



# NODE 6 OVERVIEW

Greg Ivey  
UWA





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# WAMSI S&T Symposium

## Node 6: Ocean Science for Offshore and Coastal Engineering

Professor Greg Ivey, School of Environmental Systems Engineering &  
UWA Oceans Institute, UWA

9 February 2010



western australian  
marine science institution



## **Node 6 overview**

- **Science focus - understanding, modelling and predicting the effects and impacts of the physical oceanographic processes operating in the WA marine environment**
- **Geographic focus – primarily North West Shelf (unique to Node 6)**
- **Methods - integration of theory, field observations and numerical modelling**
- **Researchers are located at the School Environmental Systems Engineering (SESE) & UWA Oceans Institute**
- **Three projects**



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## **Project 6.1**

# **Offshore and coastal engineering and the effects of climate change**

**Prof Chari Pattiaratchi (SESE) - project leader**

**Dr Ivan Haigh (SESE)**

**Collaboration - Dr Kathleen McInnes (CMAR)**

**Postgraduate students: Matthew Eliot (SESE), Cyprien Bosserelle  
(SESE), Shari Gallop (SESE)**

**Climate database: Woodside Energy**

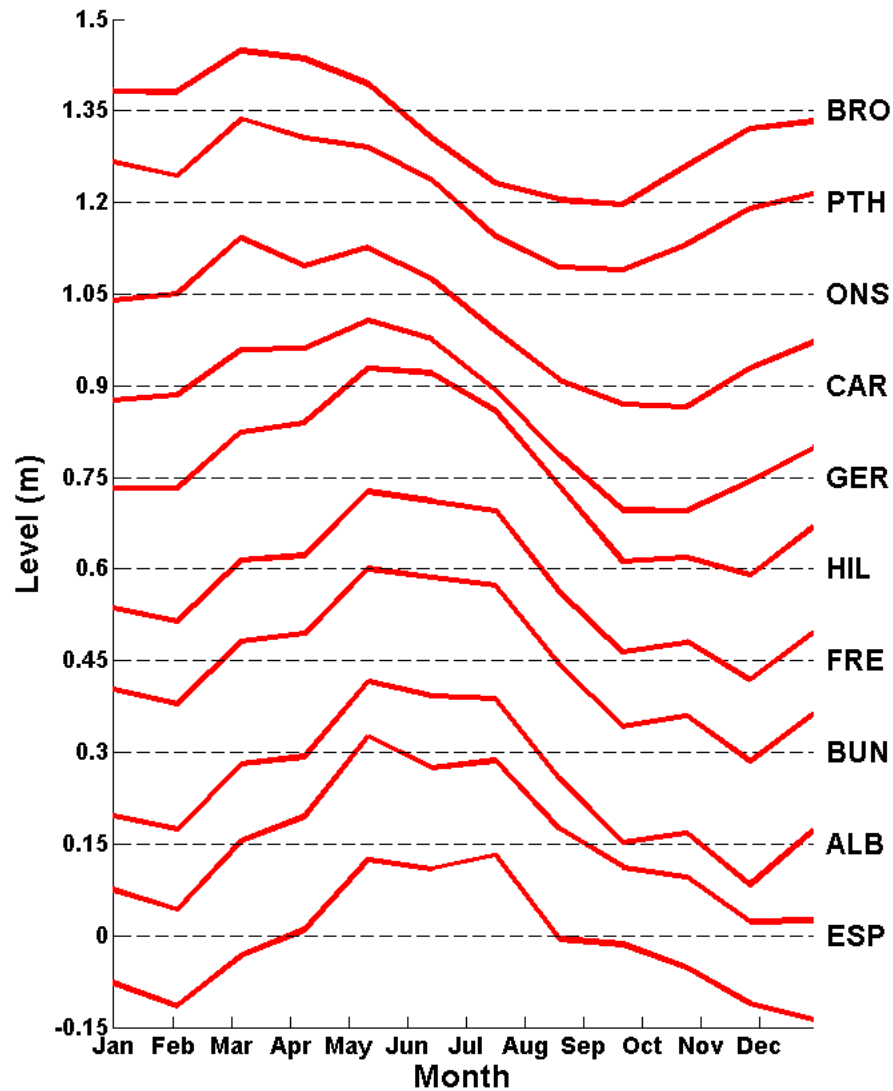
**State Government: Dept of Transport**



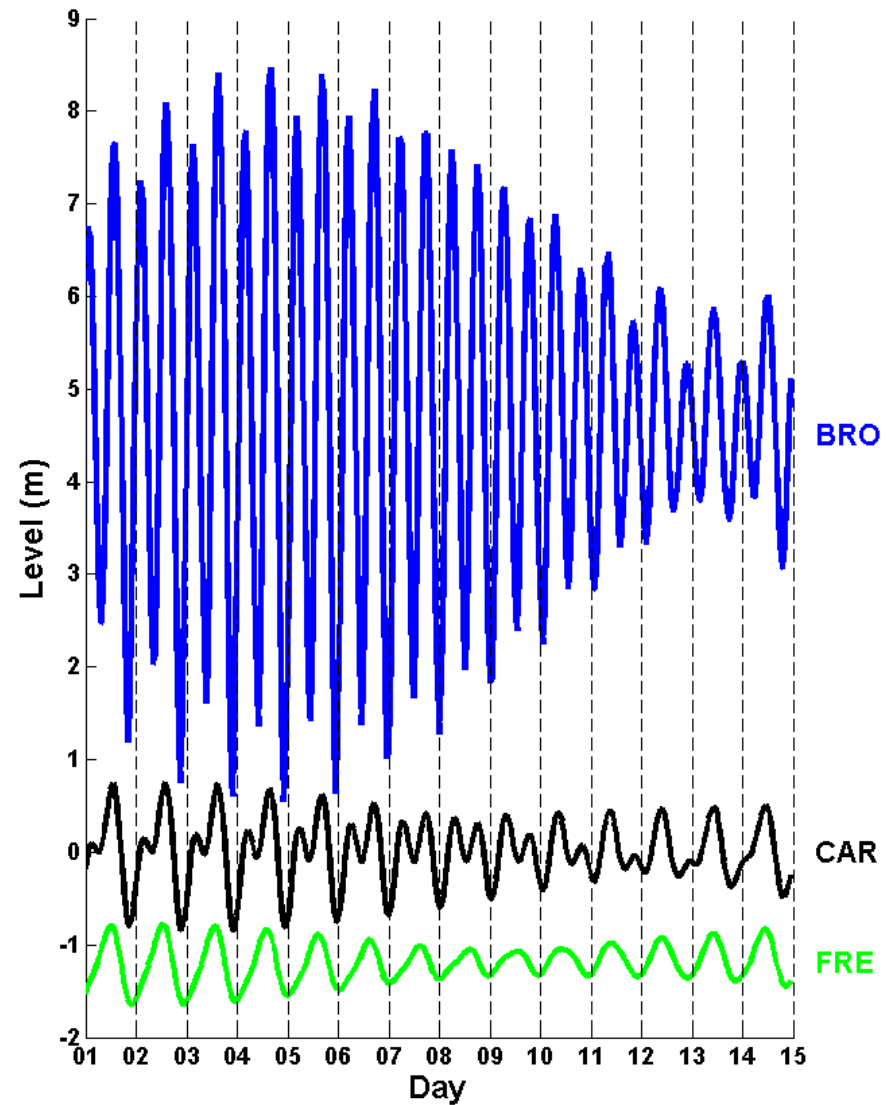
# 6.1: Sea Level Prediction

$$\text{Total} = \text{MSL} + \text{Tide} + \text{Surge}$$

## MSL



## TIDES

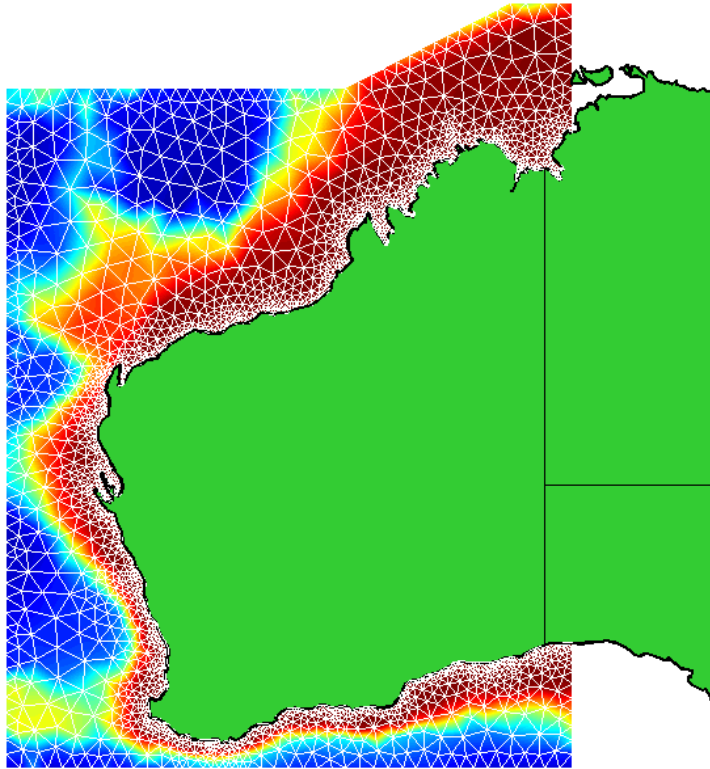


# Model Grid (DHI – MIKE21 FM)

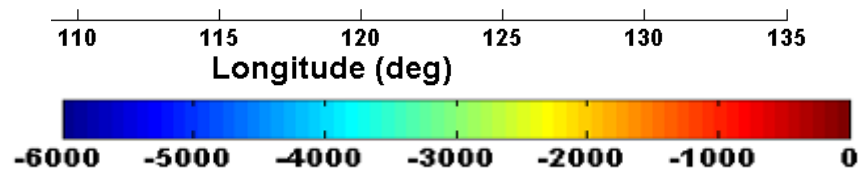
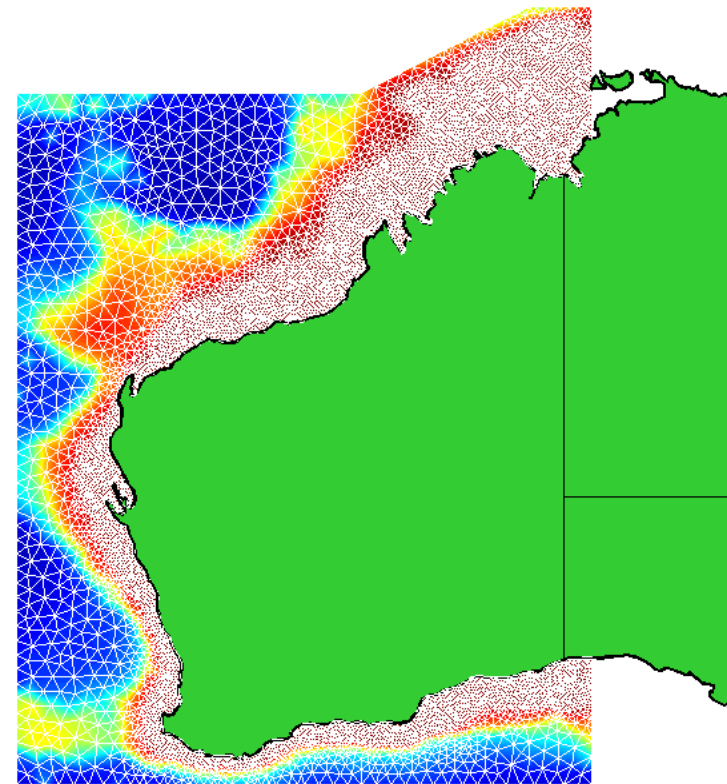


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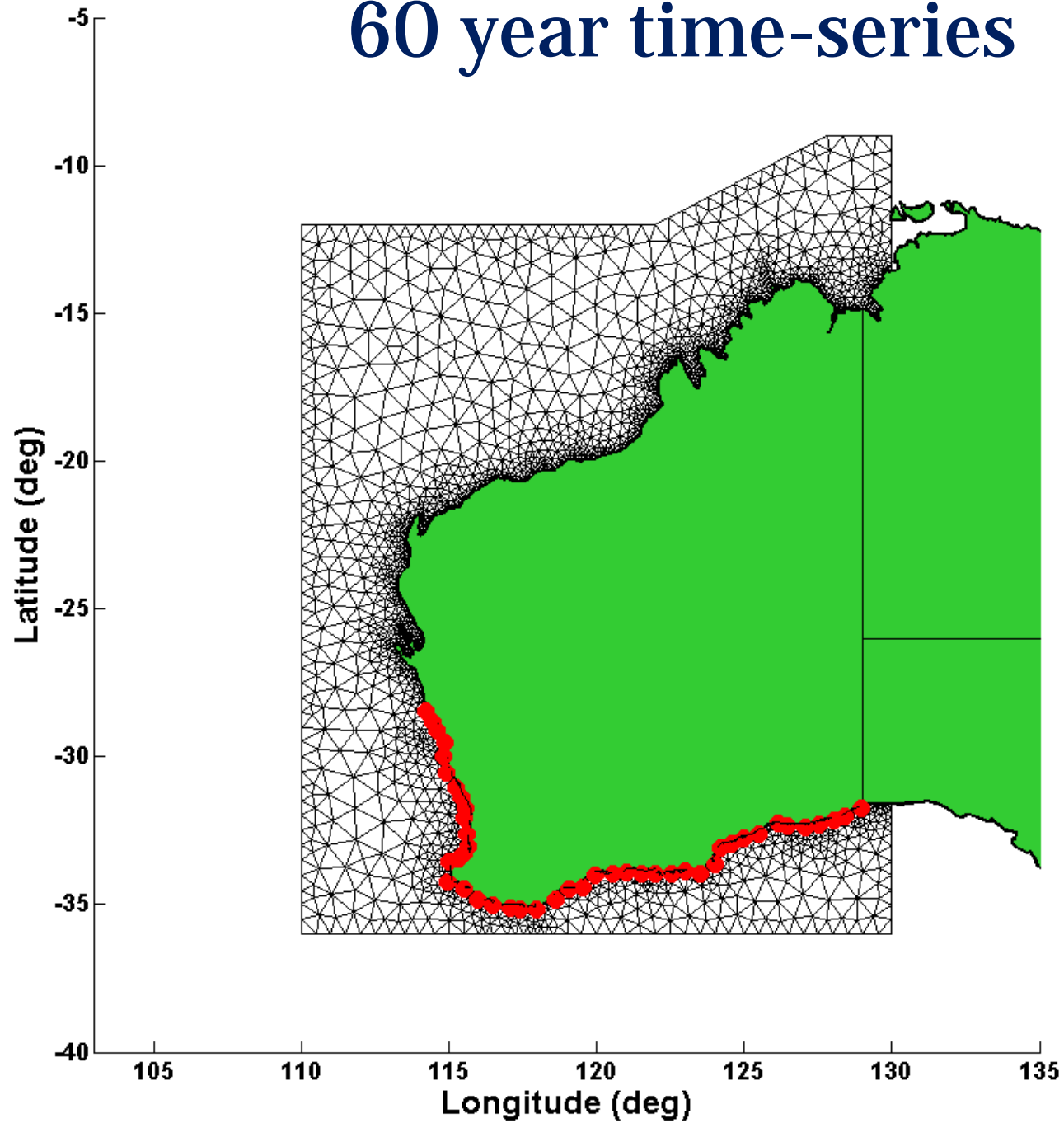
## 1. Coarse (60 – 10 km)



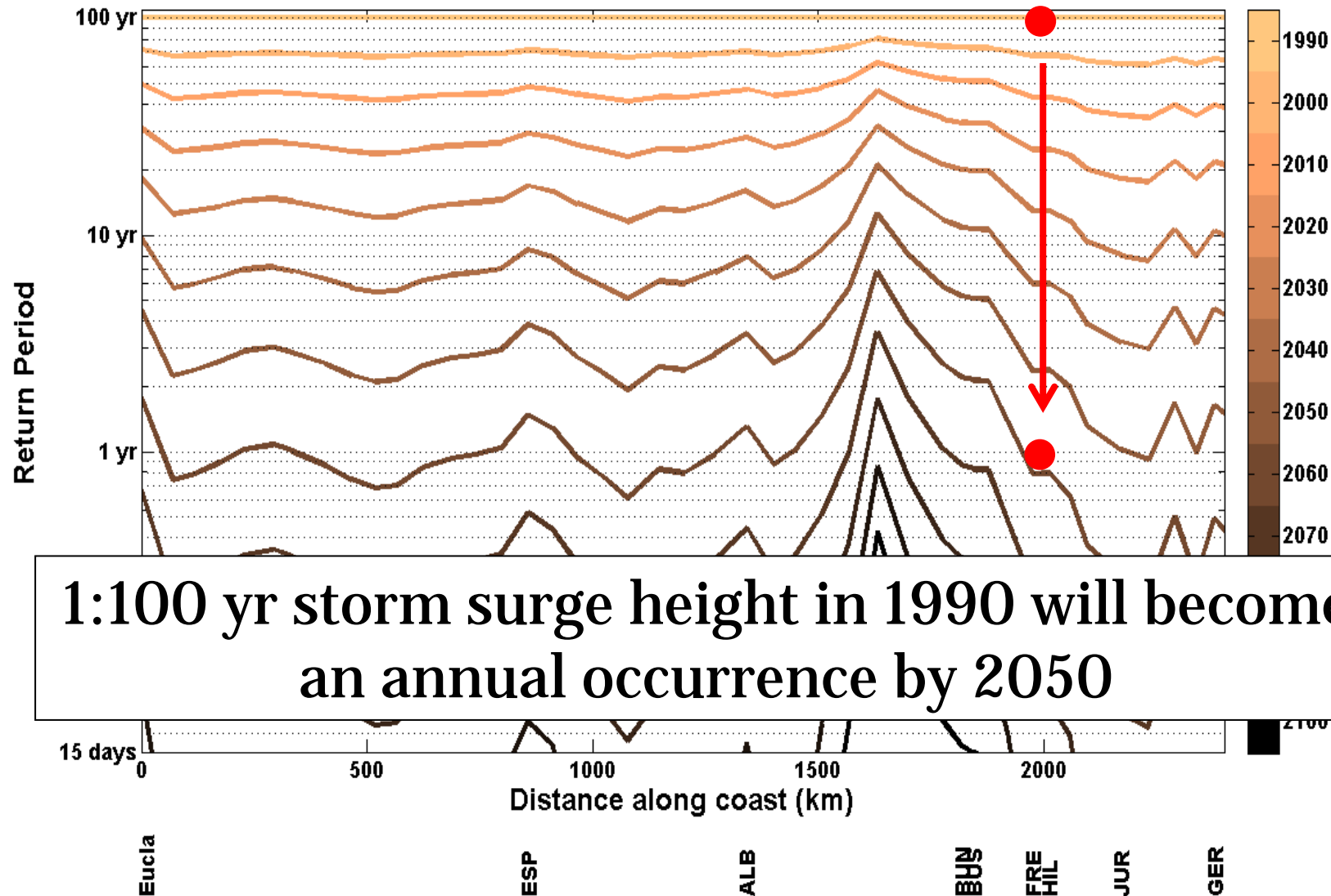
## 2. Medium (60 – 1 km)



# 60 year time-series



# Mid-range Projection (0.5 increase in MSL by 2100)



1:100 yr storm surge height in 1990 will become an annual occurrence by 2050



## Project 6.2

# The impact of tides and internal waves on offshore engineering

**Professor Greg Ivey (SESE) - project leader**

**Assistant Professor Nicole Jones (SESE)**

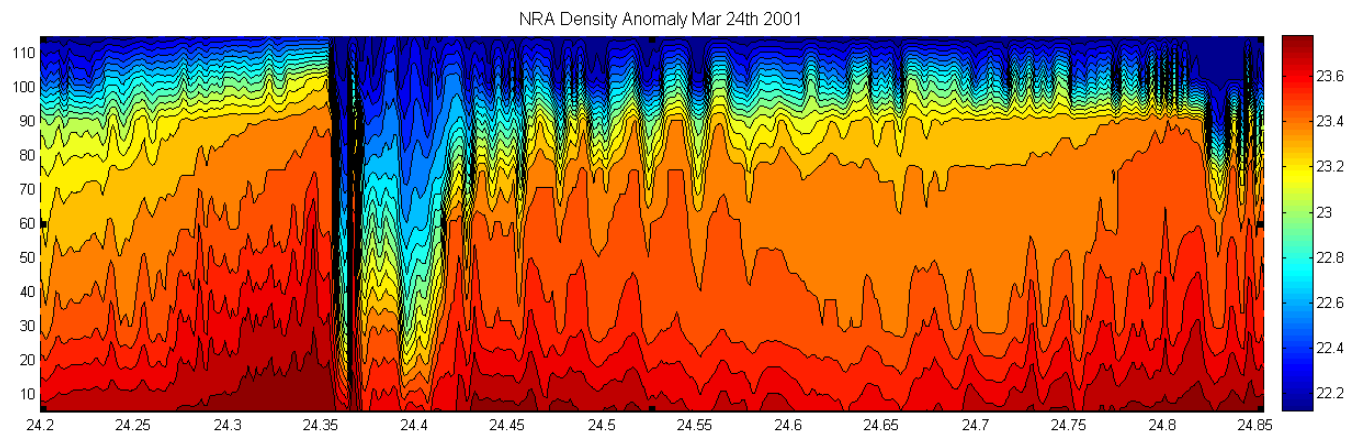
**Assistant Professor Michael Meuleners (SESE)**

**Dr Geoff Wake (Woodside)**

**Collaboration - Assistant Professor Oliver Fringer (Stanford Univ)**

**Postgraduate students - Kenny Lim (SESE), Paul van Gastel (SESE), Matthew Rayson (SESE), Cynthia Bluteau (SESE), Shahab Hosseini (SESE), Tien Lei (SESE)**

**Woodside Energy (NASS JIP)**



## WEL MetOcean - Offshore facilities NWS

- Forecasting of extreme winds, wave, tides and internal wave currents to assess structural integrity and to assess operability



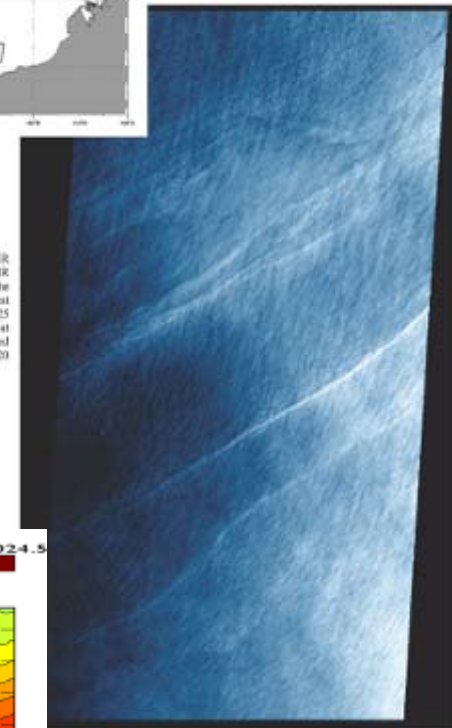
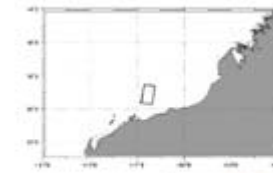
NRA Platform



Wanaea Cossack FPSO

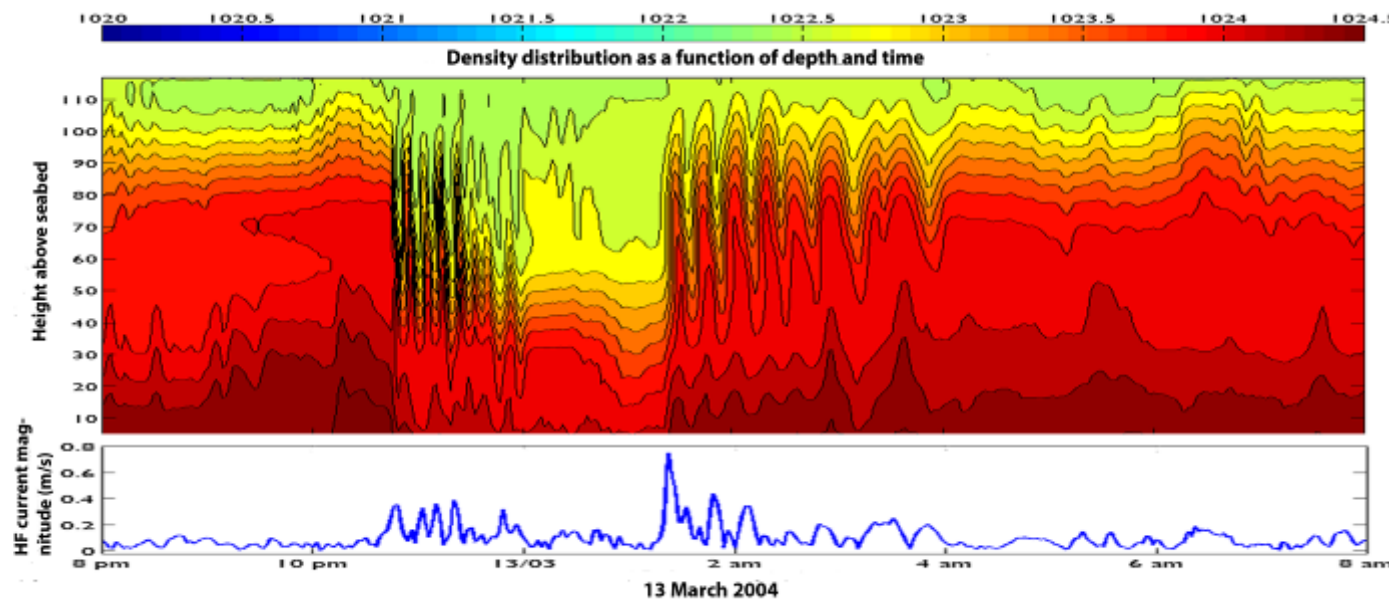
## Example: Internal waves

Satellite  
images



ASTER  
false-color VNR  
image over the  
Australian Northwest  
Shelf acquired on 25  
November 2000 at  
0245 UTC. Image  
area is 60 km x 120  
km.

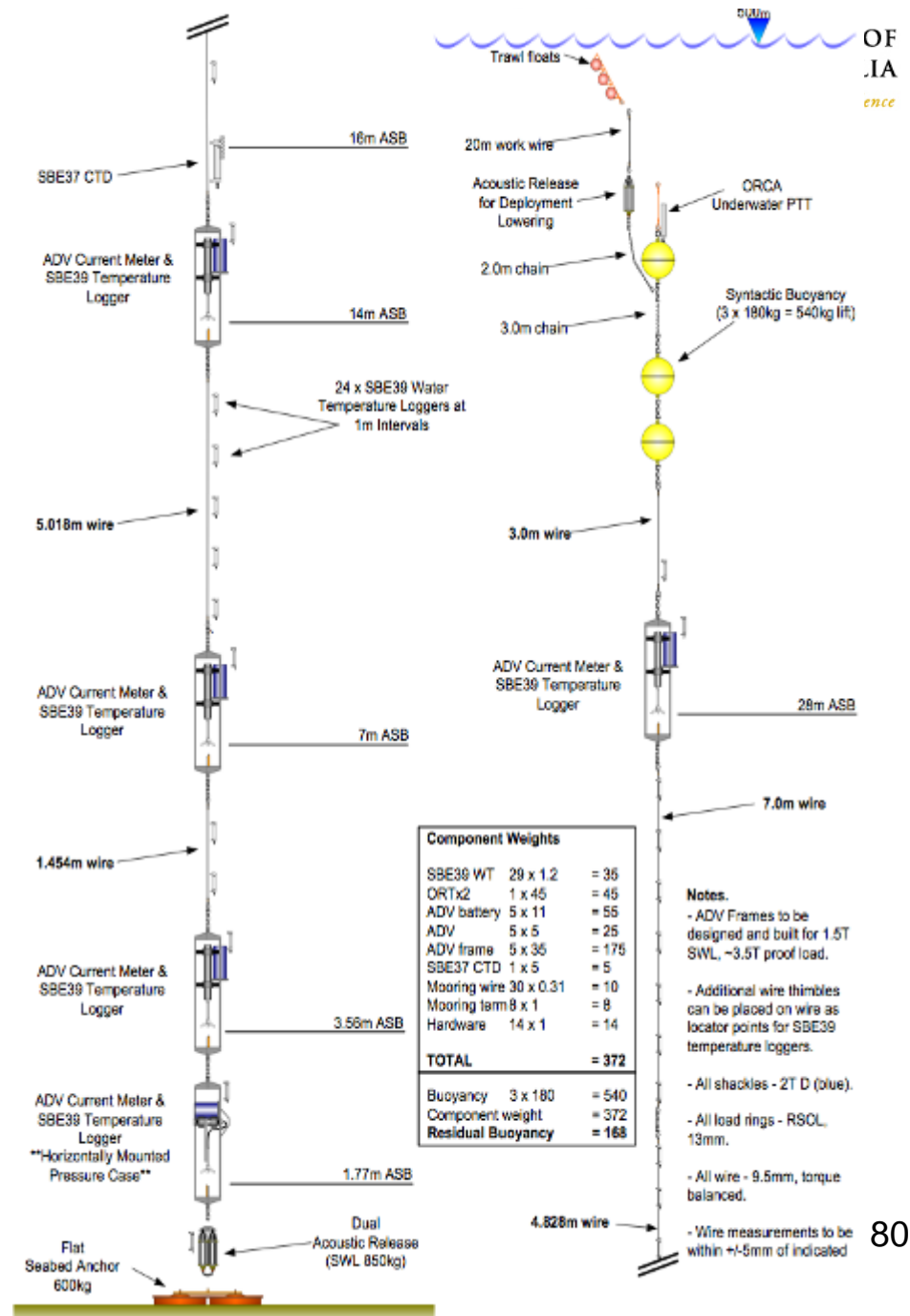
Field observations over entire  
water column (NRA)



Movie

# Field Observations: Bottom current mooring array (as deployed NW of NRA)

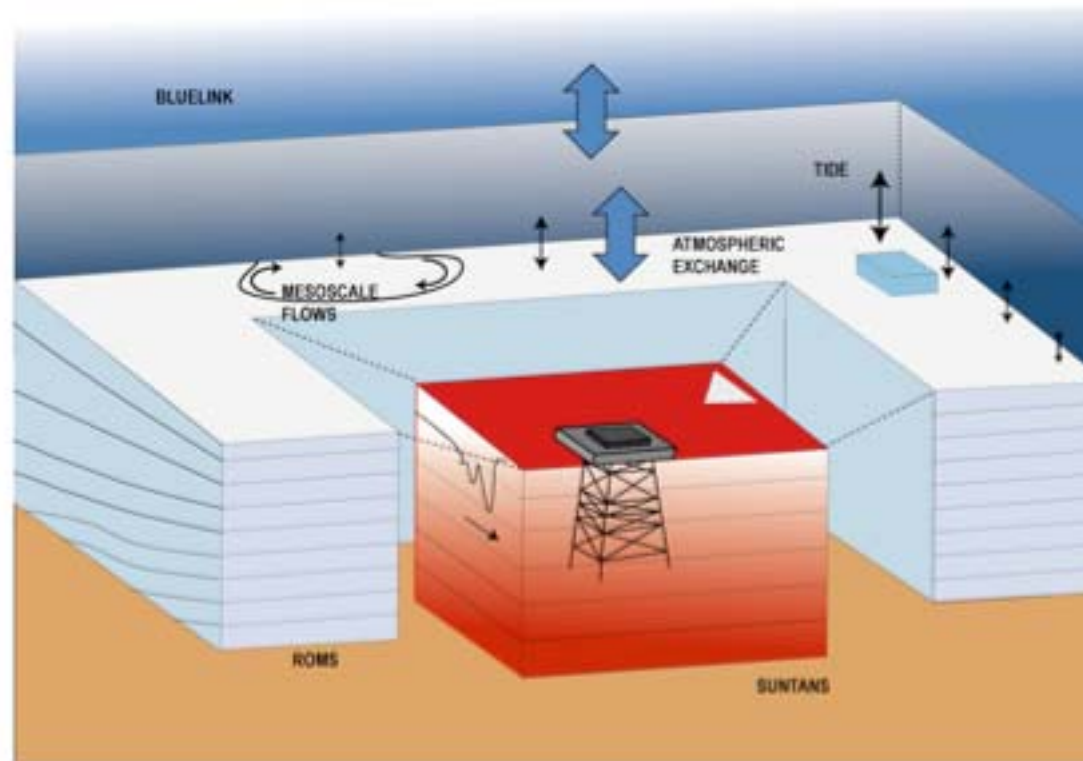
- Current (5) and temperature (30) sensors in bottom 30 m in total water depth of 400m
- 1 sec sampling, 3 weeks, Dec 2009





# Hybrid numerical modelling for ocean forecasting

Scales: Space: 1000 km down to 10 m  
Time: months down to minutes



# Field vs model: NRA

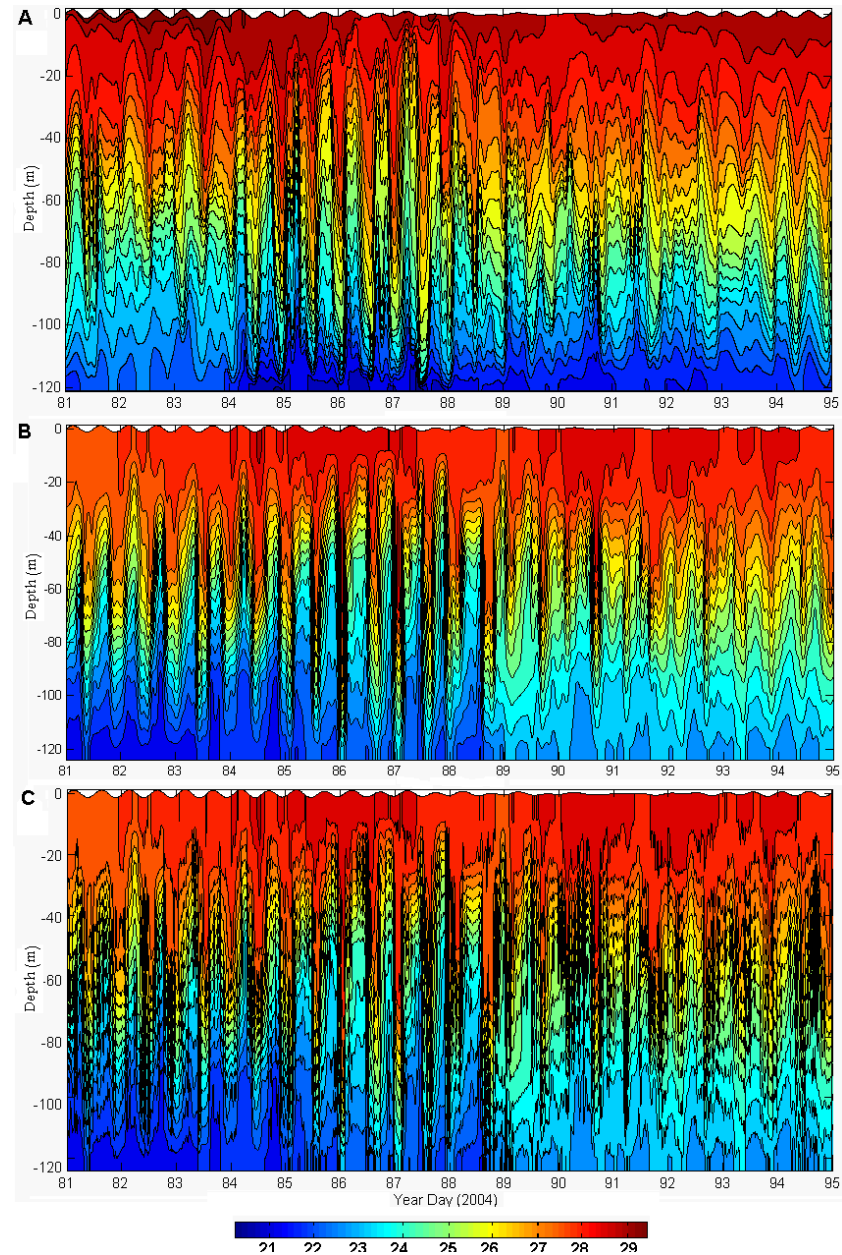
## Ocean temperature changes over 14 days



woodside



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## Project 6.3



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### **Ocean glider deployments off Western Australia (as part of IMOS/Australian National Facility For Ocean Gliders (ANFOG))**

**Prof Chari Pattiaratchi (SESE), project leader**

**Collaboration - Dr Ming Feng (CMAR)**

**Postgraduate student: Thisara Welhena (SESE)**

**Dr Christine Hanson – speak about ANFOG this afternoon**



# Node 6 Summary



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**Period: 2007-2011**

**Research staff: 10**

**PhD students: 10**

**Honours students: 5**

## **Acknowledgments:**

- **WAMSI (\$1.2M, 6% WAMSI)**
- **Woodside Energy Ltd (NASS JIP)**
- **MetOcean Engineers**
- **Australian Research Council Discovery Program**
- **UWA**
- **IMOS**

## **Further information:**

- **Greg Ivey, UWA, [ivey@sese.uwa.edu.au](mailto:ivey@sese.uwa.edu.au)**



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