCAL WAVE FORECAST

National Scale High Resolution Wave Forecast

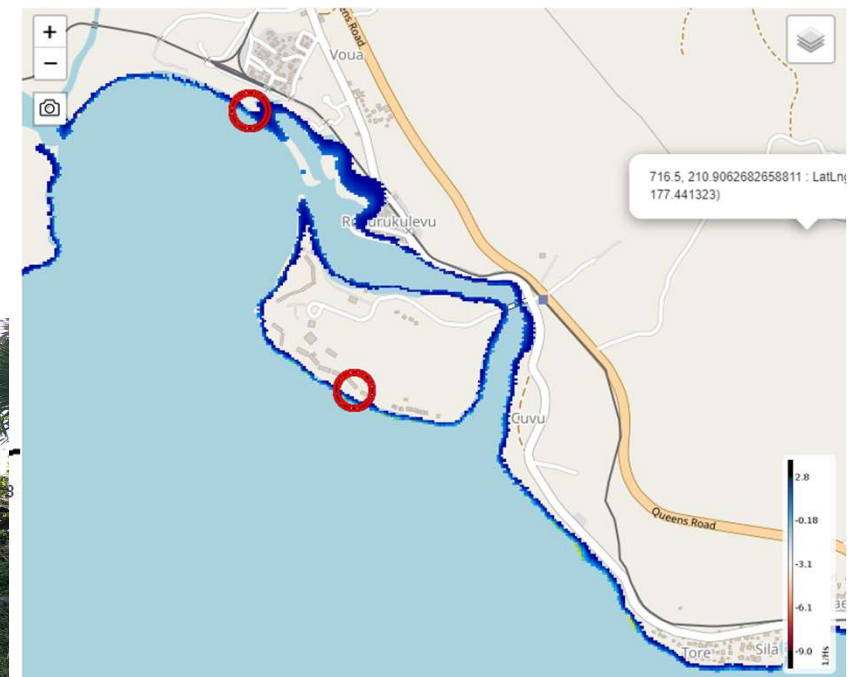


COASTAL INUNDATION FORECAST

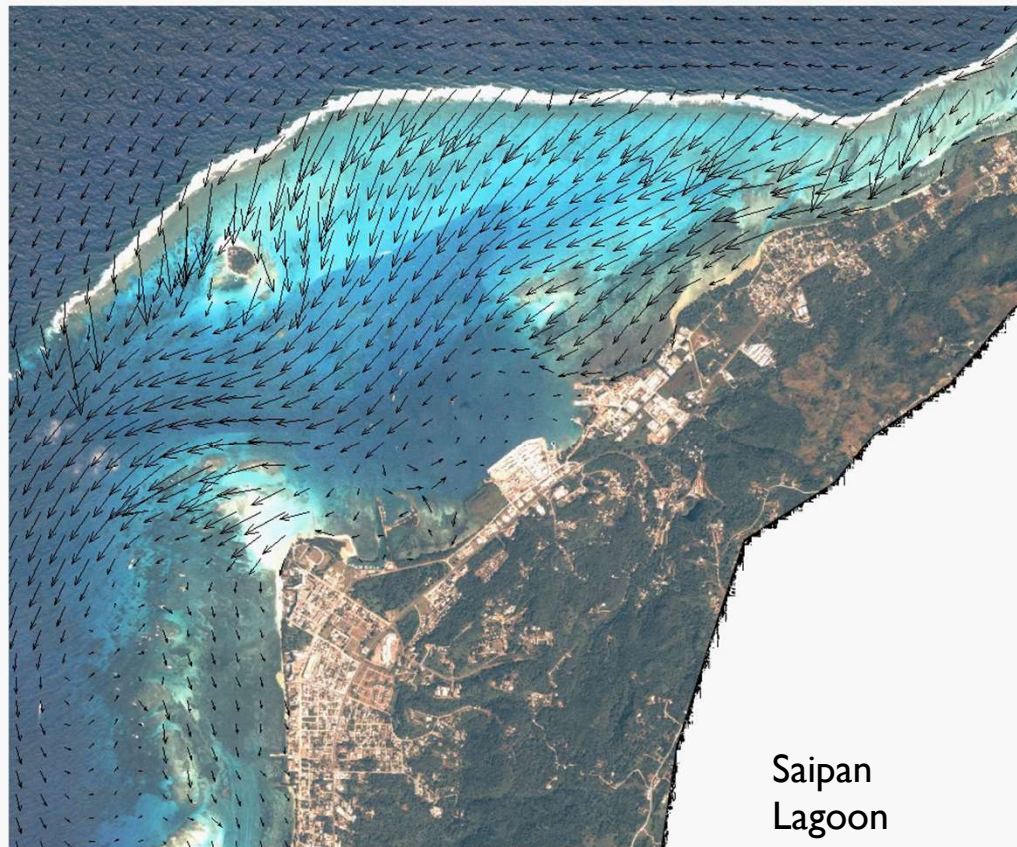
- Designed and tailored to NMHS resources and capacity
 - Light weight (Meta-modelling: Clustering, Dynamic modelling and Machine Learning)
- Provide HR inundation forecast products in support of impact-based forecast



15/06/22 Swell driven inundation event

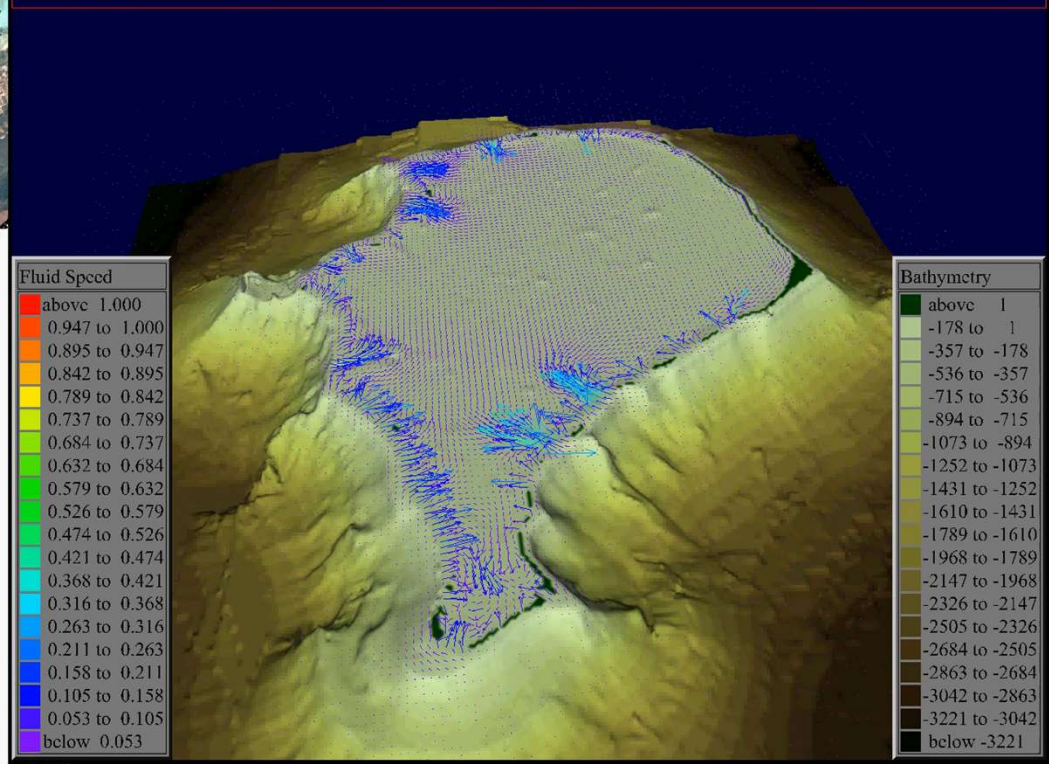


High Resolution Ocean Current



6:00:00 5/27/2010 Time Step 180 of 750. Sigma Layer No. 1 of 4.

NUMERICAL MODEL OF FUNAFUTI



Funafuti Lagoon

STRENGTHENING OCEAN PREDICTION SERVICES PIPELINE WORK AT SPC

- **High resolution national scale Ocean Current Forecast (CK, TV, Niue, SB)**
- **Some Applications:**
 - Support Search and Rescue Operation
 - Support Navigational Safety and inter-island shipping routes (energy efficiency)
 - Support Lagoon Health Forecast
 - Marine Heat Wave forecast
 - Oil spill management

RAPID CASE STUDY

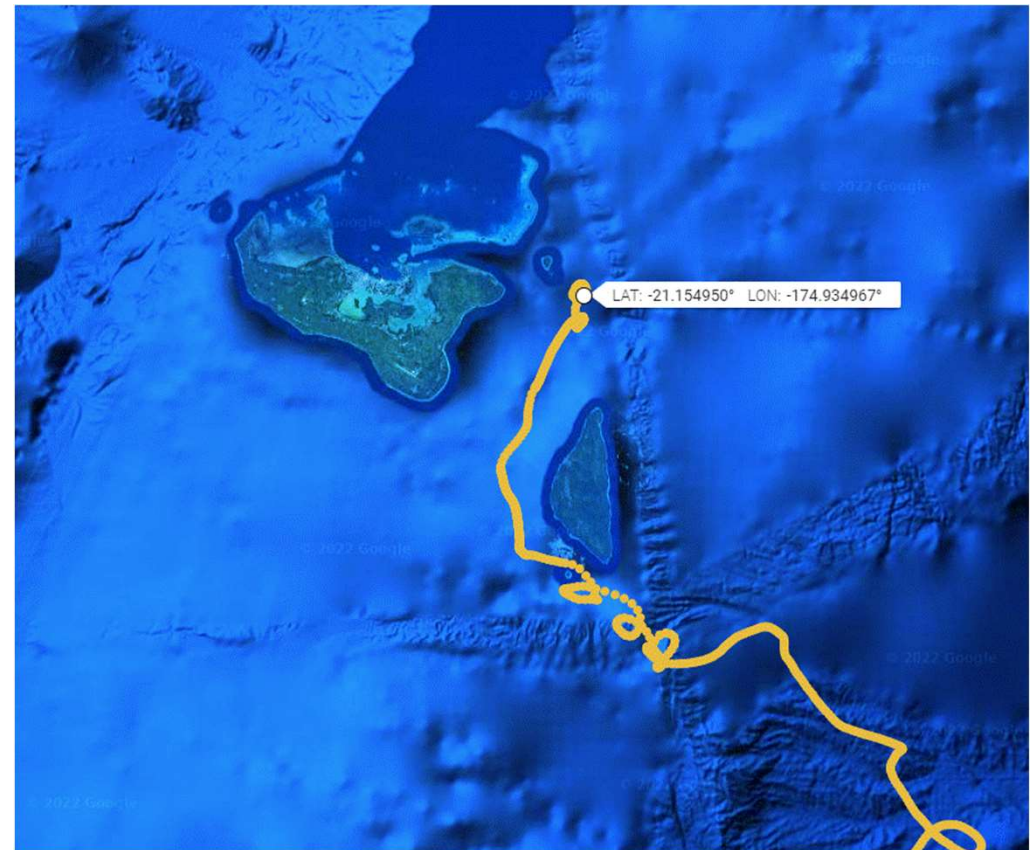
DRIFTING WAVE BUOY IN TONGA

Wave buoy attached on FAD started drifting off Tonga on 18/04/2022

→ Depth of the under-water structure unknown



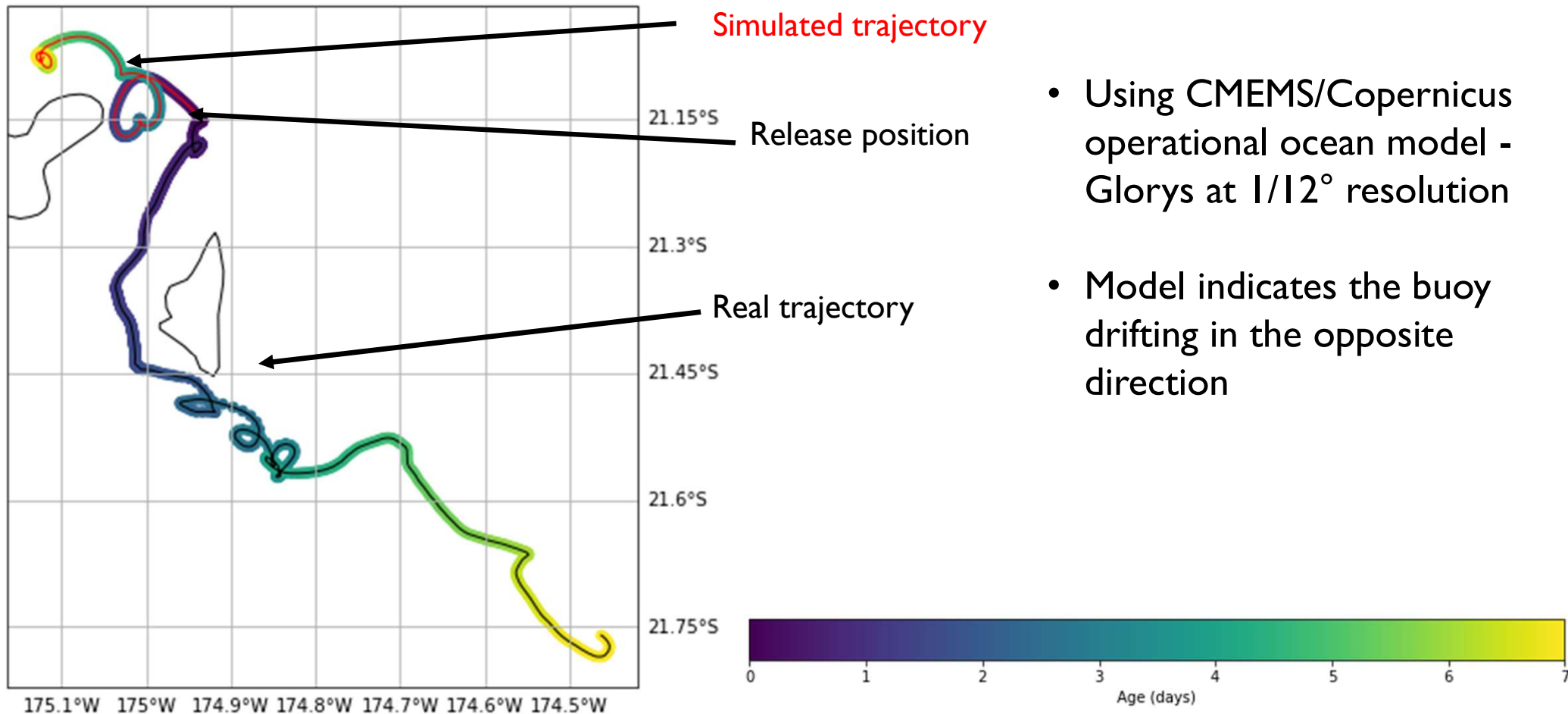
Wave buoy deployed in Tonga



Drifting Wave buoy track

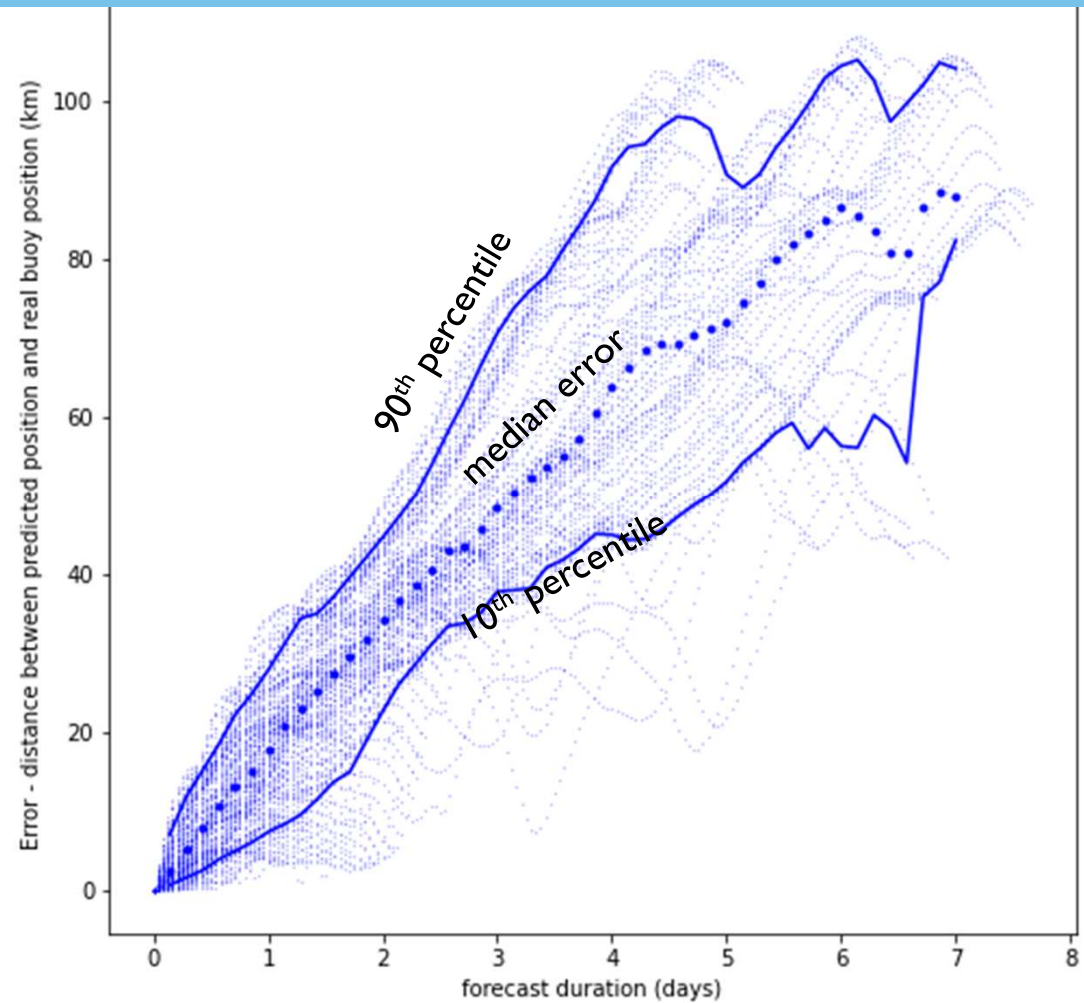
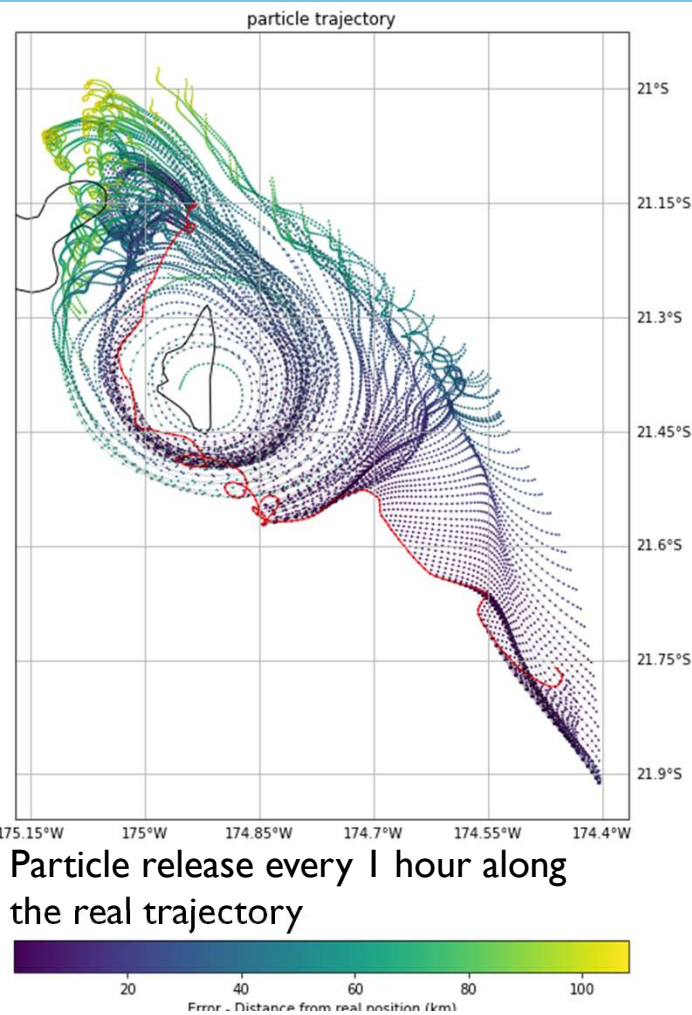
RAPID CASE STUDY

DRIFTING WAVE BUOY IN TONGA



RAPID CASE STUDY

DRIFTING WAVE BUOY IN TONGA



RAPID CASE STUDY

DRIFTING WAVE BUOY IN TONGA

Can we improve trajectory prediction within Island groups?

Exercise:

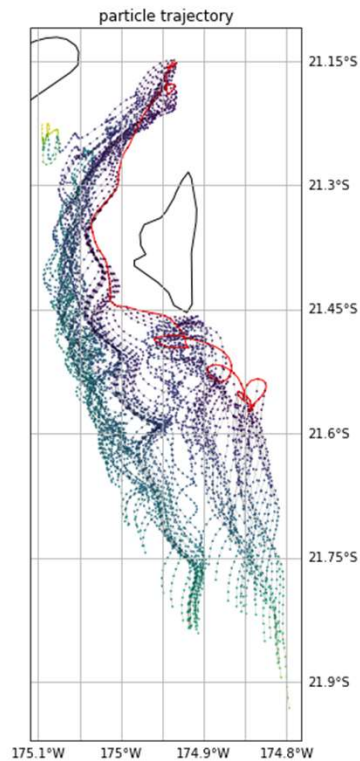
- Setting up a higher resolution model (1/50th resolution)
- No fine tuning
- No validation

CROCO model:

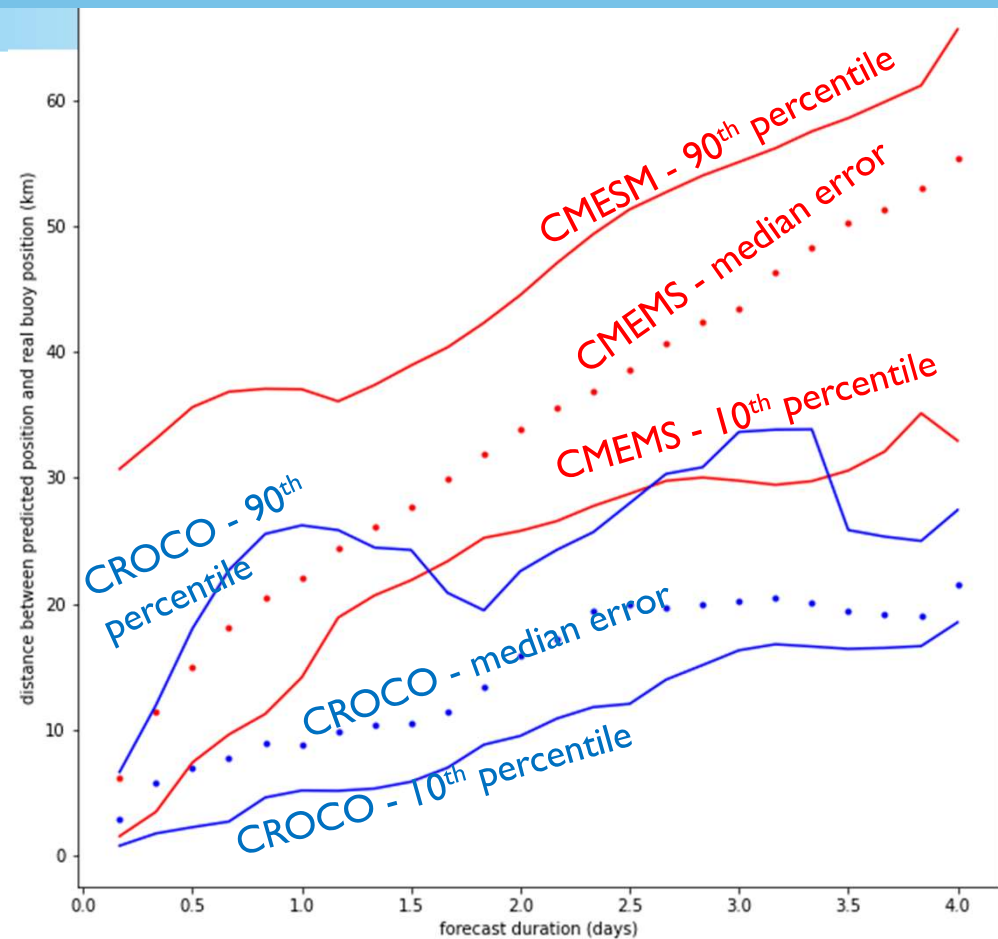
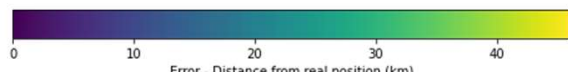
- ERA wind forcing
- GLORYS boundary conditions
- TPXO tide forcing

RAPID CASE STUDY

DRIFTING WAVE BUOY IN TONGA



Particle release every 1 hour along the real trajectory during first 4 days



Improved prediction around islands !

CONCLUSION



- There is a critical need to convert global ocean forecast into localised forecast products to strengthen regional EWS capacities
 - Operational Wave and inundation forecast developed for FJ, TV and KI
 - Upcoming system: Samoa, Tonga, CK, Niue
- SPC is now moving towards supporting localised ocean current forecast services within member countries
 - Model being developed for Solomon Islands under PCCOS
 - High Resolution ocean current models will be developed for CK, TV and Niue (ECIKS project)
- Results from Tonga drifting wave buoy case study looks promising. Could SPC's support to enhance national/regional ocean services be relevant to support regional SAR capacity?
- A strengthened collaboration between SAR community and NMHS could open new windows of opportunities for income generating activities