



# Coral sensor network at Racha Island, Thailand



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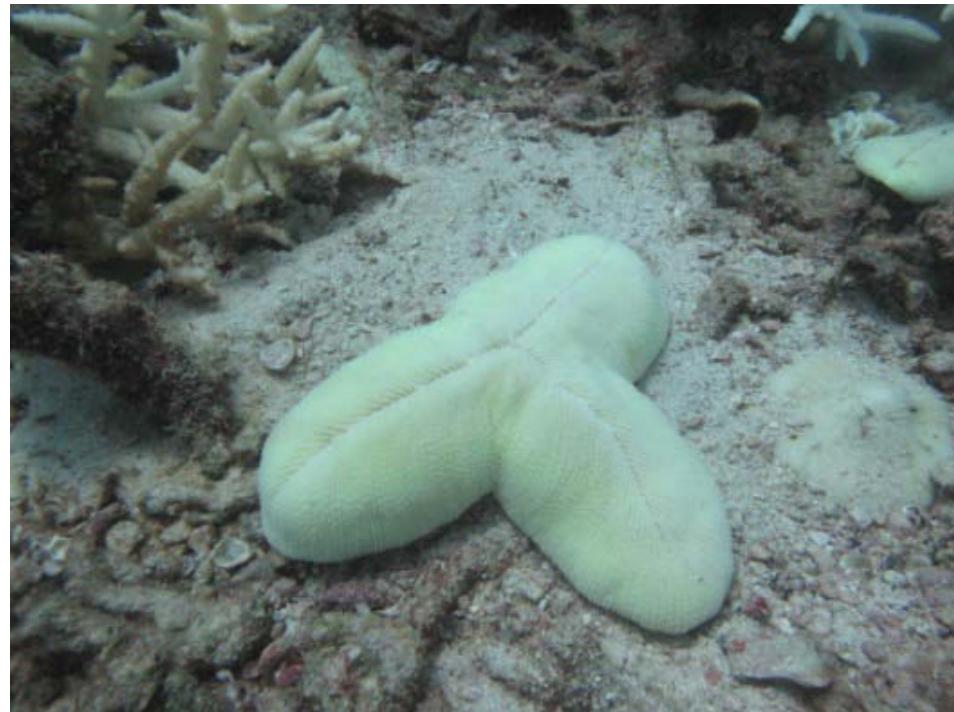
# Racha Island's coral diversity





# What cause bleaching events?

- Elevated ocean temperatures
- Reductions or increases in salinity
- Intense solar radiation
- Sedimentation
- Chemical pollutants



# Why Racha Island?



- Large scale coral bleaching was observed at Racha Island in 2009/10 with some of the HOBO loggers recording water temp up to 33.12 °C.
- There were 70-80% coral mortality.





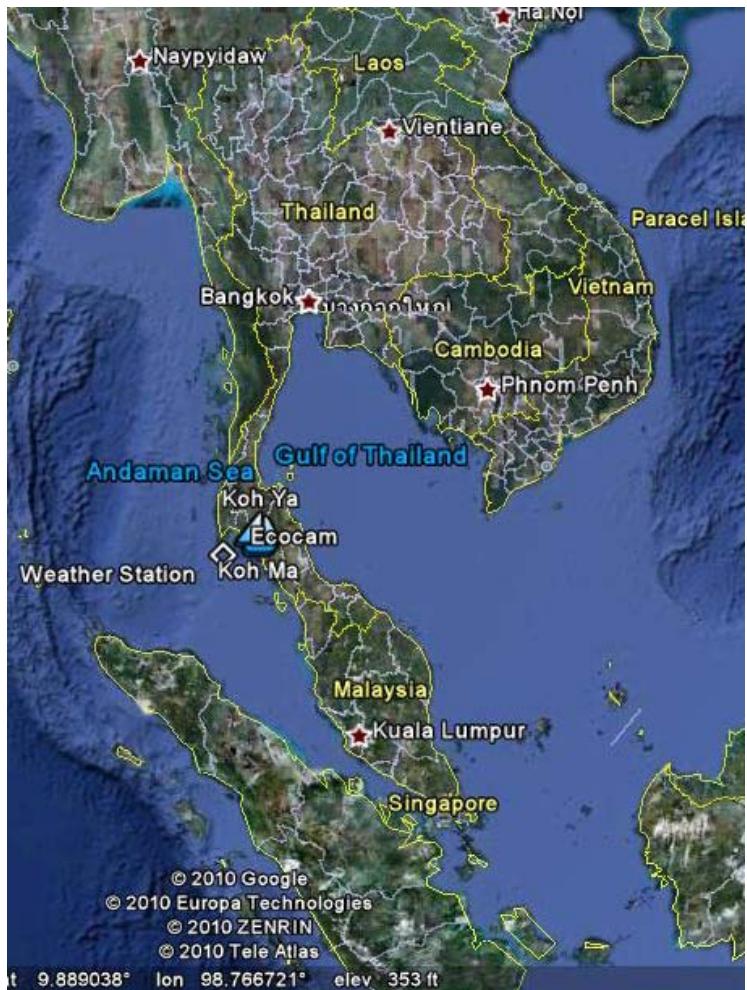
# Objective



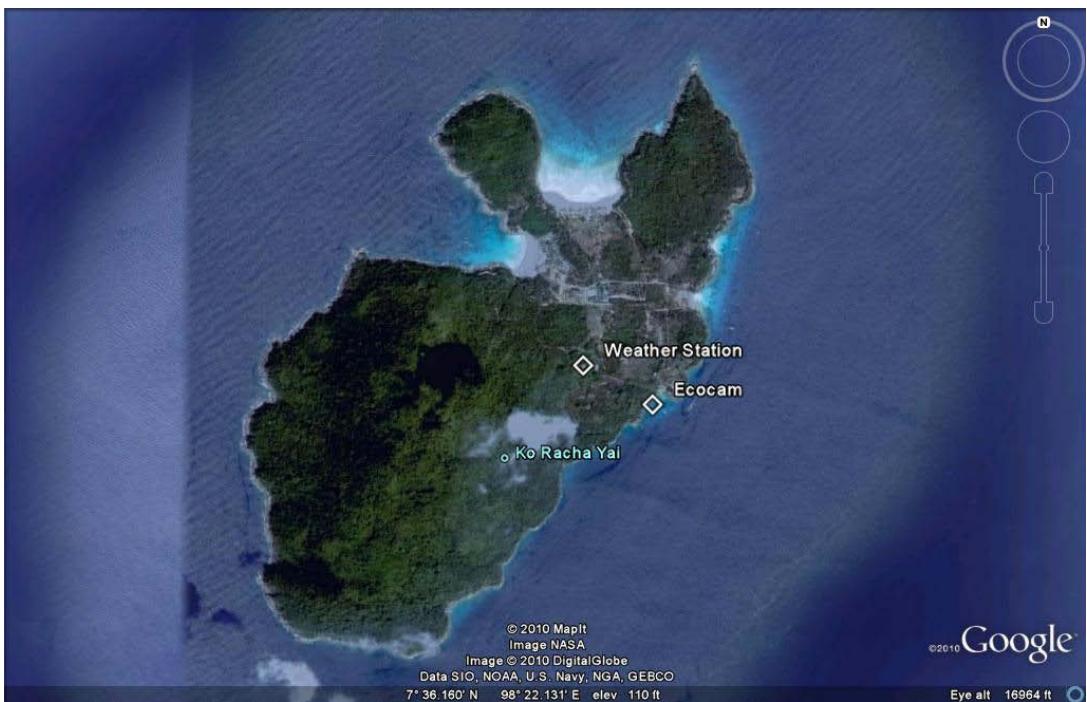
- We use a sensor network for monitoring a coral ecosystem at Racha Island, Phuket, Thailand.
- This project is part of the Coral Reef Environmental Observation Network (CREON)



# Study site



- Racha Island, Thailand is located at latitude 7.61528 °N and longitude 98.37125 °E .





# Study Site: Banraya beach





# Table 1 Deployed Sensors in Real-Time System

Sensor	Sampling Interval	Types of Measurement	Networked
Weather Station	1 min	Temperature, Rain, Wind, Humidity, Bar. Pressure, Solar Radiation	Yes
CTD	5 min	Conductivity, Temperature, Depth	Yes
HOBO	10 min	Temperature, Lux	No
EcoCam	Cont.	Video	Yes

# HOBO Light/temp sensor



- On June 2007, we deployed HOBO Pendant temperature and light data loggers.

# Weather Station



- Davis Vantage Pro II Plus was installed at Racha Island since Nov 2009.
- 26 weather data were measured, e.g. max/min temp, RH, rainfall, UV index, solar radiation, wind speed, wind direction.



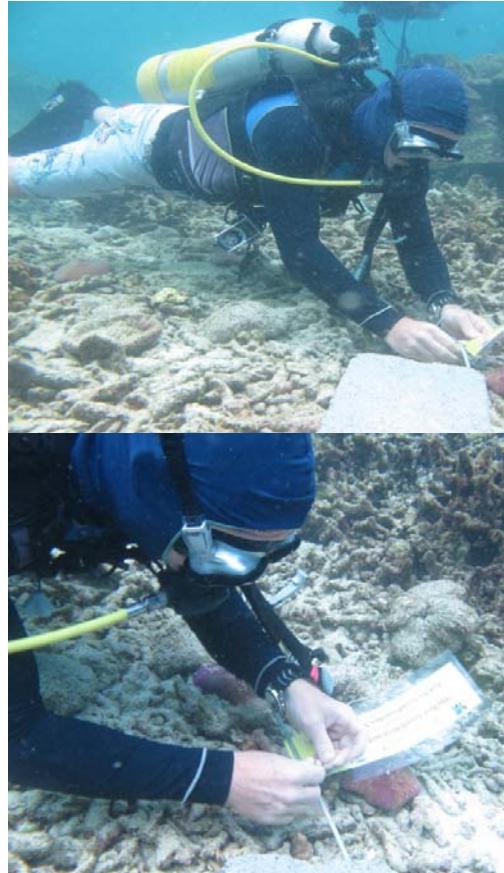
# Ecocam at Racha Island



- On February 2010, four EcoCams capable of real time video capture were deployed, 2 underwater on the reef and 2 on land.



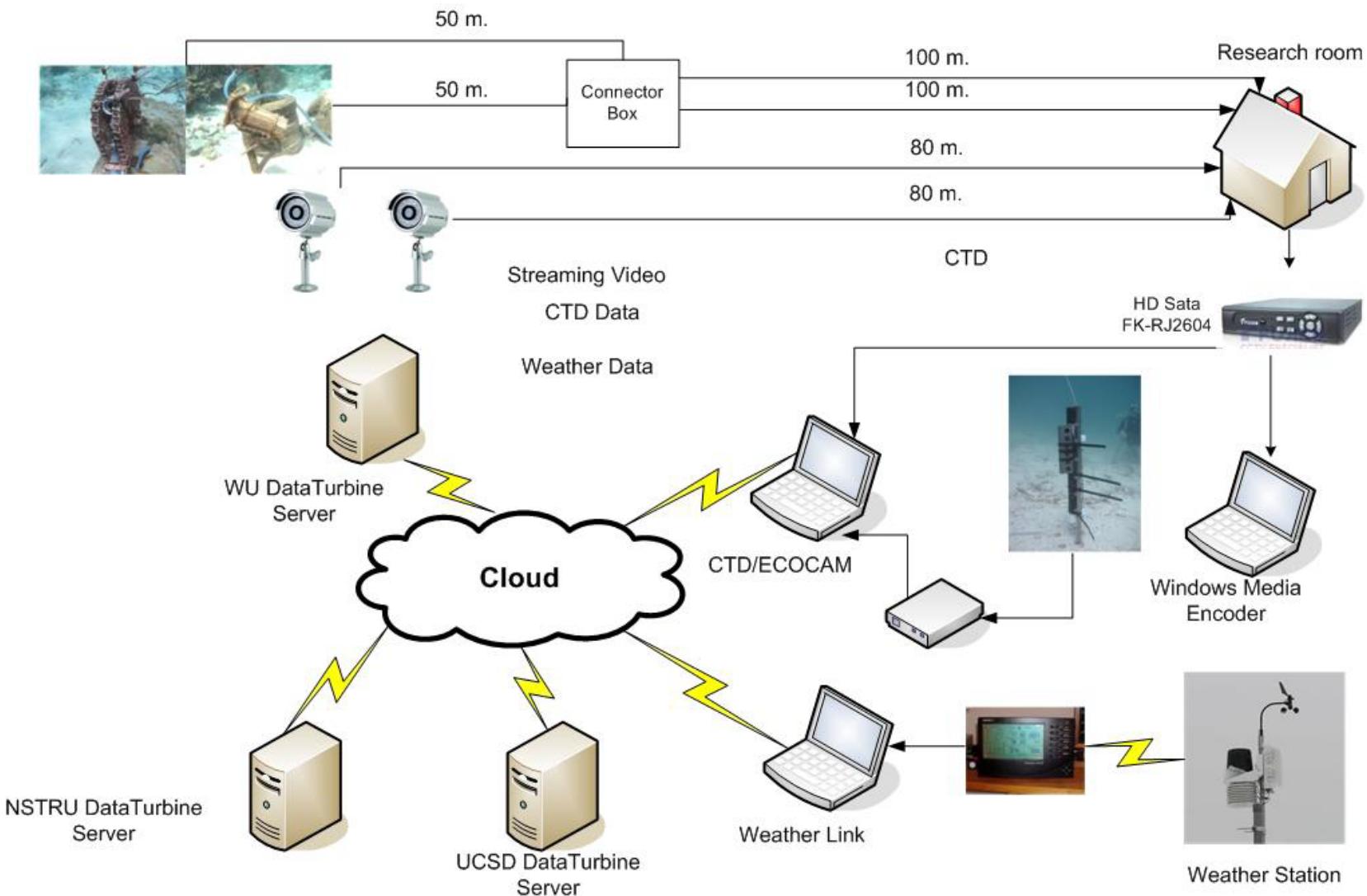
# CTD



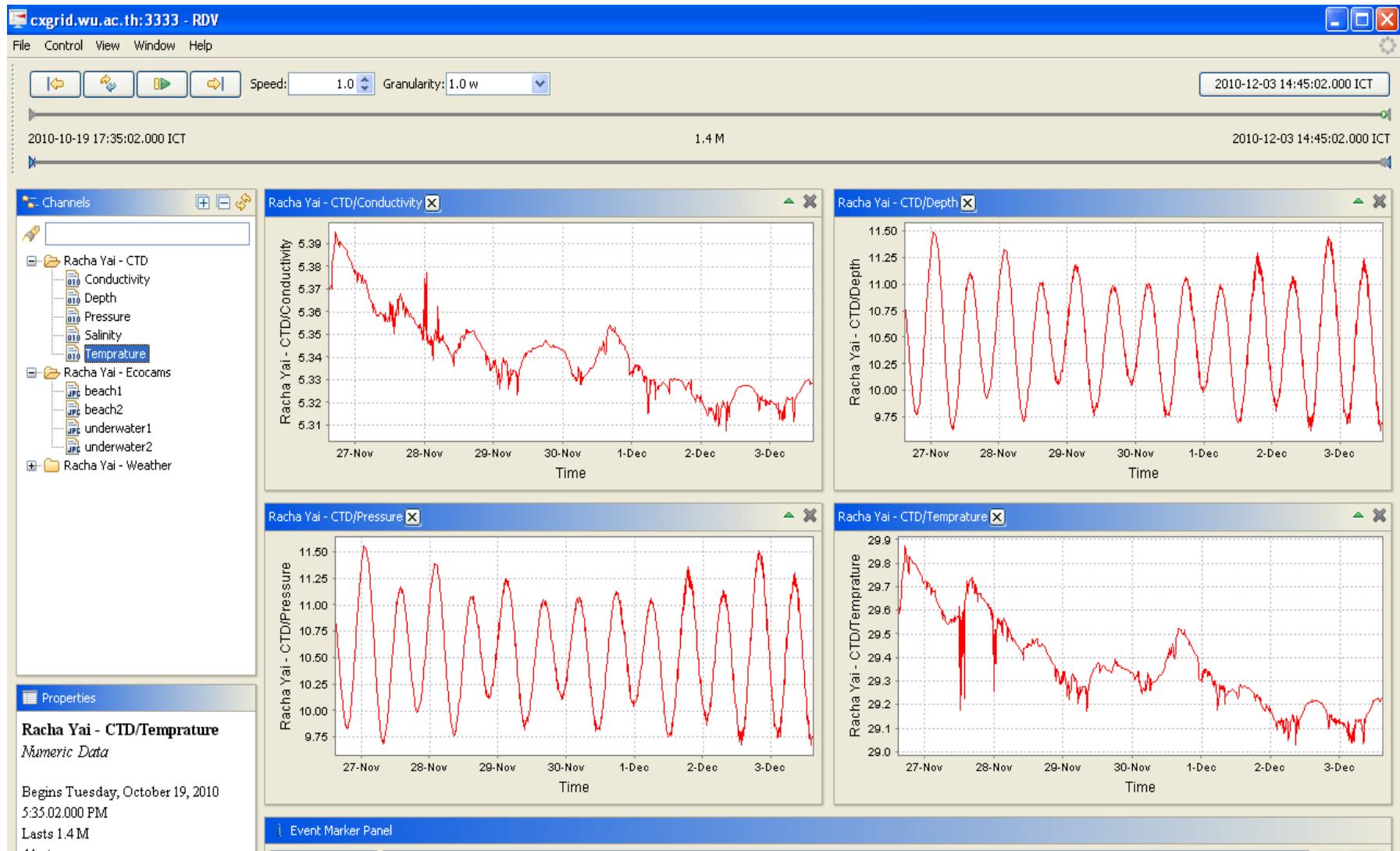
- In October 2010, a SeaBird SBE37 CTD was deployed on the fringing reef in 10 m water depth with 5 min sampling frequency.



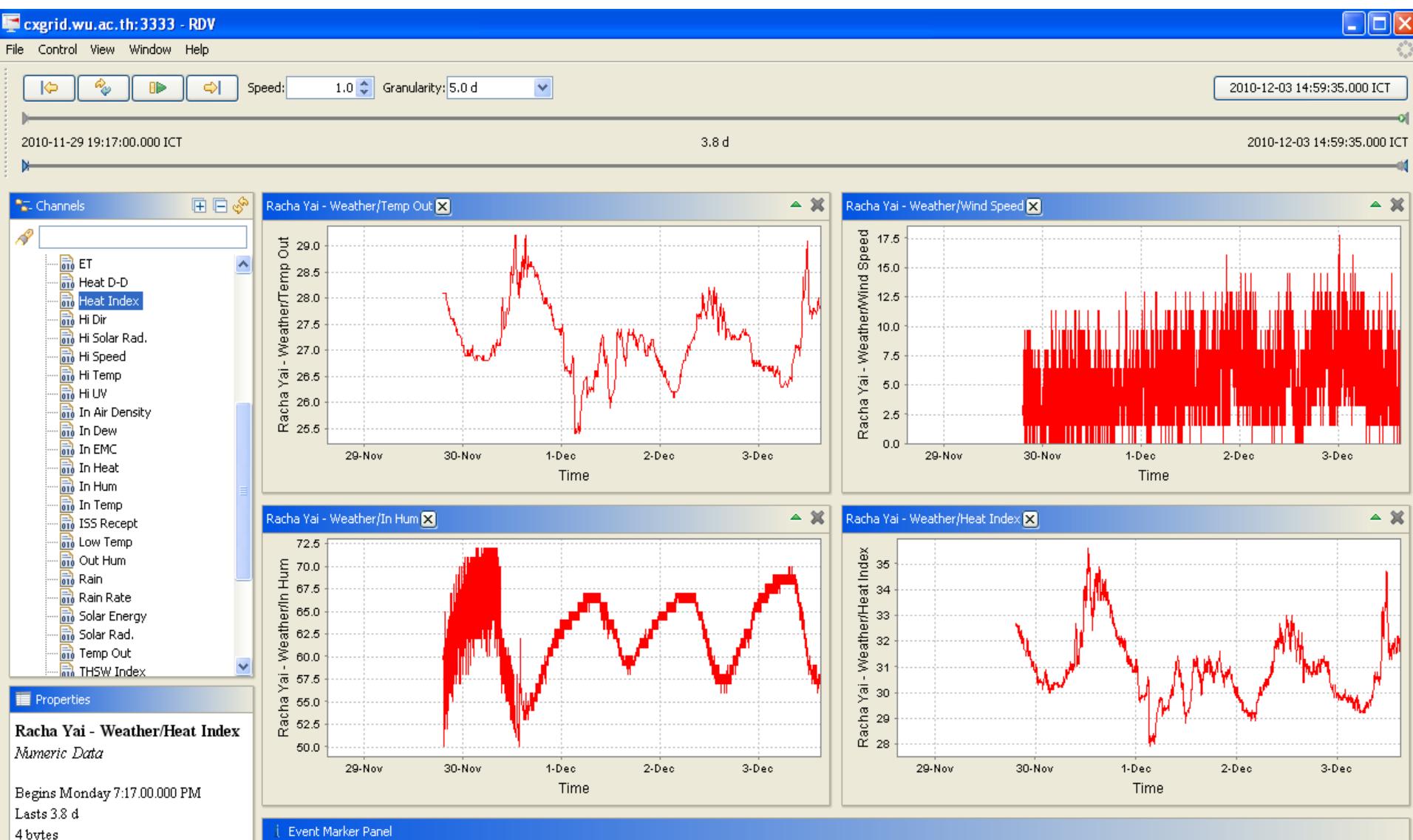
# Racha Island System Overview



# DataTurbine Real-time Data Viewer (RDV): CTD data



# RDV: Weather data



# RDV: Ecocam data

**xgrid.wu.ac.th:3333 - RDV**

File Control View Window Help

Speed: 1.0 Granularity: 1.0 w

2010-12-03 14:59:35.000 ICT

6.2 d

2010-12-03 14:59:35.000 ICT

**Channels**

- Racha Yai - CTD
  - Conductivity
  - Depth
  - Pressure
  - Salinity
  - Temprature
- Racha Yai - Ecocams
  - beach1
  - beach2
  - underwater1
  - Underwater2
- Racha Yai - Weather

**Racha Yai - Ecocams/beach1**



**Racha Yai - Ecocams/beach2**



**Racha Yai - Ecocams/underwater1**



**Racha Yai - Ecocams/underwater2**



**Properties**

Racha Yai - Ecocams/underwater2

JPEG Images

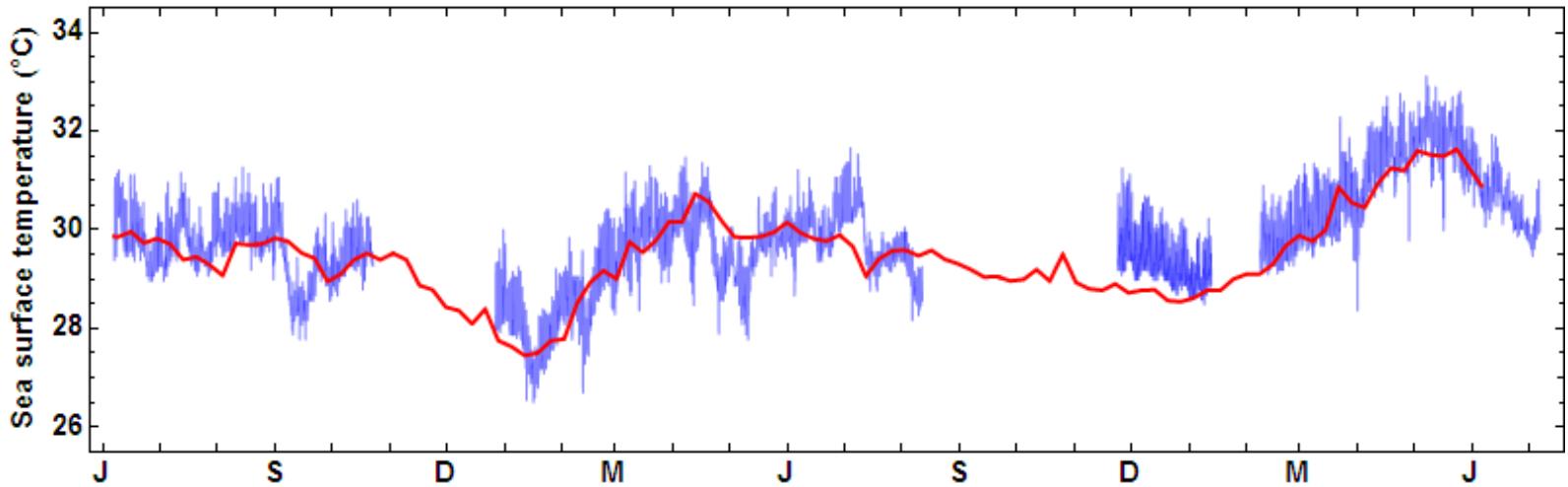
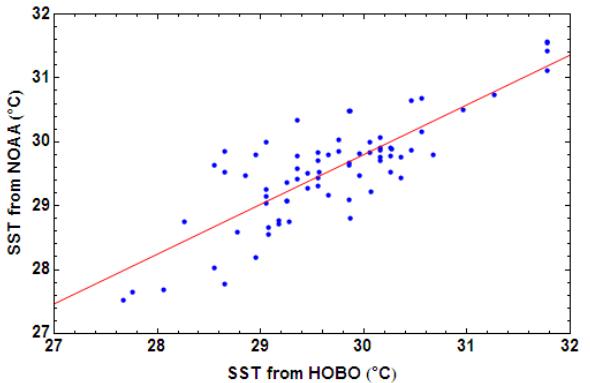
Begins Saturday 9:36.31.000 AM

Lasts 6.2 d

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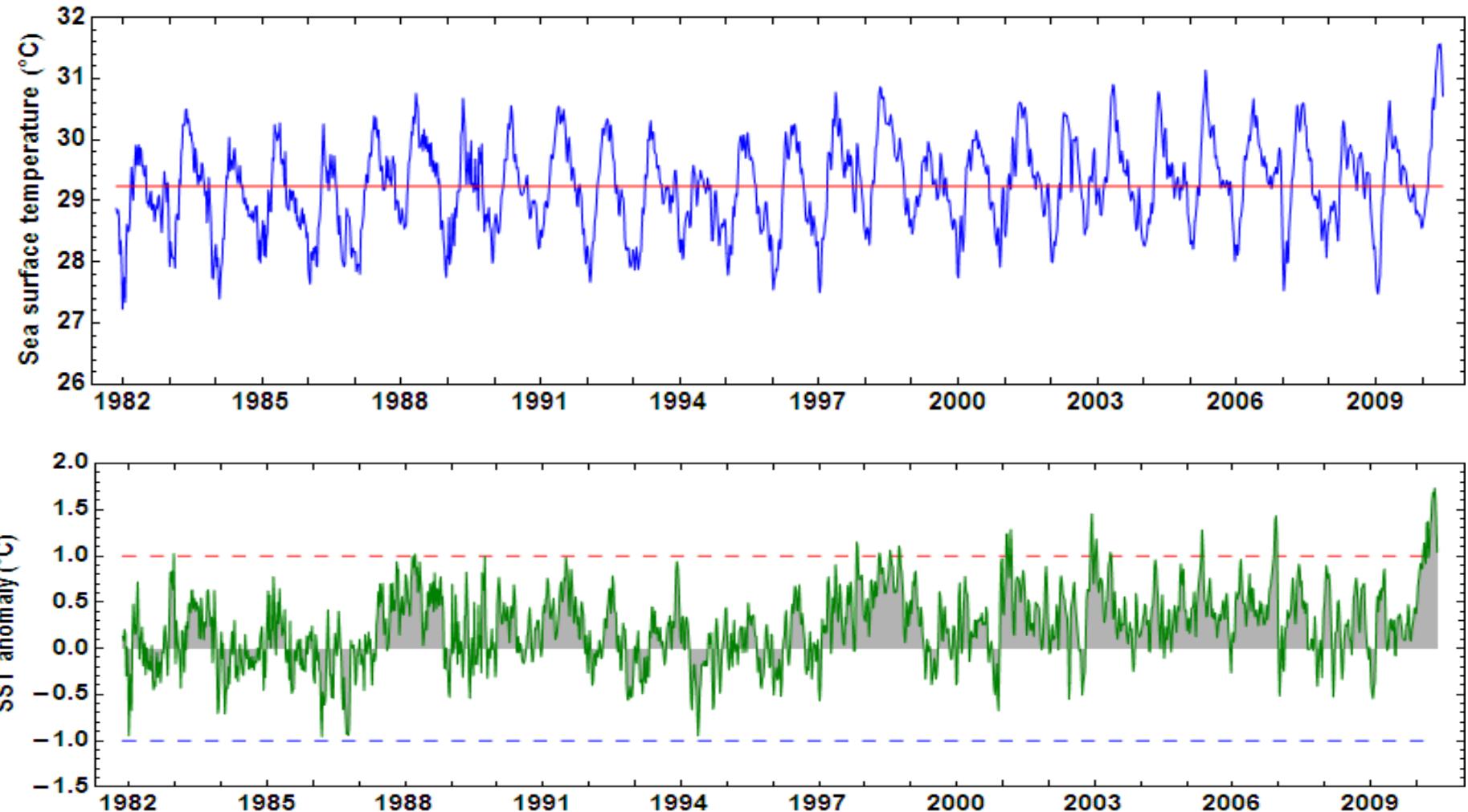
Event Marker Panel

# Comparison between HOBO and NOAA data

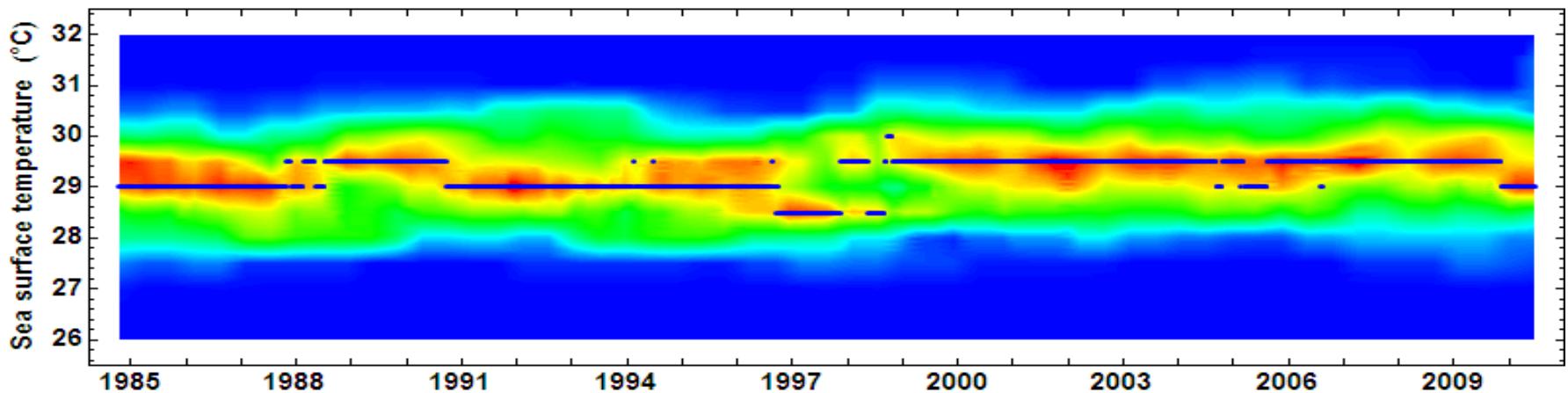
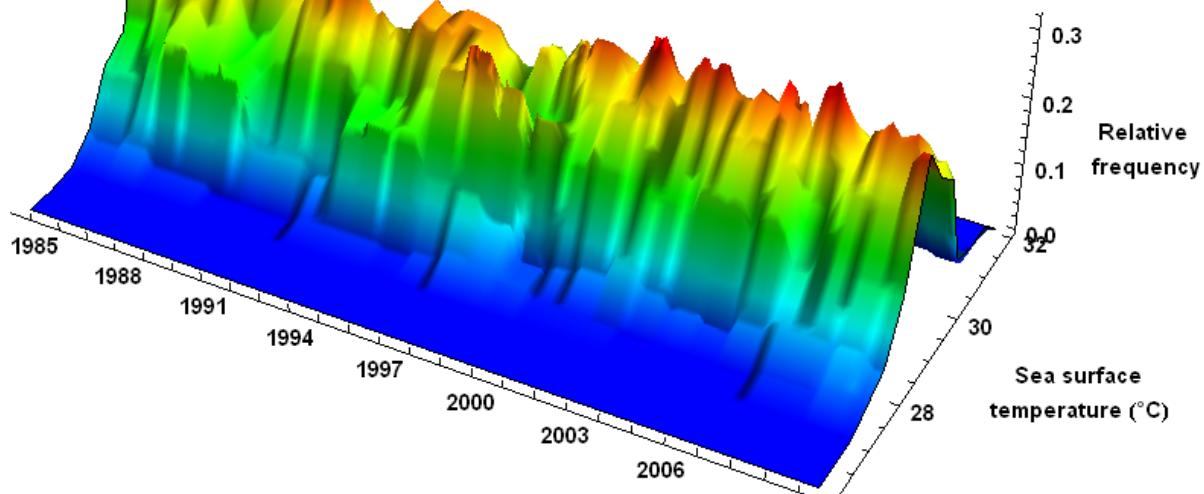


*SST from HOBO (blue line) and NOAA (red line):  
 Racha Island in the Andaman Sea (7 June 2008-7 July 2010)*

# SST and SSTa from NOAA data



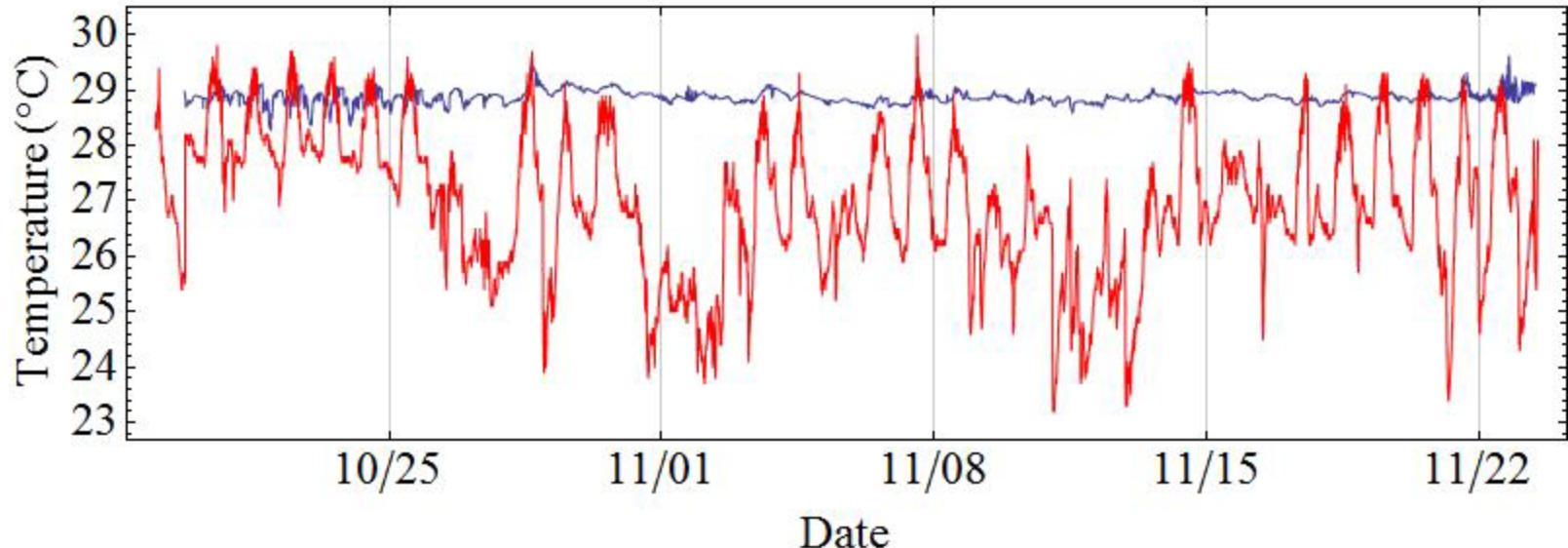
# SST Analysis



*SST 3D moving histogram at Racha Island.*

*SST contour moving histogram at blue dots represent SST modes.*

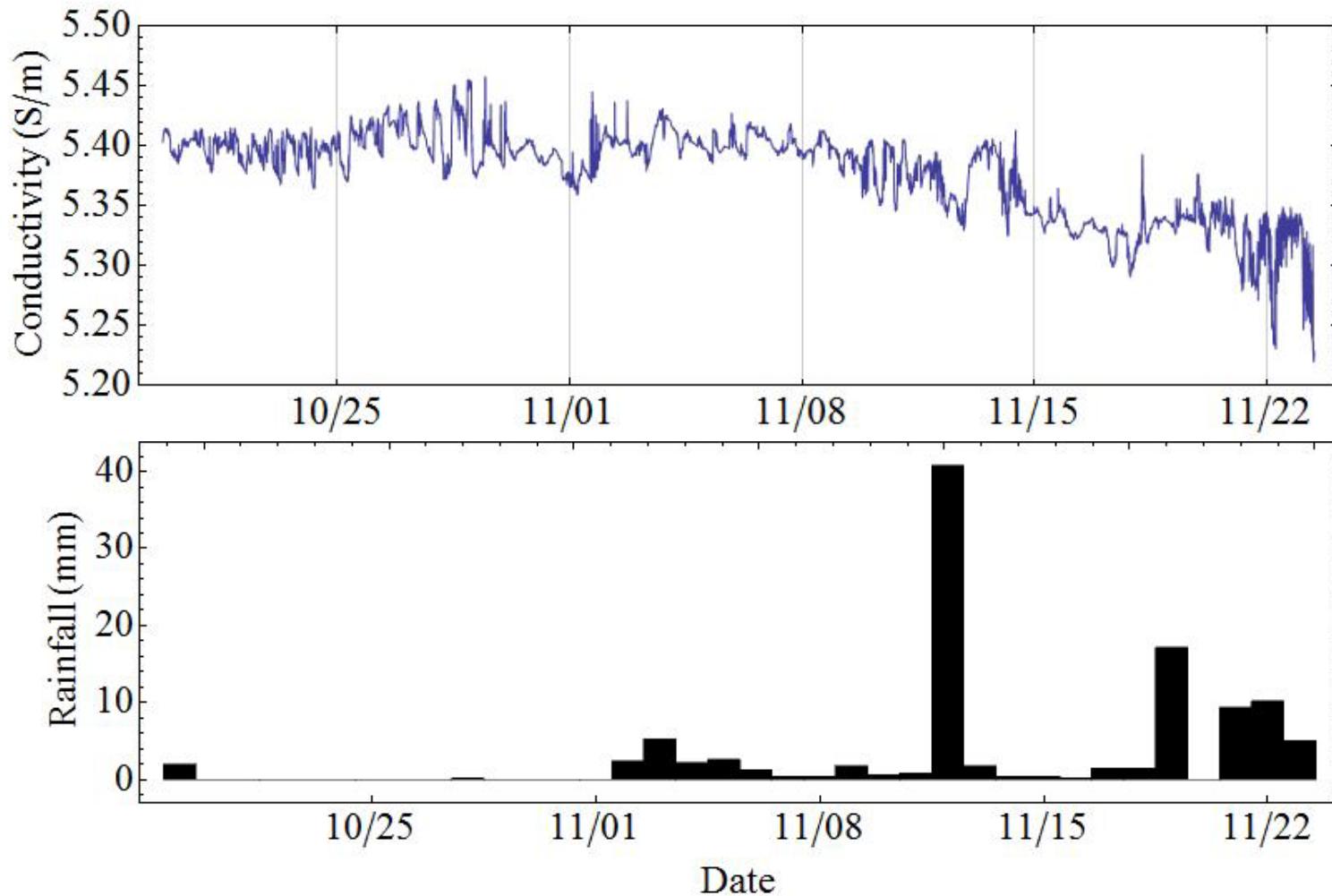
# Sea and Air Temperature



Water temperature (10 m) ( $28.88 \pm 0.12$  °C) (blue line)  
and air temperature ( $26.96 \pm 1.27$  °C) (red line).  
Water temperature at 10 m had a higher mean but a  
lower SD than air temperature.

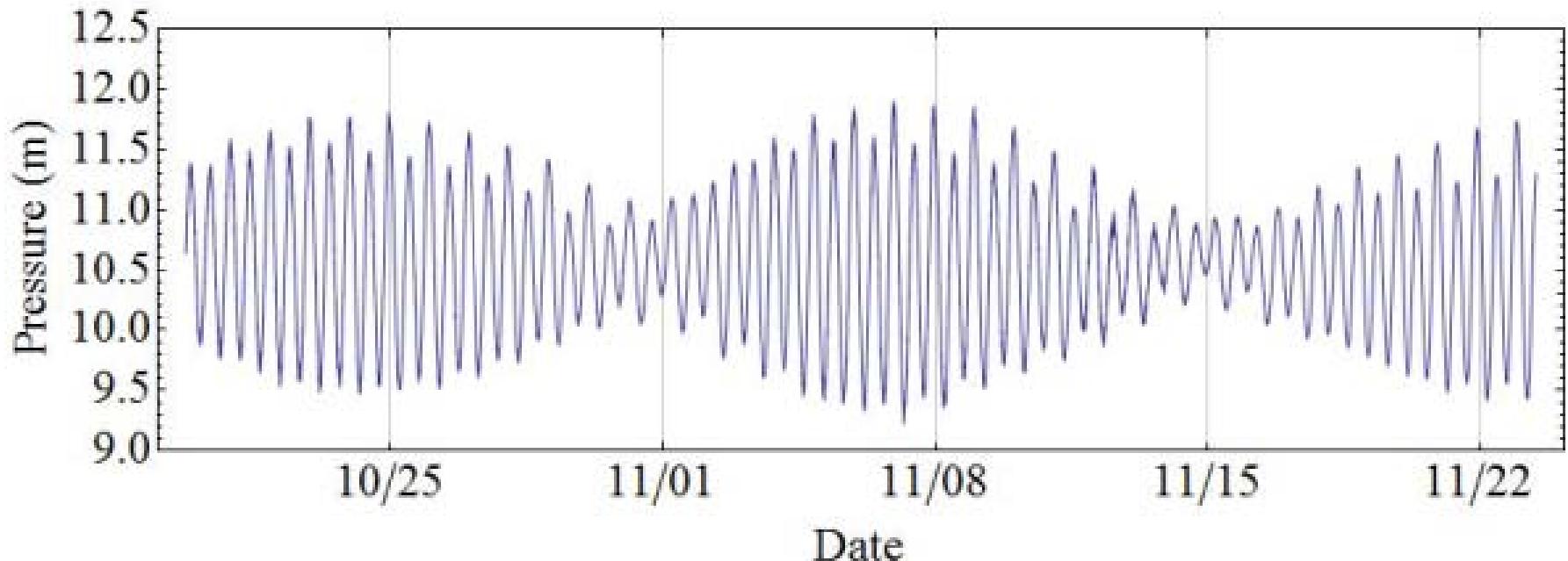


# Conductivity and rainfall



Mean and SD of Conductivity  $5.38 \pm 0.06$  S/m, Rainfall  $3.00 \pm 7.40$  mm

# Depth



- Our pressure results showed that coral reef site at Racha Island was at 10.57 m deep and had a semidiurnal tide with the common pattern of two daily tidal peaks. Maximum tide range from high to low was around 2.5 m.

# Conclusion

- The system has been operational since coming on line in 19<sup>th</sup> October 2010.
- The Data Center services have been very stable.
- The system has been robust to occasional power and network outages, even during through several very heavy storms in early November 2010.

# Acknowledgements

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# Thank you for your attention

