Reclamation and channel dredging of the Korea South Pacific Ocean Research Center, Chuuk

2016, 6

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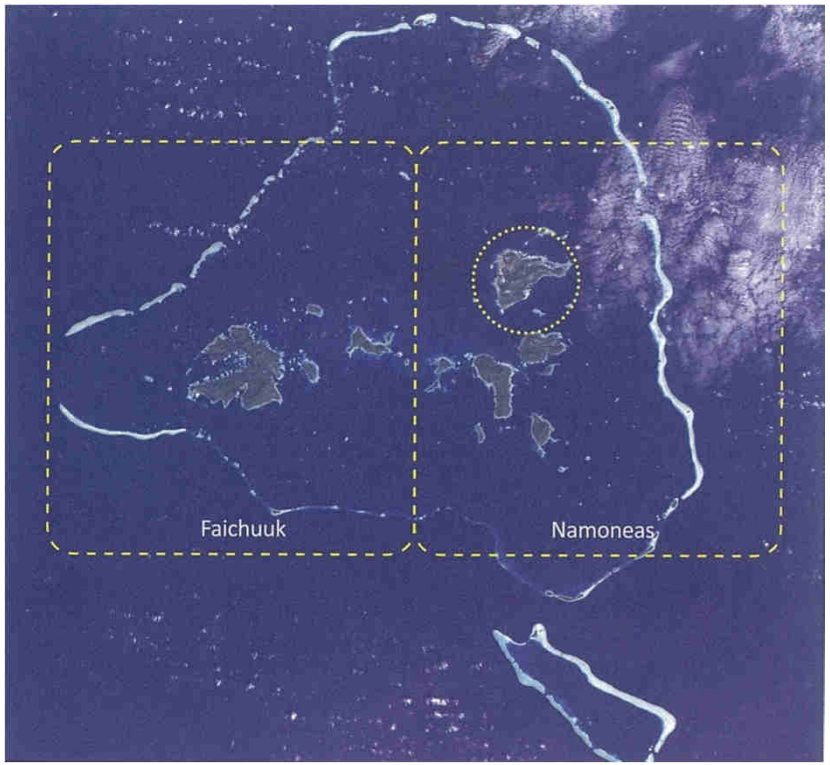
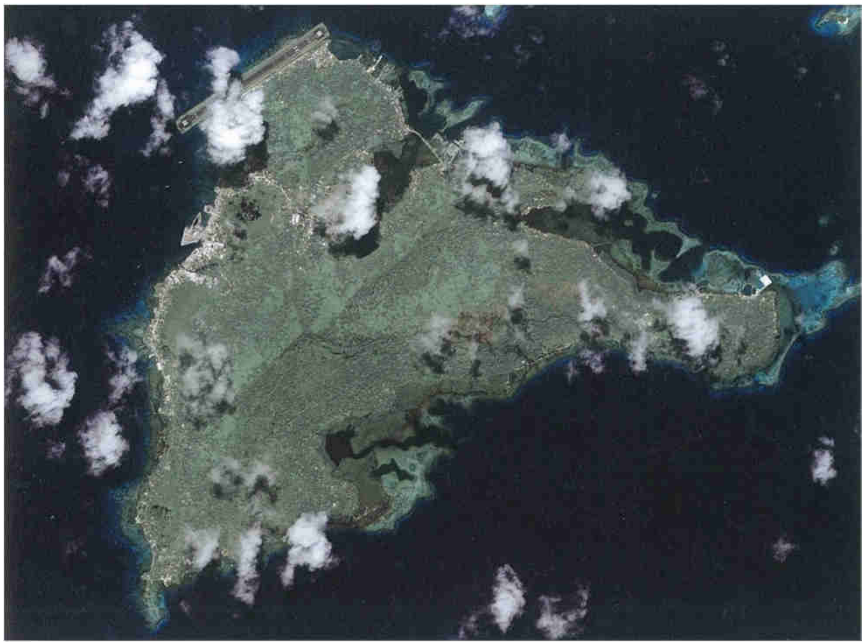
Korea Institute of Ocean Science and Technology

Satellite images of Chuuk islands

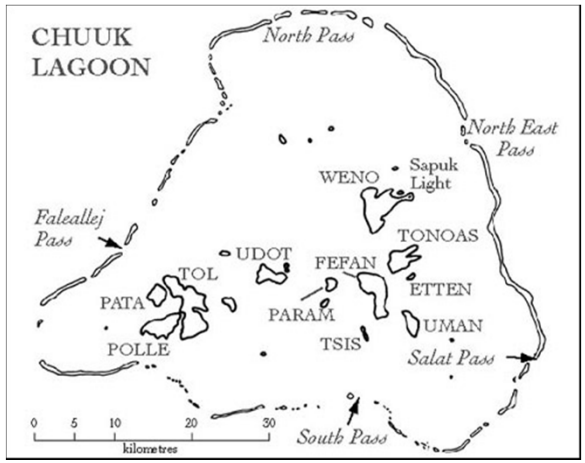


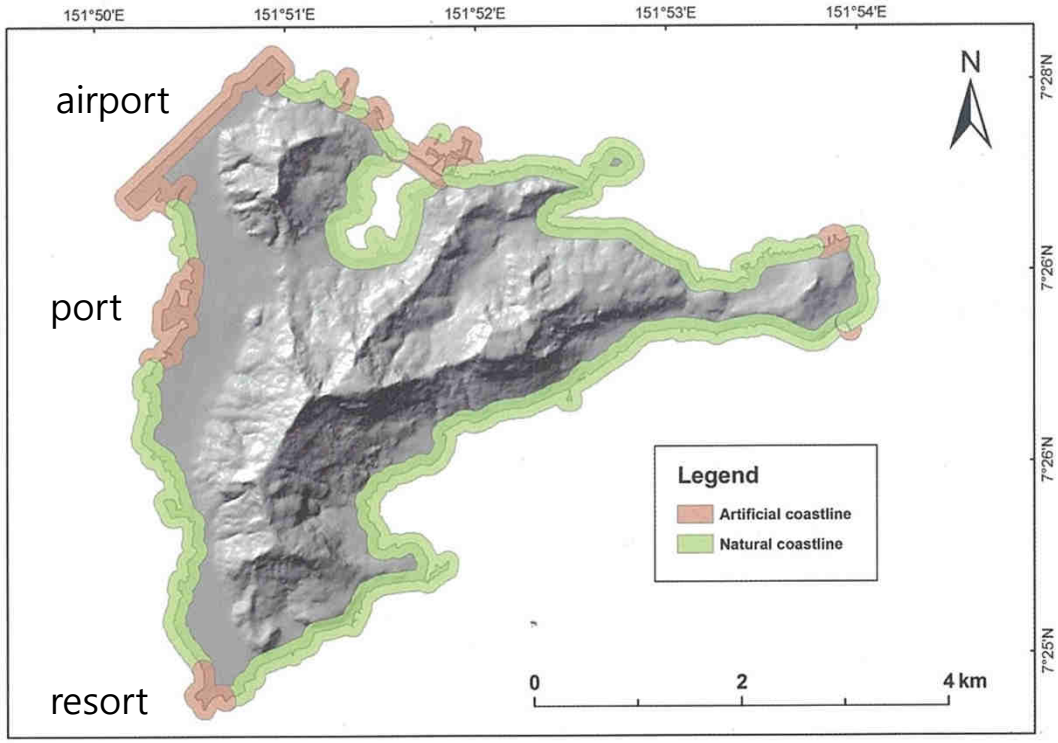
Landset in 2002



Korea Aerospace Research Institute in 2013

Coastline of Weno island



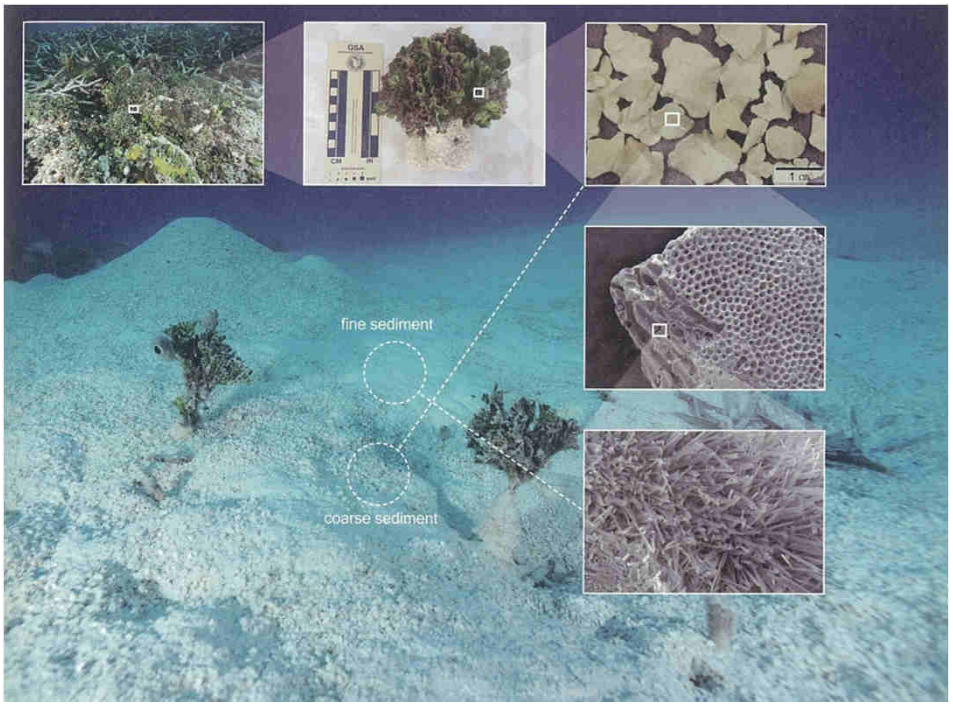


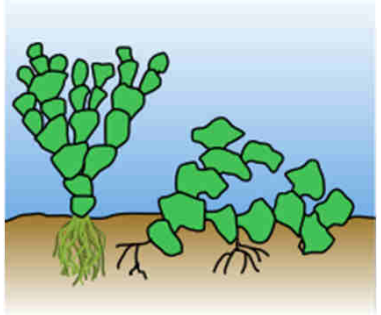
- The coastline of Weno island amounts to around 78 km.
- Major artificial coastlines are found in the areas of Chuuk international airport, port and Truk Blue lagoon resort.

Korea South Pacific Ocean Research Center in Weno island

- In 2000, KSORC was founded at Sapuk village.
- Last year, land reclamation was completed by dredged materials from channels, covering an area of 9,900 m^2.

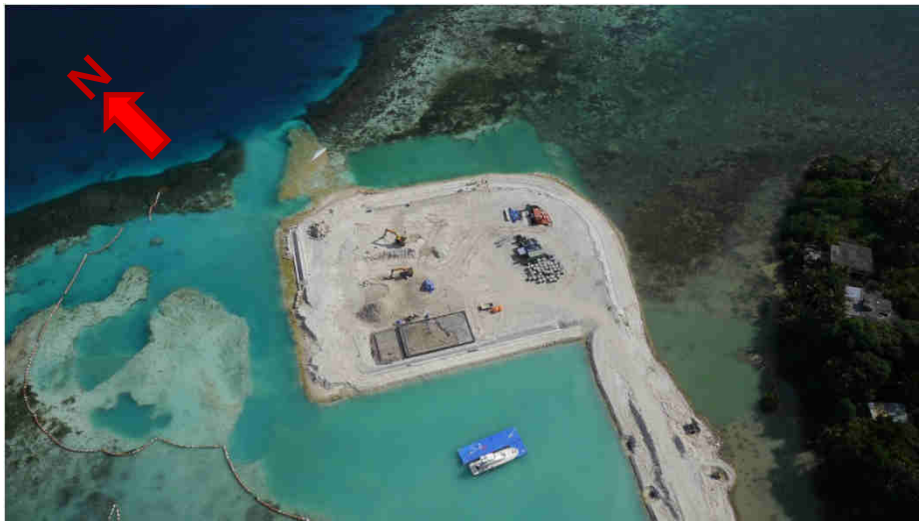
Sediment in the lagoon





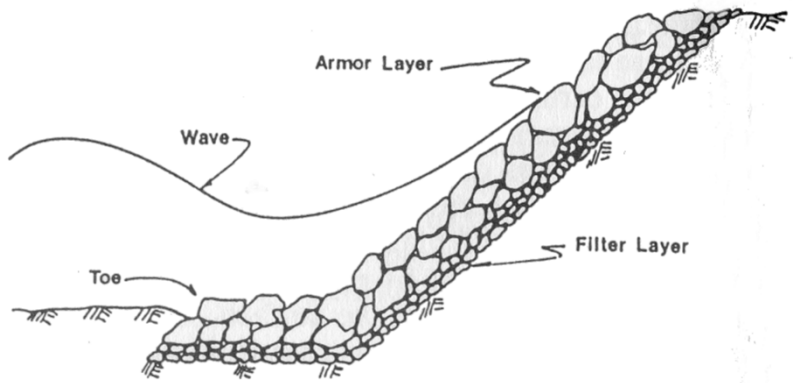
Sediments in shallower area are largely originated from **macro algae Halimeda**, whereas those found at deeper area are composed of coral and fragments of foraminifera.

Revetment damage



- West revetments of upper left corner were damaged in February 2016 by wave-induced current flowing along the revetment.
- The revetment is built to protect a scarp of the landfill against erosion.
- An emergency measures for toe protection has been taken place.

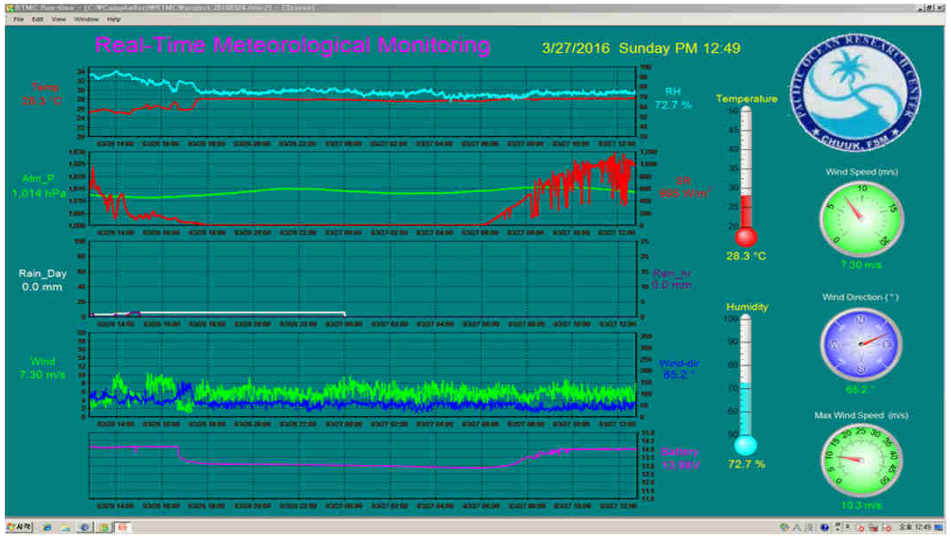
Revetment cross section



Typical stone armored revetment section

- Concrete armor layer provides the basic protection against wave action.
- Filter layer supports the armor, allows water to pass through the structure and prevents the underlying soil from being washed through the armor. ⇒ necessary to improve the filter layer
- Toe protection prevents displacement of the seaward edge of the revetment. ⇒ necessary to reinforce the toe protection

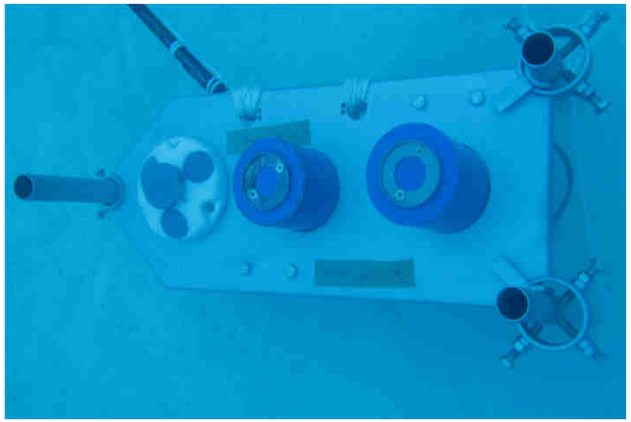
Automatic weather station



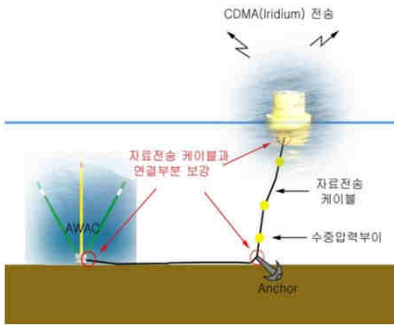
Model	Manufacturer	Sensors
WS501-UMB	KIPP & ZONEN	Temperature, Relative Humidity, Air Pressure, Wind Direction and speed, Solar Radiation
ERG(H)	ELP	Precipitation

- AWS is under operation in KSORC
- Measured data are saved and displayed every minute

Acoustic Wave And Current profiler

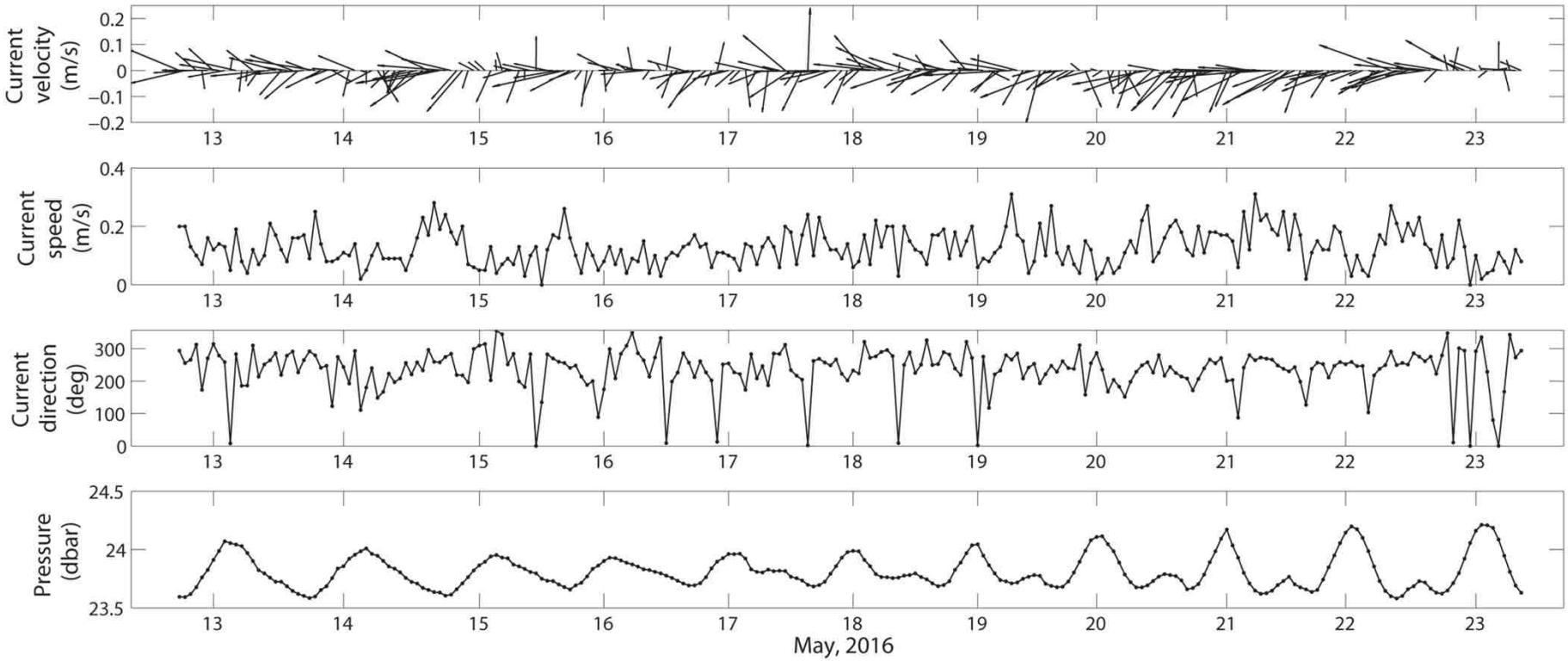


- Current, Wave, Pressure and Temperature data
- Online data collection every hour via IRIDIUM communication satellite
- Started from 12 May, 2016 at 24 m deep



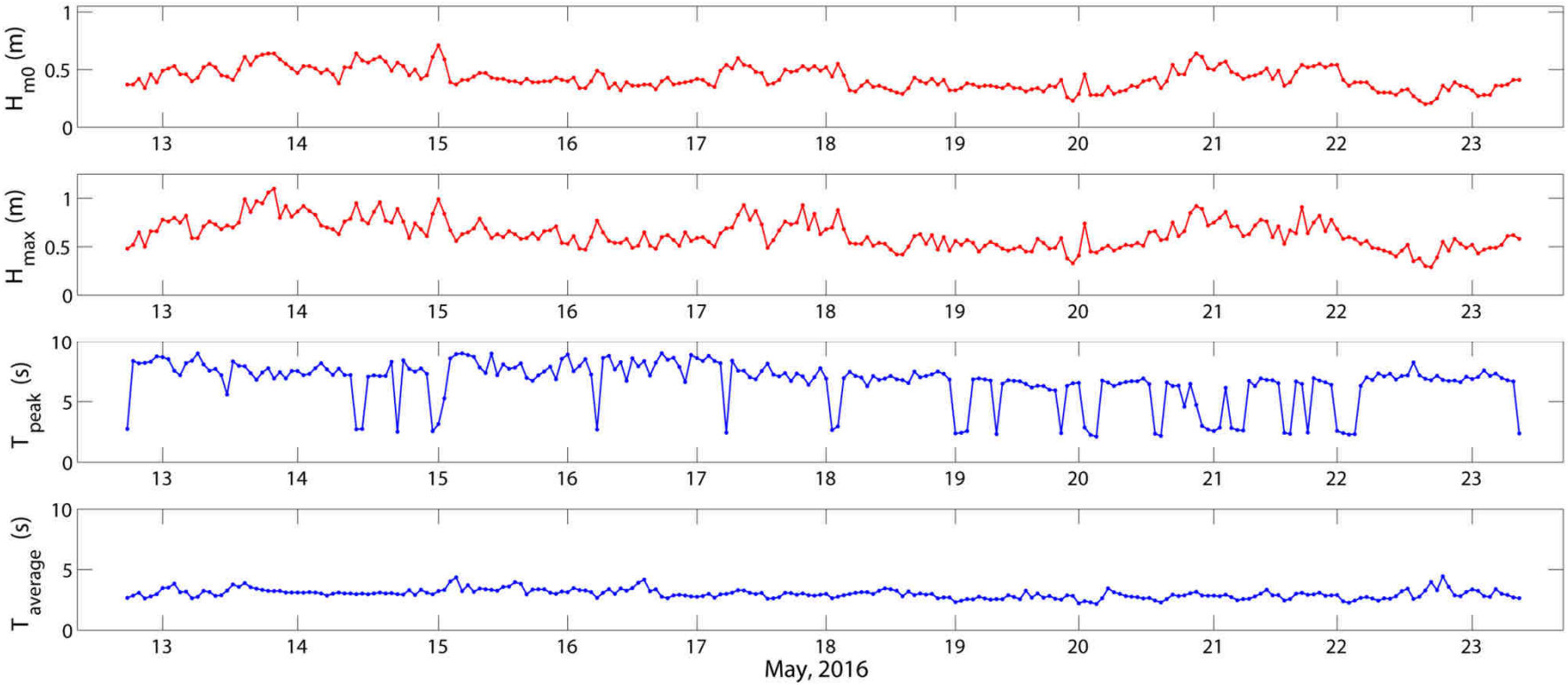
Real-time data transfer system

Observed surface current



- Current speed: 0.04 ~ 0.31 m/s
- Pressure: 23.58 ~ 24.21 dbar

Observed wave



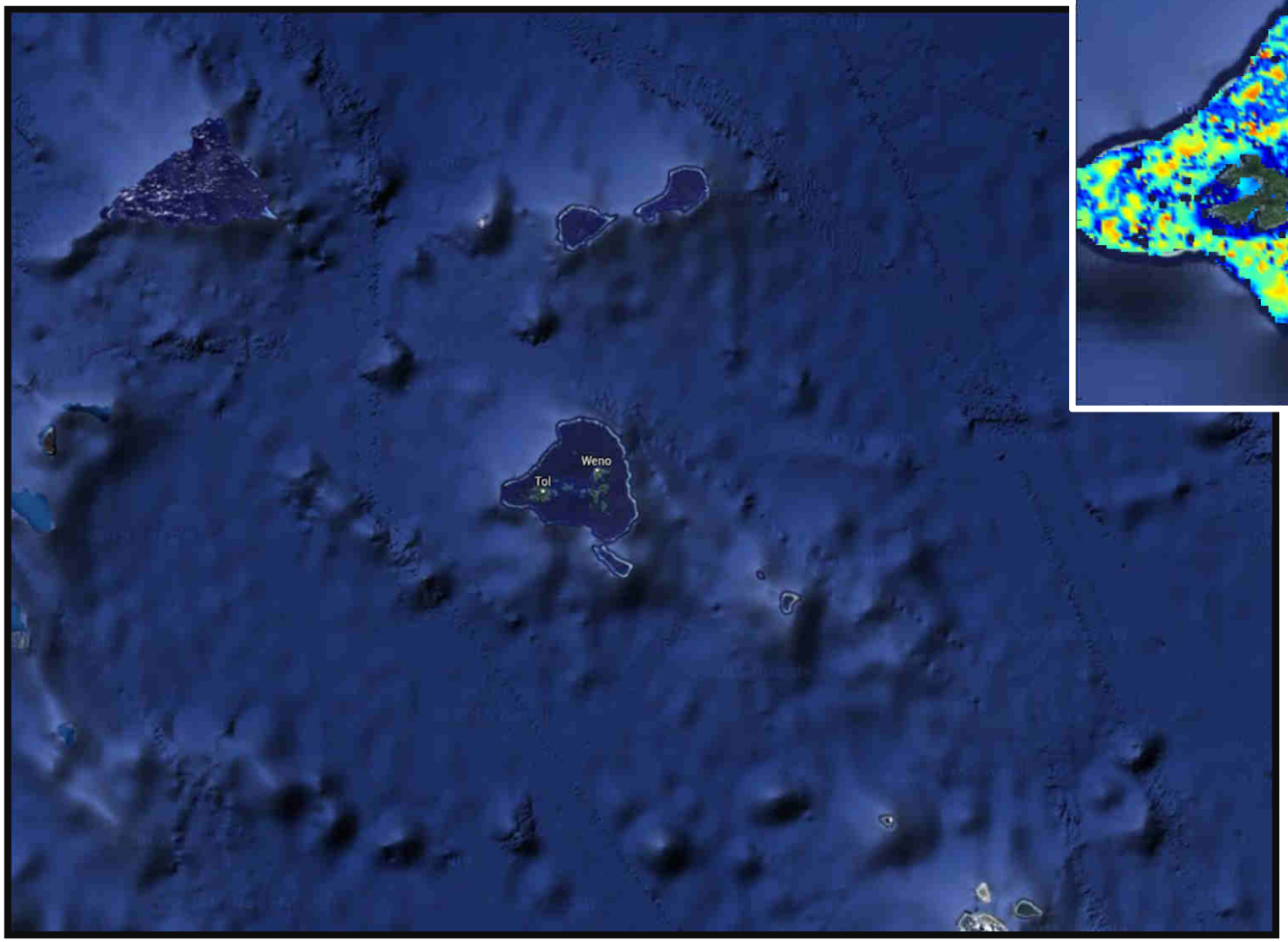
- H_{m0} wave height: 0.20 ~ 0.71 m
- Average wave period: 2.16 ~ 4.45 s

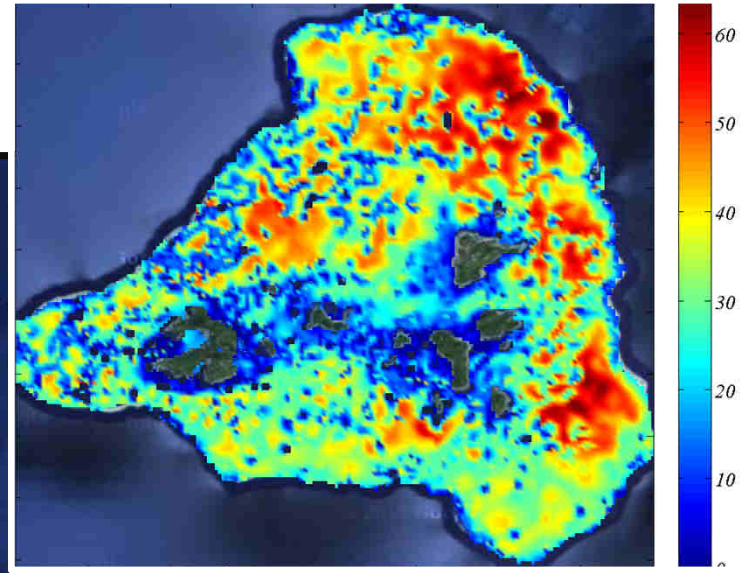
Tide observation

- Self-recording pressure sensor installed at 2.5 m deep
- Measures surface elevation continuously at every 0.5 sec

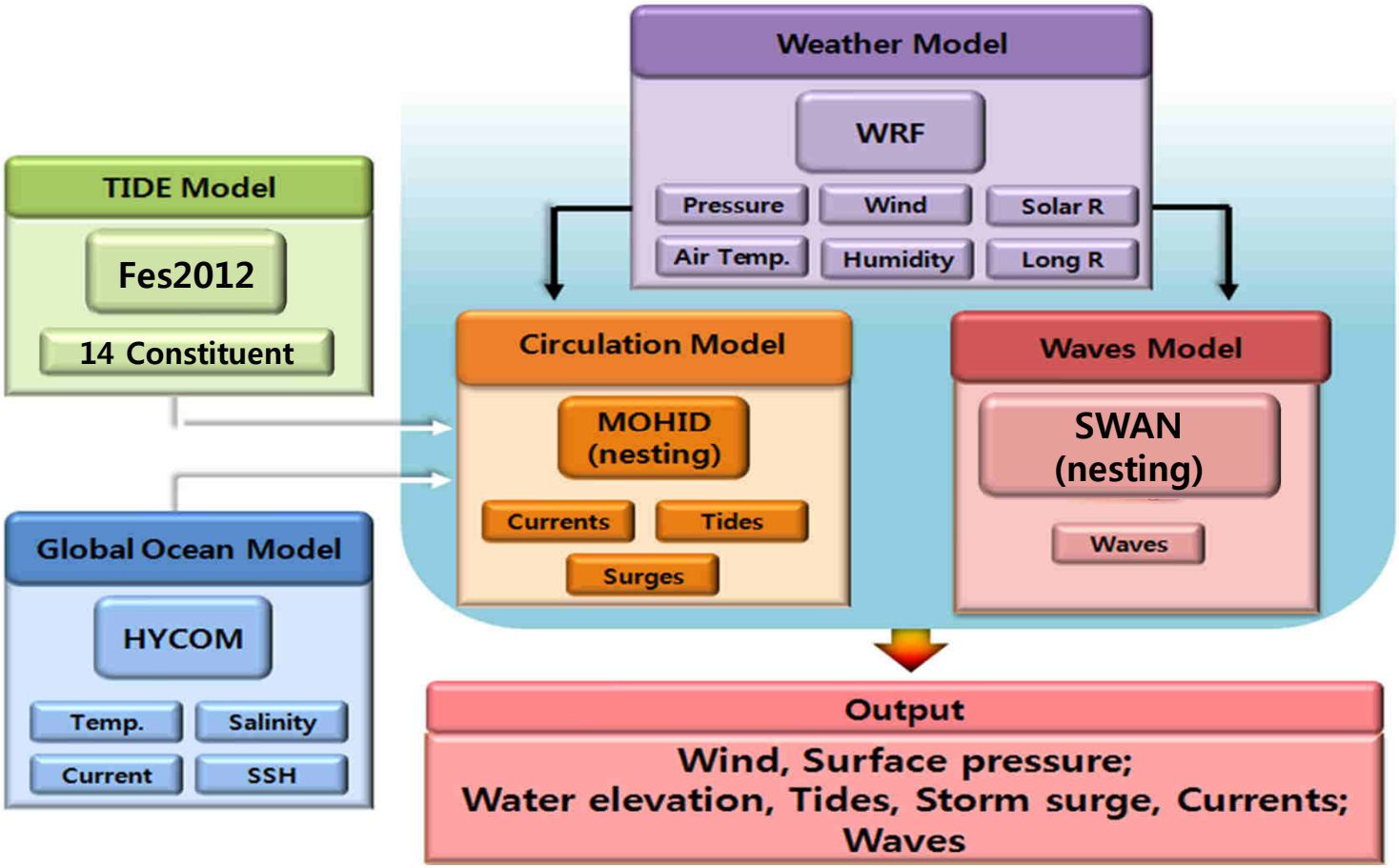
Bathymetric data

GEBCO 2014 Gridded bathymetric data (30 sec)
http://www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_30_second_grid/





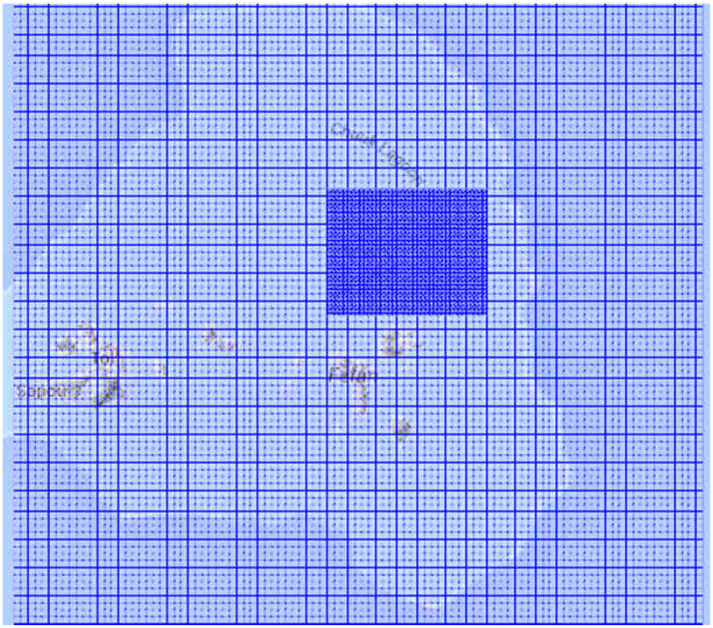
Chuuk Forecasting System



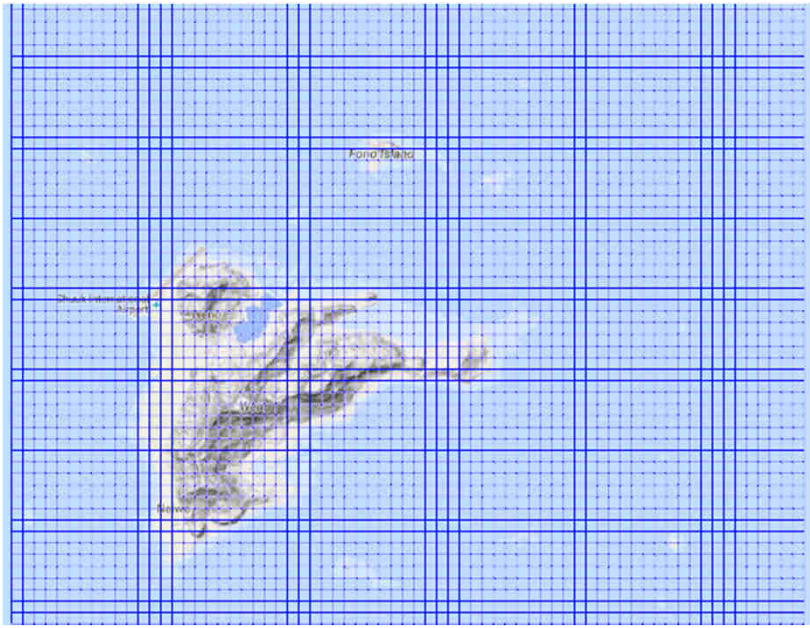
Nested grid system

5 levels: L1 (18km) → L2 (9km) → L3 (3km) → L4 (1km) → L5 (300m)

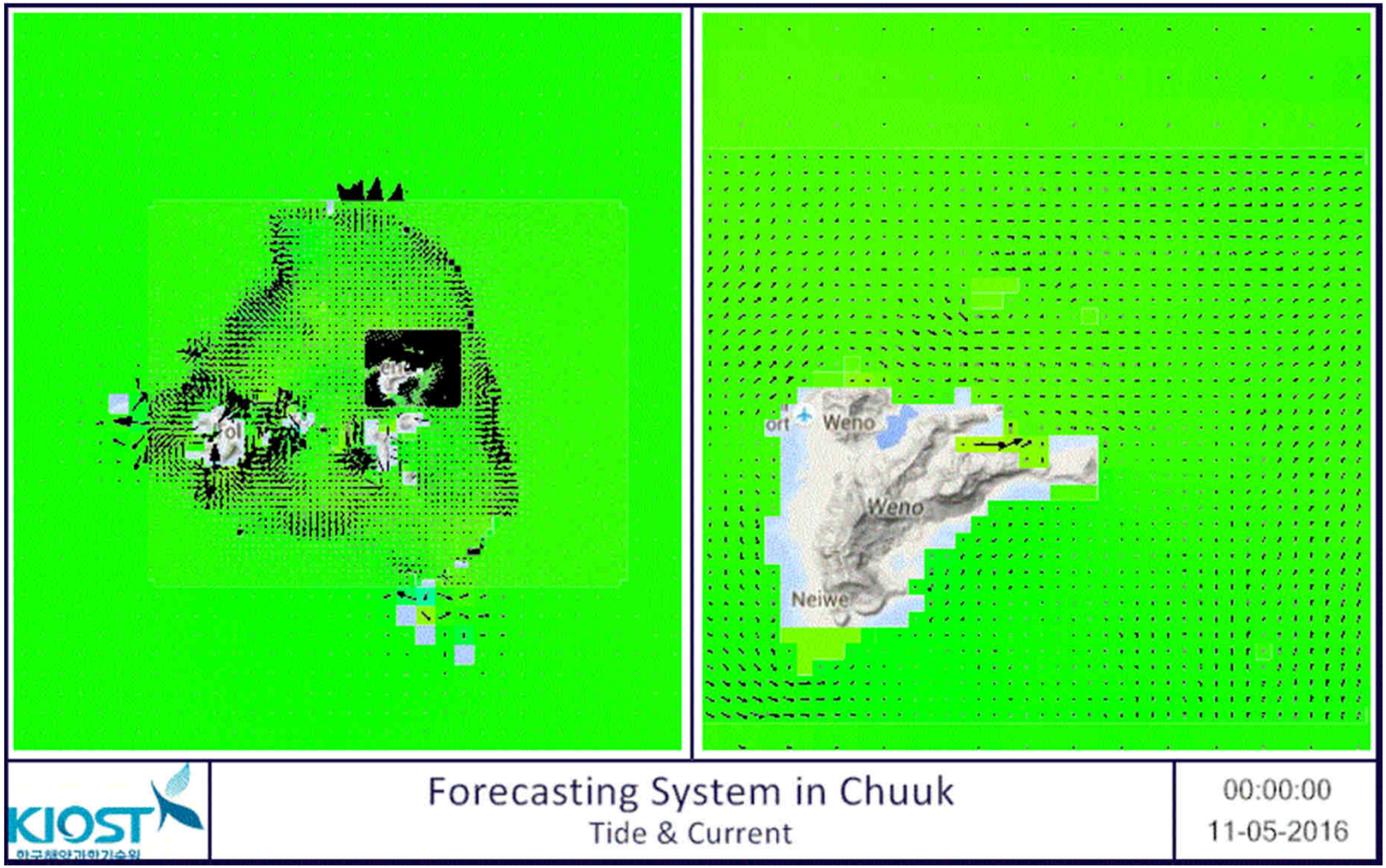
L4 (1 km)



L5 (300 m)

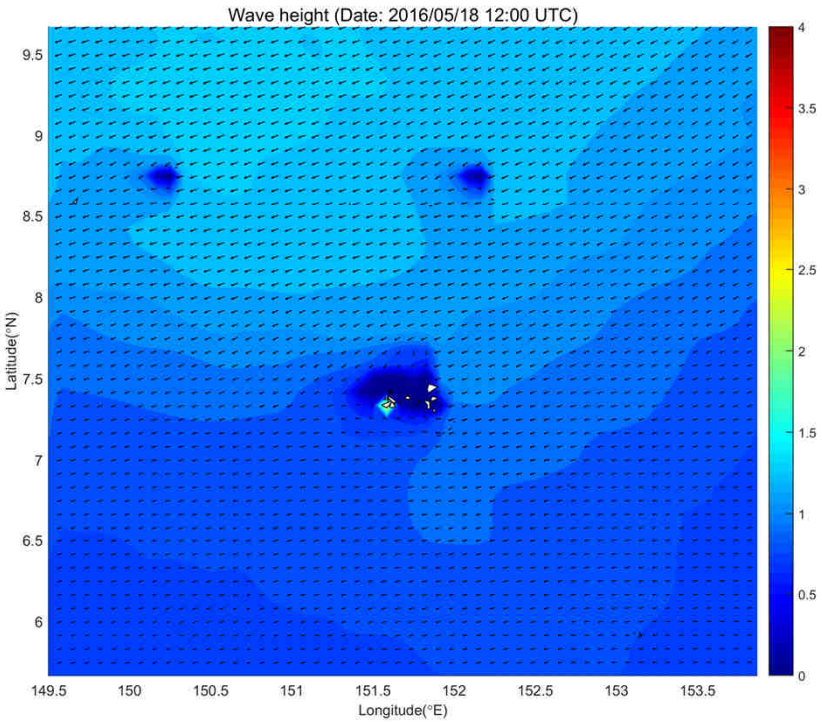


High resolution 3-D circulation

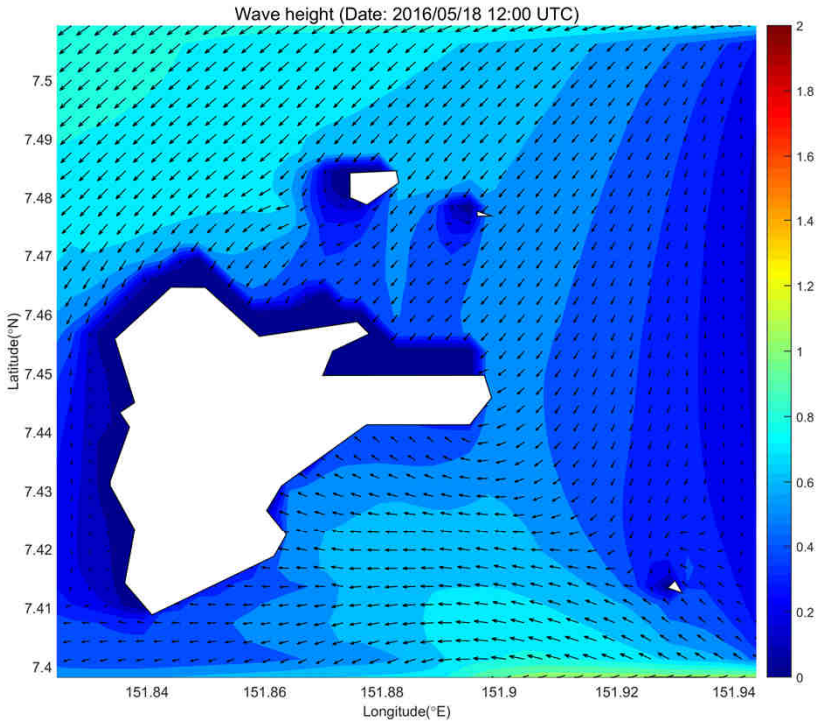


High resolution wave field

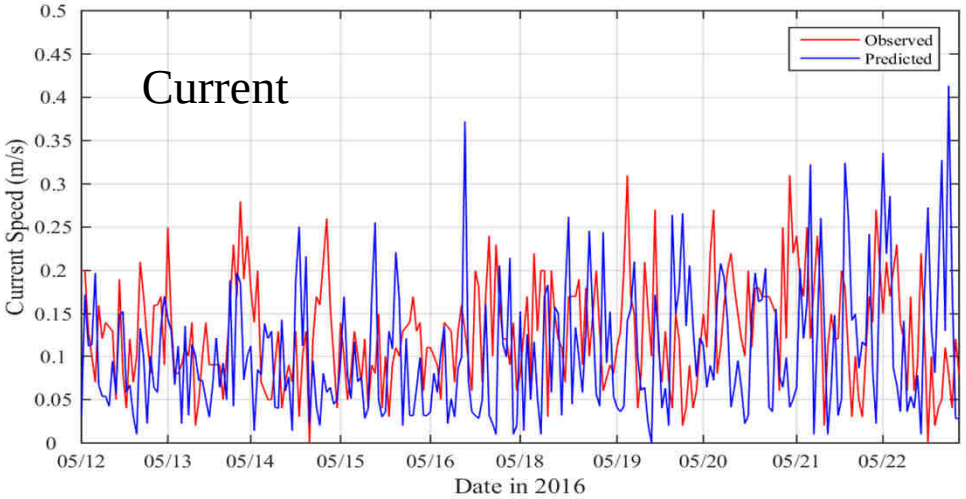
L2 (9 km)

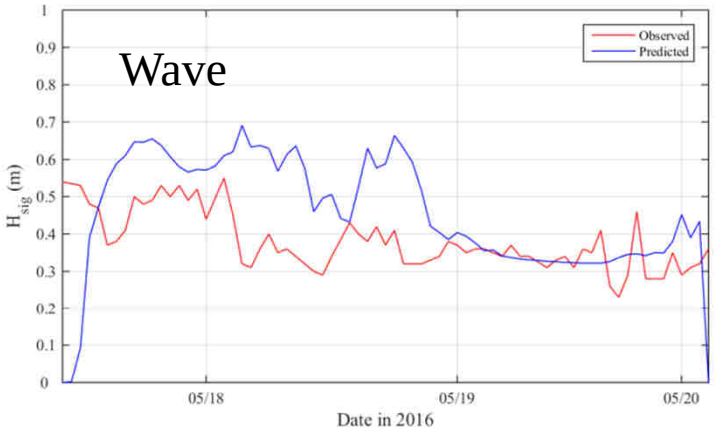


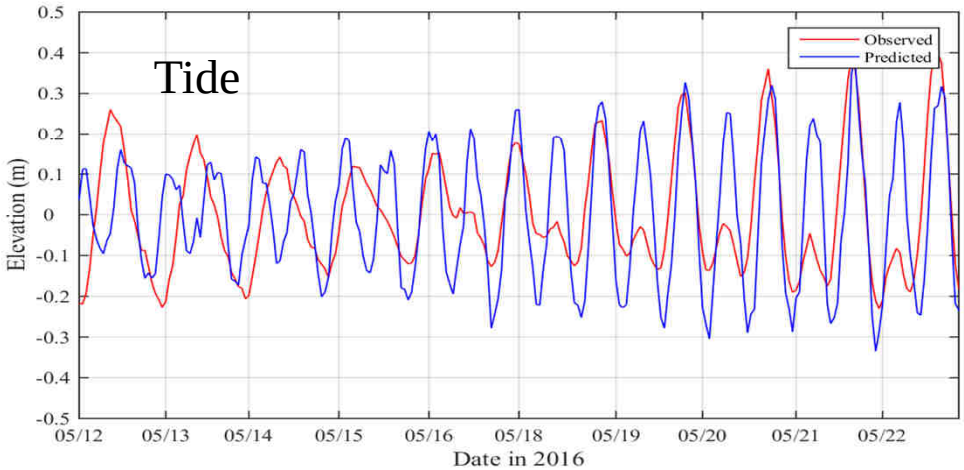
L5 (300 m)



Validation of numerical results

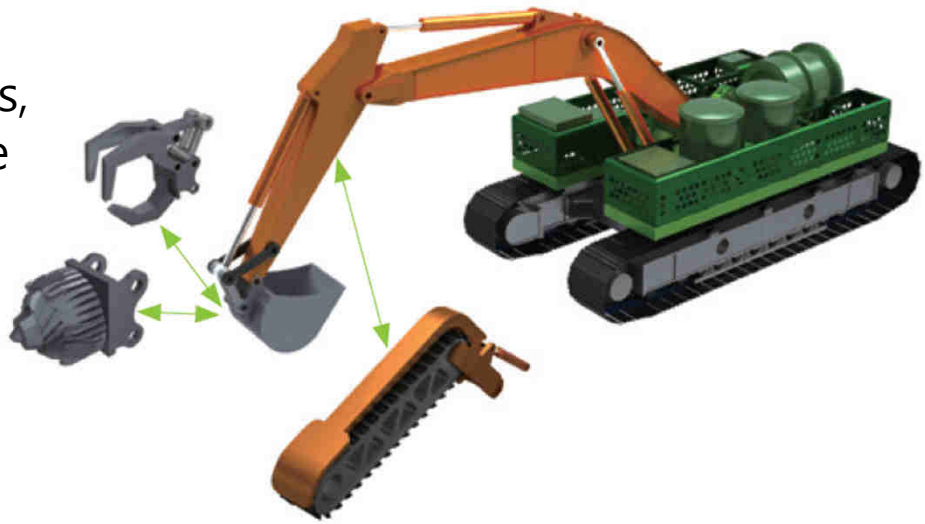






Underwater Construction Robot

Using various attachments, this track based ROV can be utilized against underwater heavy-duty construction works.
Using a cutter which make trenches, underwater cables/pipelines can be laid in the trenches



- Depth rating 500m
- Moving speed : max 2km/h
- Climbing angle : 30° (unloaded condition)
- Laying depth : max. 2m
- Laying speed : trenching speed 300m/h
- Workable seabed condition : Compression strength of 20MPa or below

Conclusions

- Additional works are needed to obtain more reliable numerical predictions.
- Find sustainable engineering solutions for the reinforcement of toe protection.
- Our efforts to provide environmental information for the South Pacific will be continued and extended.