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WAMSI Node 1 Western Australian Marine Ecosystems Overview - February 2010

Wealth from Oceans Flagship

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Node 1 Leader
9 February 2010



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Wealth from Oceans



Vision for WAMSI Node 1

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- Outcomes from Node 1 will contribute strongly to sustainable ecosystem-based multiple-use management of Western Australia's marine environment.
 - Initial Node 1 focus has been on the south-west / west coast
 - Future focus in the Kimberley
 - WAMSI Node 1 Kimberley survey conducted in 2008
 - Southern Surveyer voyage in April 2010 builds on work done in WAMSI

WAMSI Node 1 Projects

WAMSI 1.1

- *Southwest Australian Coastal Biogeochemistry*
 - CSIRO, UWA, Murdoch, ECU, Curtin, WA Museum, Chemistry Centre, IMOS, Geosciences Australia

Flagship Collaboration Fund Project

- *The role of herbivory and hydrodynamics in ameliorating the effects of nutrient enrichment in marine ecosystems*
 - ECU, CSIRO

WAMSI 1.2

- *Coastal ecosystem characterisation, benthic and spatial ecology, connectivity and client delivery module (DIVE)*
 - CSIRO, ECU

WAMSI 1.3

- *Benthic habitat surveys of potential LNG precinct locations in the Kimberley region*
 - CSIRO, AIMS, DEC

WAMSI Node 1 PhD Scholar Projects

Adam Gartner – ECU (Prof. Paul Lavery/Dr Kathryn McMahon)

Trophic Implications of Seagrass Habitat Disturbance from Reduced Light

David Rivers – UWA (Prof. Diana Walker)

The role of seeding recruitment in maintaining seagrass diversity

Cecile Rousseaux – UWA (Dr. Anya Waite)

Production losses in heterotrophic marine systems

Thibaut de Bettignies – ECU (Prof. Paul Lavery)

Linkages between temperate limestone reef and seagrass habitats

Charulata Singh – ECU (Prof. Paul Lavery)

The role of kelp and seagrass wrack in marine food webs

Thisara Welhena – UWA (Prof. Charitha Pattiaratchi)

Physical processes along the Rottnest continental shelf

Sharon Yeo – Murdoch (Dr. Mike van Keulen)

Population biology of sand dollars: important agents of benthic pelagic coupling

Four high level science questions

1. What are the large scale influences on the south-western Australian coastal environment?
2. How can we account for the highly productive characteristics of south-western Australian coastal ecosystems in an oligotrophic environment?
3. How do the south-western Australian coastal marine ecosystems respond to potential anthropogenic forcing?
4. What physical and ecological interactions are important determinants of south-western Australian coastal marine benthic habitats?

Project Objectives in south-west WA

Downscaled hydrodynamic models and coupled biogeochemical models

- influences on benthic habitat,
- cross-shore and longshore transport and connectivity
- exchange of water, nutrients and particles between the lagoon and shelf.
- quantitative nutrient budget for coastal waters at shelf and lagoon scales.

Improved biogeochemical and ecological characterisation of shelf and lagoon waters

- seasonal and interannual variability and their causes
- Importance of benthic primary production and benthic-pelagic coupling

Assessing and predicting impacts of natural and anthropogenic forcing

- importance of physical forcing, nutrients and ecological interactions in structuring benthic habitats.
- understanding ecosystem processes by contrasting fished and non-fished areas.
- dispersal patterns for marine organisms using hydrodynamic and genetic models.

Electronic delivery of data and models

- Data Interrogation and Visualisation Environment (DIVE)

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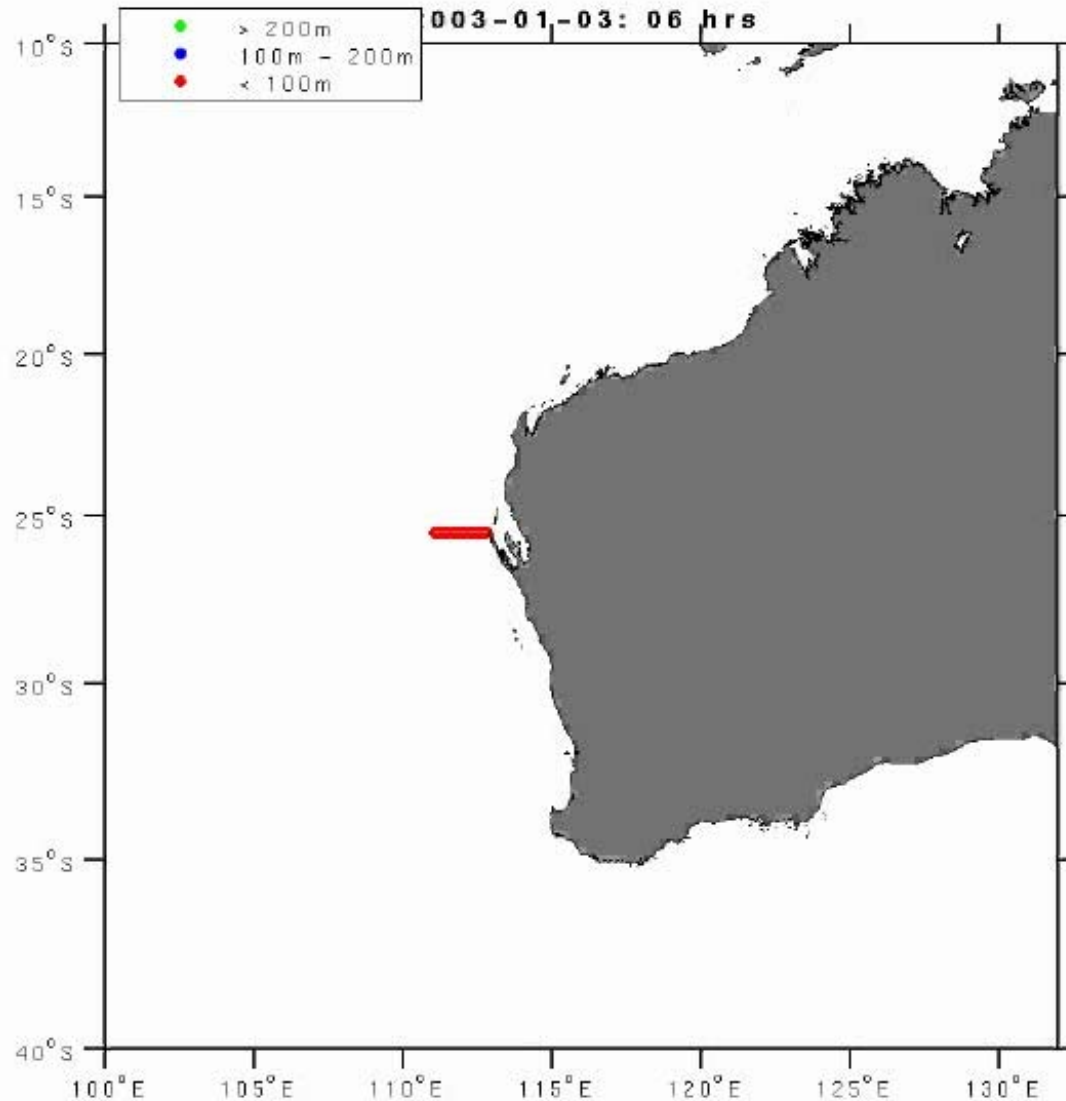
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Modelling connectivity along the WA continental shelf



Particles (red) entrained in the Leeuwin Current are transported southwards.

A high proportion will make contact with the shelf and coast.

About 30% will pass around Cape Leeuwin.

Modelling connectivity along the WA continental shelf

Low
High retention

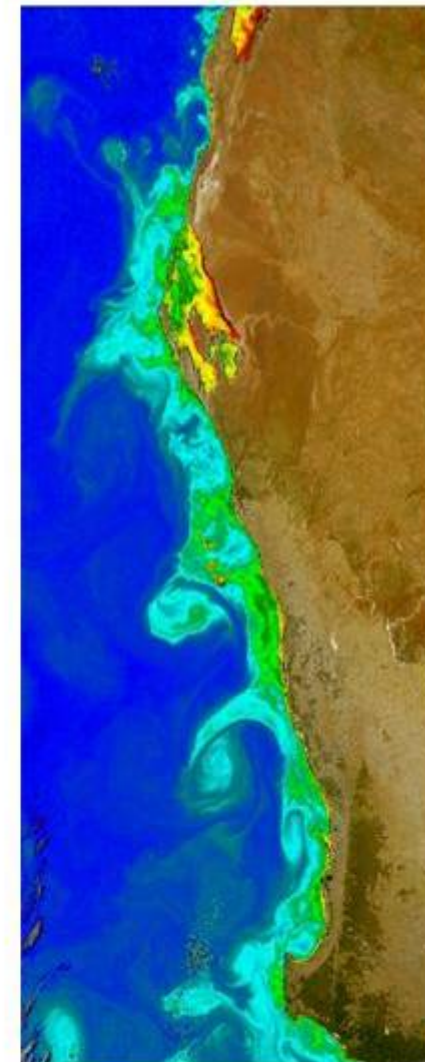
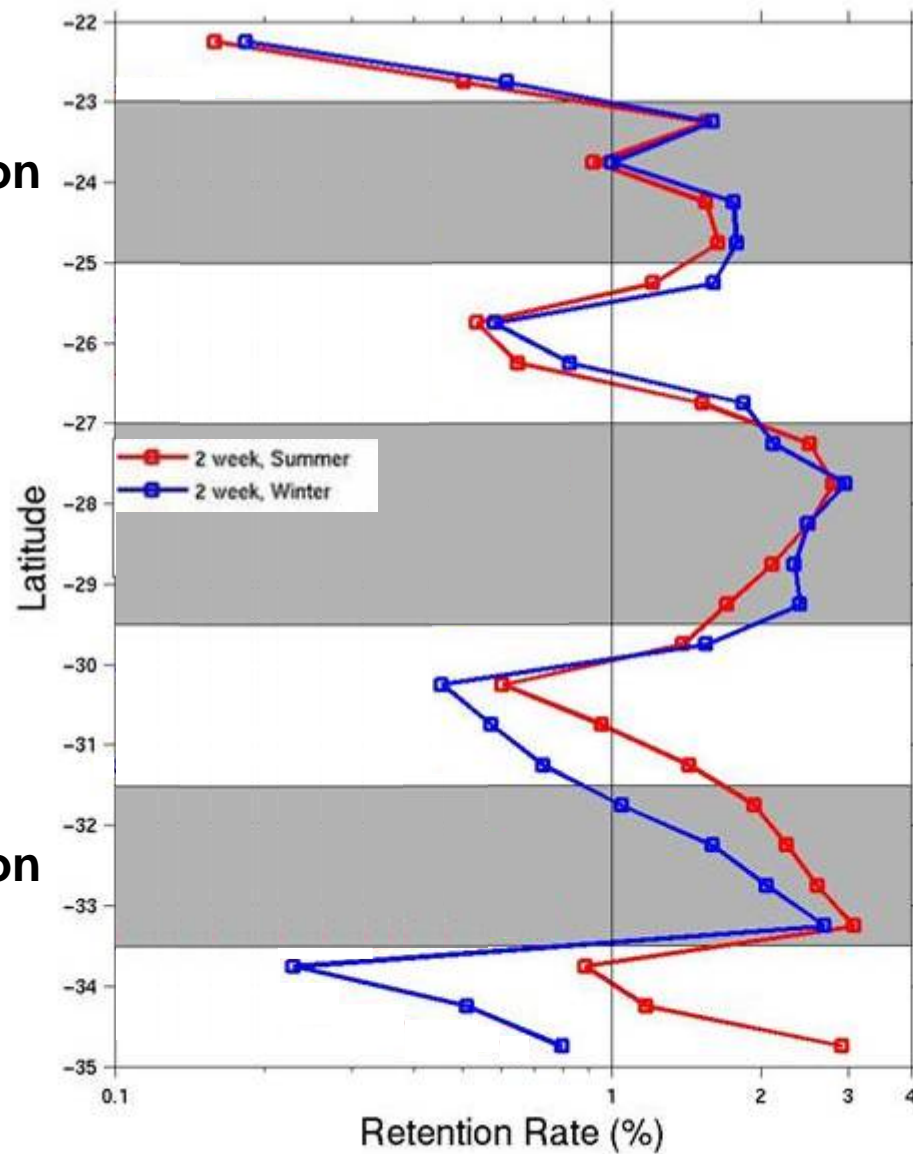
Low

High

Low

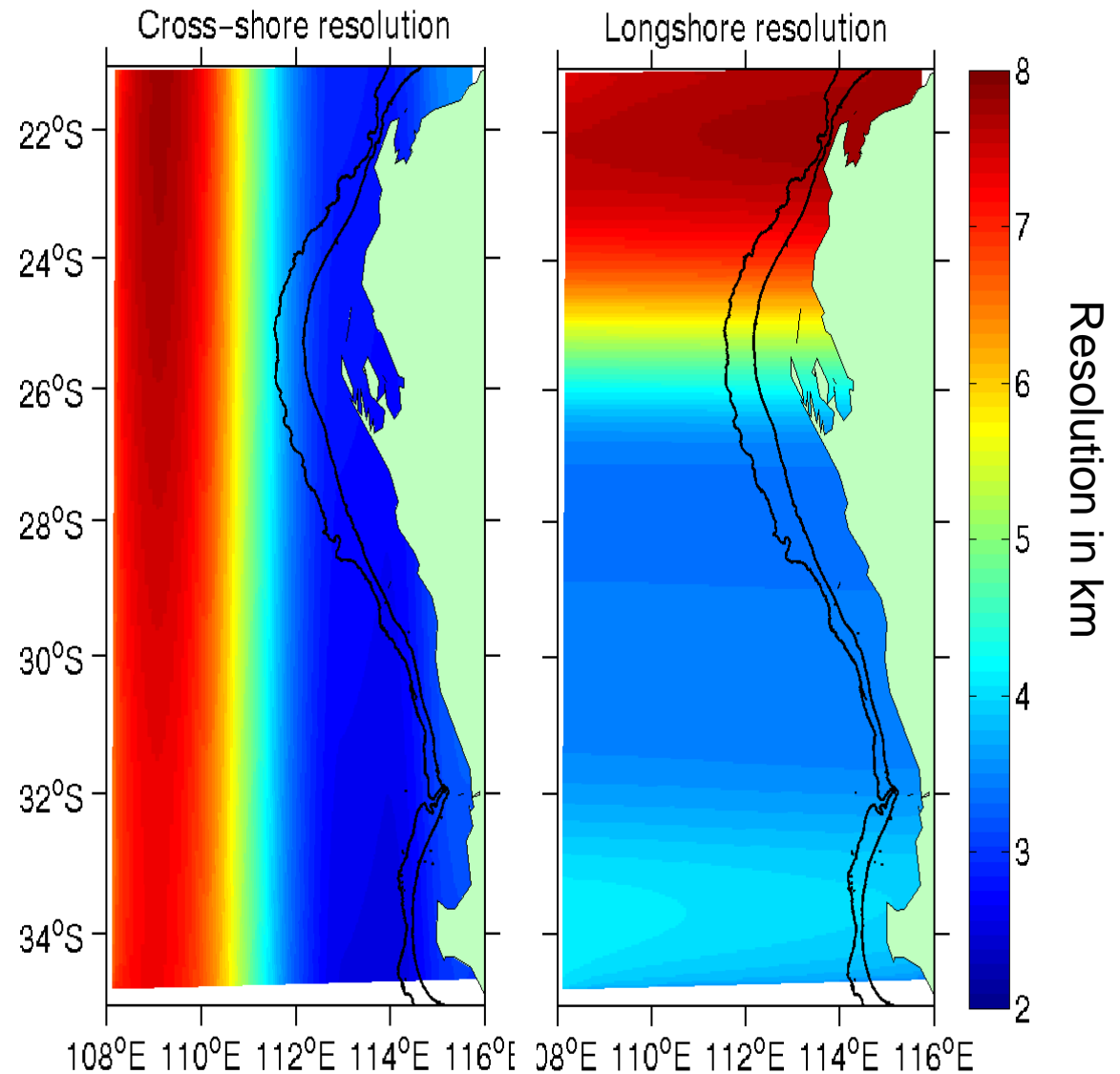
High retention

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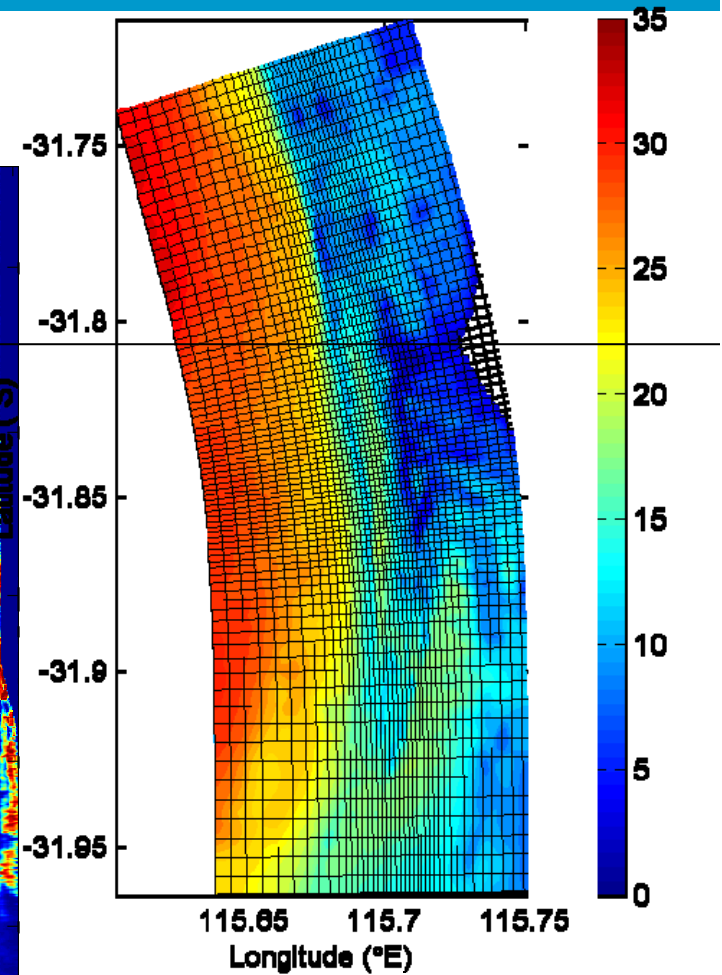
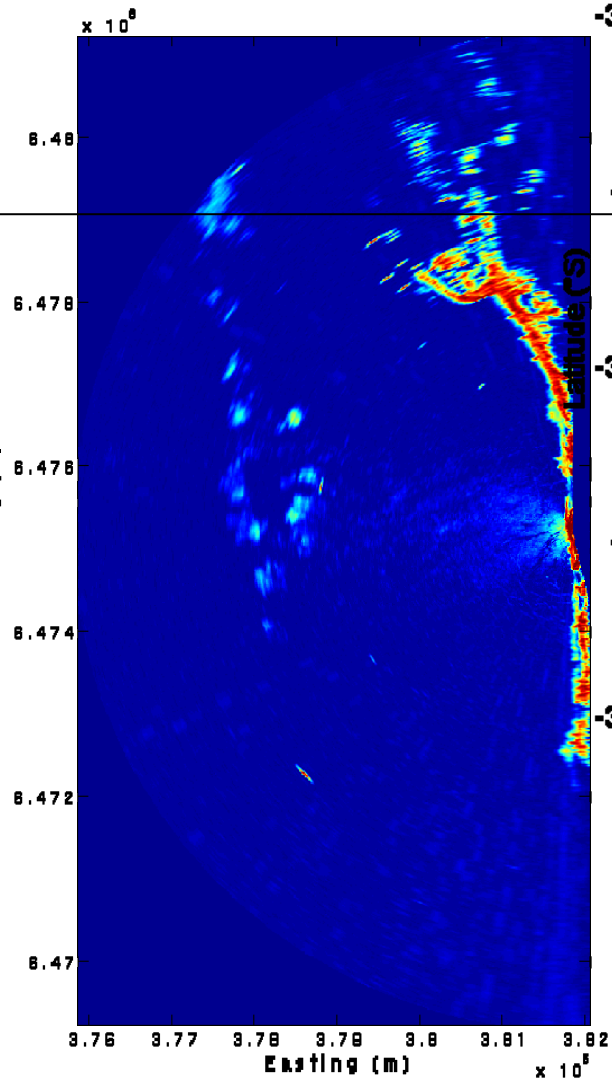
Downscaled hydrodynamic models - shelf

- Hydrodynamic model with high resolution of 2~4 km in the shelf region - up to 5 times better horizontal resolution at coast than the 10 km SRFME or Blue Link model
- Model captures features of the Leeuwin Current System
- Capes Current well represented



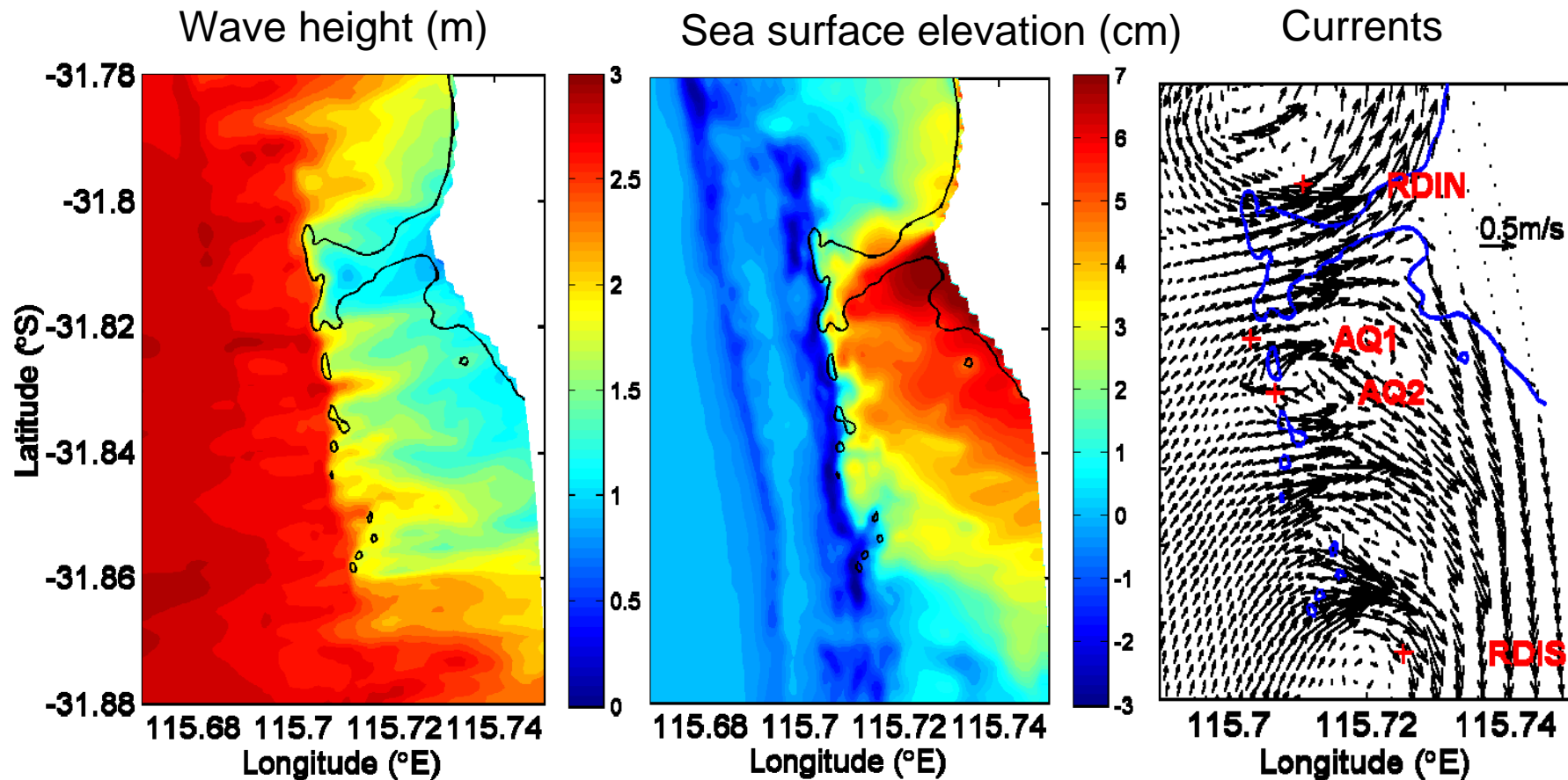
Downscaled hydrodynamic models - lagoon

Extensive instrumentation deployment and measurement program



High resolution hydrodynamic model (50m grid near shore)

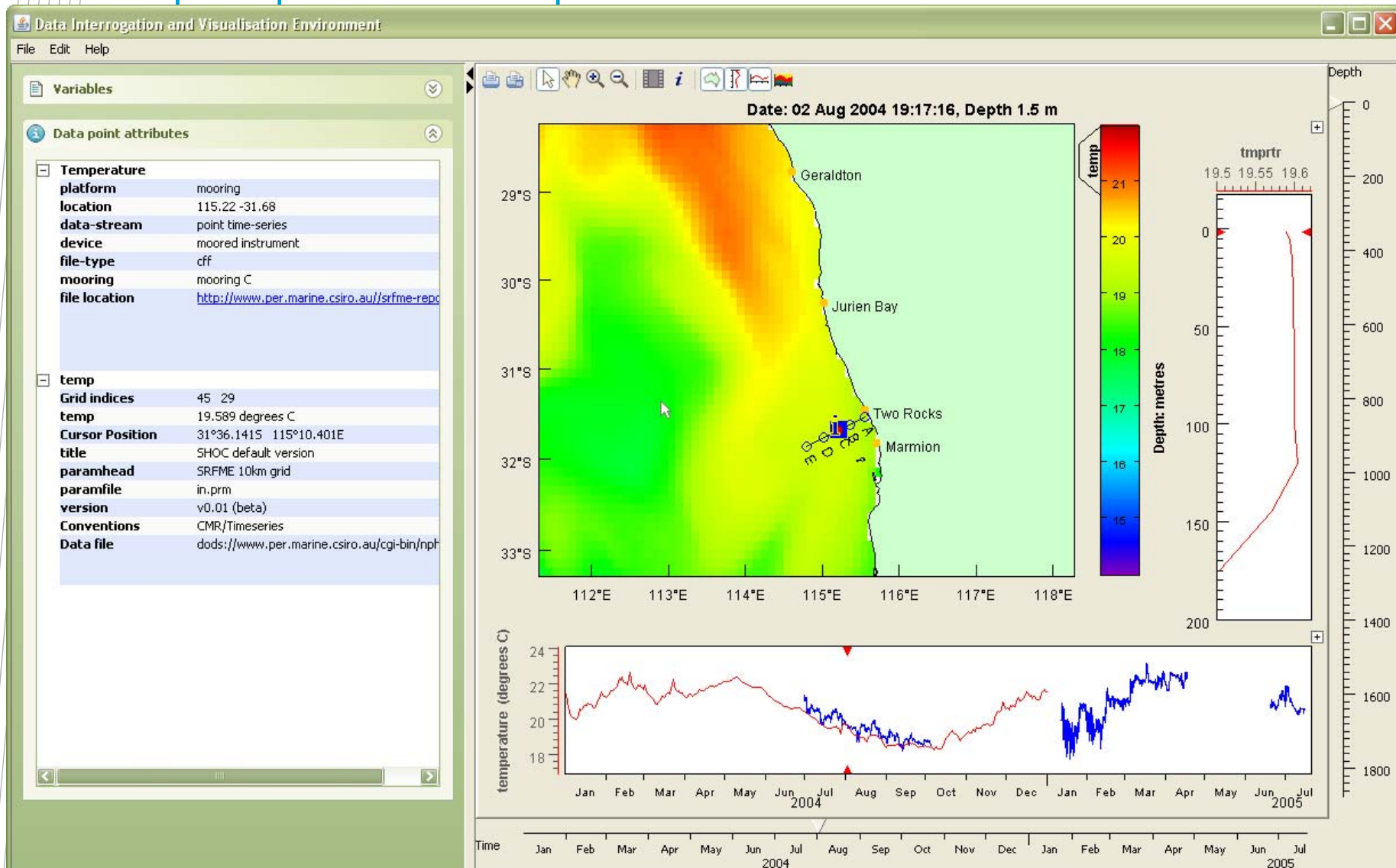
Constant wave forcing drives currents and lagoon flushing



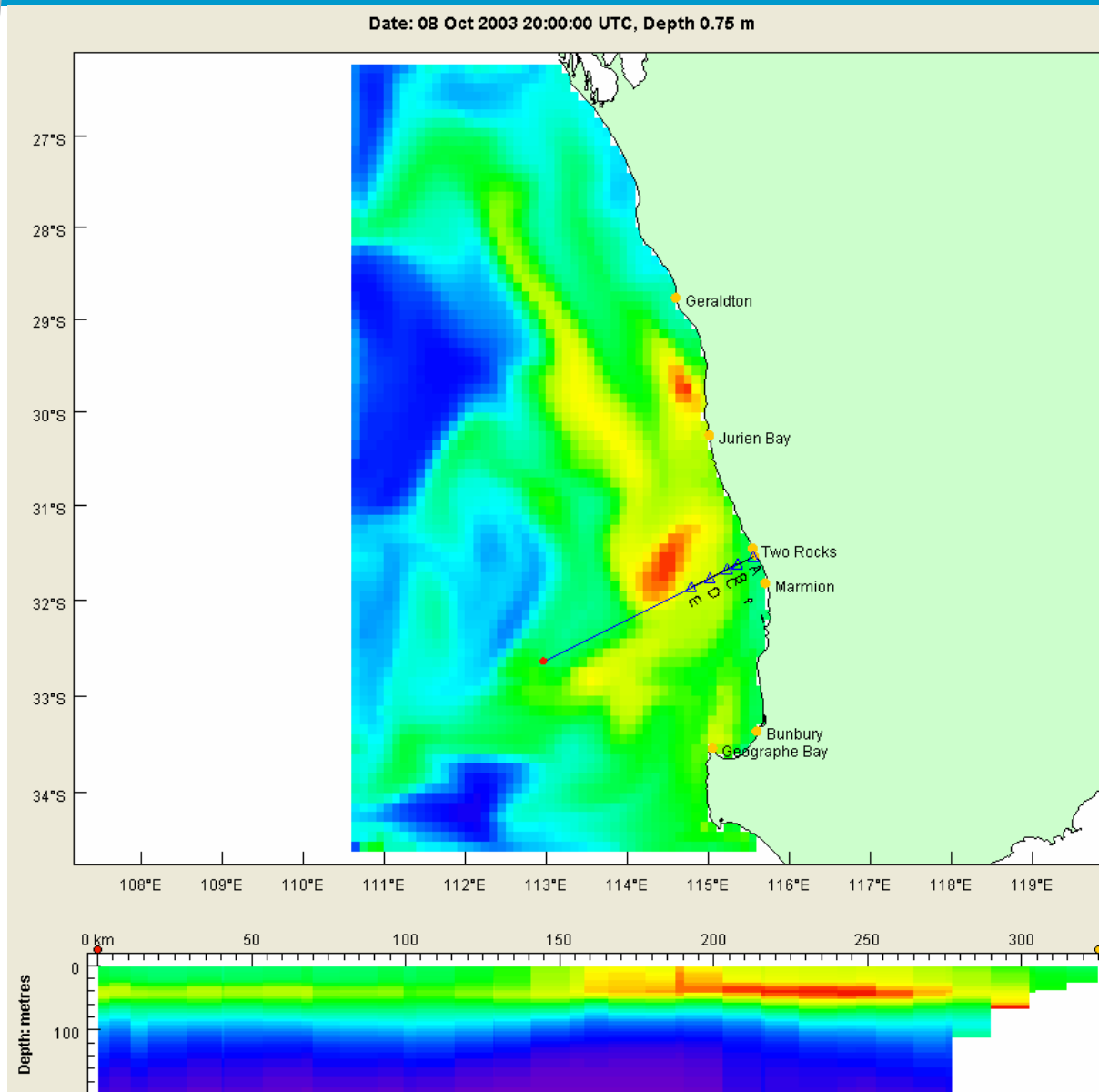
Wave induced currents and flushing of lagoon every 15 hours

Data Interrogation and Visualisation Environment (DIVE)

- Superimpose model output and moored instrument data



Data Interrogation and Visualisation Environment (DIVE)



- Visualise animated model output



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Thank you



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