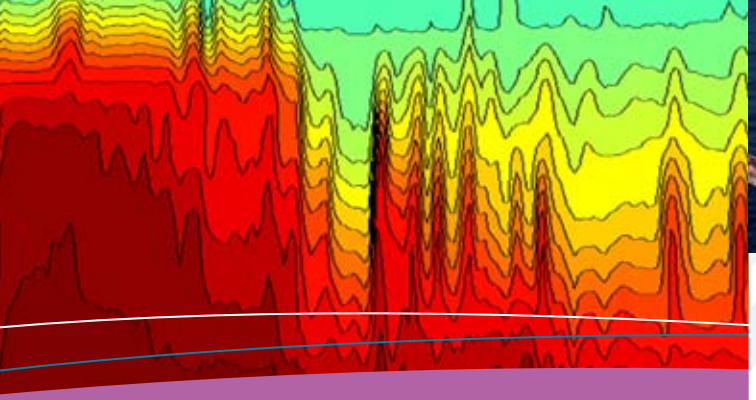

Impacts of the combined effect of tidal and cyclonic forcing (UWA)

- Develop numerical models to describe ocean response to cyclone forcing
- Develop hindcasting and forecasting tools for the ocean environment

The deployment of ocean gliders as part WAIMOS (UWA)

- Establish networks and data streams for ocean glider observations of the ocean environment

Researchers have:

- analysed past field observations of internal tides at a number of sites on the North-West Shelf;
- built laboratory models to study internal tide generation and dynamics;
- built hybrid numerical models linking global ocean circulation models (BLUElink) with regional scale ocean models (ROMS);
- developed very high resolution non-hydrostatic numerical ocean models to couple with regional ocean models;
- built high resolution benthic boundary layer instruments for ocean measurements of diverse sites on the North-West Shelf;
- obtained an understanding of internal tide dynamics in southern portions of the North-West Shelf and
- deployed ocean gliders monitor to obtain near-real time data from the continental shelf and slope regions.

Research results will be used to:

- provide tools to understand the behaviour of the physical ocean environment on the North-West Shelf;
- provide tools to predict the behaviour of the physical ocean environment in as yet un-explored ocean regions on the North-West Shelf and elsewhere;
- predict the effects of climate change on the WA ocean environment on 25 to 50-year timescales; and
- develop new instruments and technologies to support current and future marine development.

The Western Australian Marine Science Institution (WAMSI) is a consortium of 15 State and Commonwealth government, academic and private partners undertaking multi-disciplinary inter-institutional marine research. It is Australia's first collaborative research facility dedicated to understanding the marine environment and resources, and to contributing to policy and management decisions on the future use of oceans.

WA State Government provided a $21 million five-year investment with a $60 million co-investment by member partners. WAMSI's strategic projects address climate change, its likely impacts, how marine and coastal ecosystems function and how science can be used to understand the impacts of human activity in the marine environment.

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Images courtesy of Woodside Energy Ltd, The University of Western Australia and the Western Australian Museum (C.Bryce).

ocean science for offshore and coastal engineering

western australian marine science institution

better science better decisions

www.wamsi.org.au

Western Australia's coastal and offshore regions have many types of infrastructure including offshore platforms and pipelines, ports and coastal protection structures.

The design of these structures requires a thorough understanding and prediction of the physical oceanographic processes, particularly under a changing climate.

The waters off WA's North-West coast – 2000 kilometres along the coast from the North West Cape in the south-west to the Timor Sea in the north-east and 500 to 600 kilometres offshore – are of national strategic significance. The region is home to the offshore oil and gas industry, one of the most significant components of the state and national economies. Thousands of kilometres of oil and gas pipelines have been laid in this area and thousands more are expected to be laid in the future with projects in new areas.

Similarly, regions along the west coast have high population centres – including Geraldton, Perth and Bunbury – where important coastal infrastructure is located.

The Western Australian Marine Science Institution has allocated $1.25 million for oceanographic research over five years to understand, quantify and predict the physical oceanographic processes that operate in this highly energetic region of the ocean, and to predict changes in the coastal region under a changing climate.

Scientific research will ensure improved safety, reliability and operation in offshore engineering projects, particularly for oil and gas platforms and pipelines. The research will also look at the impacts of loading and natural forces on coastal engineering developments and the community in the region.

Research includes studies into shore stabilisation, the effects of sea levels and climate change, tides and internal waves and the effects of cyclones. It links to WAMSI research covering fisheries and ocean movement in Ningaloo Marine Park and ocean water further south.

The University of Western Australia is leading the research with major sponsorship and participation by Woodside Energy Limited. UWA is undertaking the work in conjunction with staff from Stanford University (USA), CSIRO's Wealth from Oceans Flagship and the Western Australian Global Ocean Observing System (WAGOOS).

UWA is also taking part in wider research activities in conjunction with Woodside Energy Ltd, Chevron Australia Pty Ltd, the WA Department for Planning and Infrastructure and the WA node (WAIMOS) of the Australian Integrated Marine Observation System (IMOS).

The science plan focuses on research that will improve our understanding of ocean movements and climate change, and the tools needed to improve safety.

Research projects

Assessing changes to surface wave fields in response to climate change (UWA)

- Develop databases of long-term wind and atmospheric data for WA under climate change
- Assess changes to offshore wave fields

Assessing storm surge effects under climate change (UWA)

- Determine changes in surge magnitude and frequency
- Assess coastal stability at selected regions under the combined effects of wave fields, storm surge and sea level rise

Impacts of climate change on coastal regions (UWA)

- Assess the impacts on coastal and estuarine infrastructure
- Provide input for policy development and planning programs

Impact of the combined effects of tides and internal waves in the offshore ocean environment (UWA)

- Determine the impacts of internal waves from field measurement arrays
- Develop hybrid high-resolution numerical models of internal tide dynamics
- Undertake high-resolution measurements of near-bottom impacts of internal tides in offshore waters
- Develop process understanding and predictive capability of Large Amplitude Internal Waves (LAIW)