

💷 eNewsletter

December 15, 2020

Welcome from Phil Watson, OFFshore ITRH Director

Reflecting on a turbulent - but successful - year

We've nearly made it to the end of 2020, and what a year it was. In the recent OFFshore Hub windup, I reflected on all that has happened over the course of the last 11 months. It's hard not to feel a little overwhelmed - and I for one am looking forward to a period without any 'breaking news'.



Despite the challenges, the OFFshore Hub team has remained resolute in its pursuit of

our research objectives and we are building to a significant final year for the programme. While border closures have stopped some researchers from joining their colleagues in Perth, overall the team has grown. We have not let the challenge of remote working slow us down and all projects have continued to deliver results. We've also seen great progress by the OFFshore Hub PhD students - congratulations to Zhenguo, Yankun and Zhechen who recently submitted their theses for examination.

This year has also seen several individual and collective achievements - Mark (WA Science Hall of Fame) and Liang (ATSE Fellow) were recognised for the immense contributions to engineering made throughout their careers; while Nicole, Greg and Matt celebrated success following the recent round of ARC Discovery Project awards. We also recognise Mark and Greg who have transitioned to the status of Emeritus Professors at UWA, and we look forward to their continued collaboration. We have also pushed ahead with our 'Impact. Engagement and Legacy (IEL)' framework - which over the last few months has seen publication of the first guidance note (Matt and Nicole), kick off of a mini 'impact' project with Woodside (Rasoul), and delivery of a series of masterclasses related to Bayesian statistics and offshore forecasting (Ed, Lachlan and Ivica). The IEL framework will guide much of our efforts in 2021 - and we look forward to what will be achieved.

The last few months has also seen us lay the foundations for the TIDE Research Hub, which was announced midyear (<u>click here</u>). This programme will launch in July 2021 and our efforts are currently focused on development of the technical programme and finalisation of contracts. We anticipate starting to recruit post-doctoral researchers and PhD students in April 2021.

This year is one in which to be especially grateful, and I would like to acknowledge the support of Andrew and Kath - who have (patiently) put up with my requests and worked tirelessly toward ensuring the success of the OFFshore

Hub - despite the challenges thrown up by 2020. In addition, progress on the TIDE Research Hub would not have been possible without the efforts of Andrew, supported by Deputy Directors Nicole and Scott. Thanks team!

No doubt many of you have holiday plans for the coming weeks. Please take care traveling, continue to respect COVID-19 rules of engagement, and be mindful that not everyone around you will make good choices. Stay safe - and all the best for the new year.

Hub News

Liang Cheng Elected 2020 Fellow of the Australian Academy of Technology and Engineering

Congratulations to OFFshore ITRH member <u>Liang Cheng</u> who was recently elected a 2020 Fellow of the prestigious Australian Academy of Technology and Engineering (<u>ATSE</u>).

New Fellows are elected by the <u>Fellowship</u> on the basis of a range of criteria, always ensuring that newcomers can contribute to the Academy's mission of applying science, technology and engineering to solve the big issues facing our nation in a fast-changing world. Membership is a highly competitive process.

Liang's research has significantly impacted industry practice – for example, to ensure that offshore pipelines and cables are designed and constructed with a small environmental footprint. Over the years he has supported oil, gas and renewables companies in building key offshore infrastructure with less damage to the marine ecosystem.



Seen as an international authority on the long-term interaction of fluid, structures and seabed, Liang has applied his expertise to help industry more effectively design and maintain a range of human-built marine structures.

Liang joins fellow OFFshore ITRH members <u>Melinda Hodkiewicz</u> and <u>Phil Watson</u> who were also elected ATSE Fellows during the term of the Hub.

Congratulations Liang!

ARC Discovery Project Success for OFFshore Hub Members

OFFshore Hub members A/Prof <u>Nicole Jones</u>, Dr <u>Matt Rayson</u> and Prof <u>Greg Ivey</u> of the <u>Metocean hazards from</u> <u>solitons project stream</u> have been awarded funding to continue their ground breaking research activities under the <u>ARC Discovery program</u> grant scheme. Their successful project is entitled "Quantifying vertical and lateral ocean transport due to fronts and eddies: understanding the contribution of sub-mesoscale currents". This project aims to quantify the intensity and location of ocean currents at unprecedented fine spatial scales by using data from a new generation of highresolution satellites. These fine scales dominate the lateral and vertical transport of ocean-borne material, including heat, larvae and pollutants like oil and plastics, yet are poorly understood. New algorithms for processing satellite data will be developed and tested using in situ data in the significant North West Shelf region. Expected outcomes will be novel methods to identify ocean currents and a paradigm shift in the quantification of fine-scale ocean dynamics.



This novel high-resolution ocean current information is directly applicable for use by search and rescue, offshore oil and gas operations, defence, ship routing, pollution response and ecosystem assessments in Australian waters. The research training provided in this project will also build Australian capacity in utilising remotely-sensed environmental data and more generally in the space technology sector.

The project will kick off in early 2021. Congratulations to Nicole, Matt, Greg and their collaborators <u>Dr Shane</u> <u>Keating</u> (University of New South Wales) and <u>Dr Aurélien Ponte</u> (Institut Français de Recherche pour l'Exploitation de la Mer) for this fine achievement.

Mark Randolph, 2020 WA Science Hall of Fame Inductee

The Western Australian Science Hall of Fame was established in 2007 to recognise exceptional lifelong contributions from Western Australians to science, technology, engineering or mathematics (STEM). Inductees are announced at the annual <u>Premier's Science Awards</u> presentations and this year OFFshore ITRH member <u>Mark Randolph</u> was inducted for his contributions as an internationally-recognised geotechnical engineer and Professor of Civil Engineering at UWA.



Criteria for this prestigious and competitive award include:

- · having undertaken a substantial portion of their work in Western Australia;
- having a substantial track record as a scientist;
- · being internationally renowned in their field;
- · having been instrumental in developing a school of thought and/or policy in WA;
- being engaged in outreach;
- · having been influential in the mentorship of others through developing the careers of STEM practitioners;
- · and being a member of a learned academy or being of similar stature.

Throughout his career, Mark has worked across academia and industry to solve complex engineering challenges. Commencing at UWA in 1986, Mark has helped to build WA's international reputation as a hub for excellence in geotechnical engineering, active in a global community looking for new solutions in the field.

Crucial to this was the establishment of the Australian Research Council (<u>ARC</u>) Centre for Offshore Foundation Systems (<u>COFS</u>) in 1997, which housed the first <u>centrifuge</u> in the southern hemisphere at the time and enabled testing relevant to what was seen as a "growing offshore industry".

Driven by the desire to solve problems and take on technical challenges, Mark will continue to focus on mentoring students and tackling new issues, such as looking at the development of offshore renewables.

Congratulations Mark!

Impact Engagement Legacy: Masterclasses

The OFFshore Hub has now entered its final year. In a bid to deliver the collective achievement of our efforts in a way that maximises value to our current industry partners, and the wider offshore industry, we are focusing on activities which maximise Impact (transferring knowledge to change current practice), Engagement (interacting with current industry partners and the wider offshore industry) and Legacy (providing an ongoing profile for the OFFshore Hub and its researchers).

As part of the OFFshore ITRH's Impact, Engagement and Legacy initiative, one of our first key engagement activities was to run a series of Masterclasses relevant to the offshore sector. The three part series entitled *Bayesian statistics and forecasting for the offshore industry* was presented to a packed crowd in the Perth CBD. The sessions were well attended with participants drawn from a broad range of organisations.

OFFshore ITRH members <u>Edward Cripps</u> and <u>Lachlan Astfalck</u> kicked it off by introducing the foundational principles of Bayesian model construction, with an emphasis on probabilistic forecasting and validation – both factors important in the decision-making process for unknown future events.



Once the mathematical foundation of Bayesian model construction was laid, Edward

Cripps and <u>lvica Janekovic</u> focused on concrete examples of how the application of Bayesian statistics can reduce uncertainty in forecasting. This has the potential to improve decision making and reduce costs across the wider offshore industry.

The goal of these Masterclasses was to disseminate useful principles and tools to the wider offshore industry. Based on the positive feedback received this was achieved!

Presentation slides and videos from all three MasterClasses will be made available on the OFFshore ITRH's legacy website in due course.

Congratulations to the TIDE Research Hub

The OFFshore Hub welcomes the announcement of the TIDE Research Hub, a new federally funded research initiative which will integrate data science techniques with engineering to transform Australia's offshore energy industry.



The Transforming energy Infrastructure through Digital Engineering (TIDE) Research Hub has been awarded \$5 million through the Australian Research Council Industrial Transformation Research Program, which will be supplemented

by an additional \$20 million in cash, in-kind contributions and co-investment from industry partners, UWA, the University of Wollongong (UOW) and a number of leading international universities.

The TIDE Research Hub will launch in 2021 and will work over the next 5 years to unite insights from experimental and industry-generated data in order to improve the design and management of offshore energy infrastructure, a

critical component of this nationally important industry.

The new Research Hub leverages the success of UWA's current Research Hub for Offshore Floating Facilities (<u>OFFshore Hub</u>), and will bring together a team of leading Australian researchers alongside international and industry partners.

Hosted at the UWA <u>Oceans Graduate School</u>, a world-leader in oceans engineering, the TIDE Research Hub will draw experts from the core disciplines of oceanography, hydrodynamics, geotechnics and data science. The chief investigators comprise 17 researchers from UWA and three from the National Institute for Applied Statistics Research Australia at the University of Wollongong (UOW).

The Australian team will be joined by international collaborators from the University of Texas, the University of Oxford, the Technology Centre for Offshore and Marine Singapore, the University of Southampton, HR Wallingford, Lancaster University and the Alan Turing Institute.

These researchers will work with an additional 17 investigators from industry partners, including three of Australia's largest LNG producers – Woodside, Shell and INPEX – as well as Lloyd's Register Group, Bureau Veritas, Fugro and Wood. Also contributing to TIDE are the Australian Bureau of Meteorology and the Australian Institute of Marine Science.

This federal funding is a recognition of the quality of ocean engineering research at UWA as well as an opportunity to create further research impact through far-reaching collaboration.

To read more about the TIDE Research Hub click here.

Hub Spotlight

Andrew Zulberti is one of the PhD students in the Project 1: Metocean hazards from solitons stream. His research focuses on creating improved methods to accurately forecast waves affecting offshore structures.

"A detailed understanding of the mechanics of near-bed hydrodynamics on continental shelves requires observations spanning both spatial and temporal scales. At present, physical and numerical models of these flows are not able to resolve all necessary scales of motion, and in-situ observations are both challenging to make and interpret. Recent advances in in-situ sensing technologies and methods of analysis provide potential for improved understanding through novel field measurements. This study will use a unique



set of mean and turbulent flow measurements, taken recently on Australia's Northwest Shelf in partnership with Shell and Woodside, to provide insight into the dynamics of near bed flows on the world's continental shelves."

The ability to accurately forecast waves surrounding offshore facilities and their vessel to vessel interactions, will lead to production and offloading efficiencies by reducing costly disruptions and enhancing safety processes.

Andrew is an active participant in the OFFshore ITRH <u>mentoring program</u> and for further details of his research, please refer to his <u>profile page</u>.

Publications

Interested in learning more about our work? Below is a list of some of our more recent publications. A full list of our publications can be found <u>here</u>. To request a PDF version please contact us.



- Sahdi, F., Tom, J., Watson, P., Gaudin, C., Bransby, M. (2020) <u>Effect of water entrainment on seabed soils</u> <u>during cyclic pipe-soil interaction</u>. Proceedings of ISFOG 2020
- Guevera, M., Doherty, J., Watson, P., White, D. (2020) <u>Key features impacting soil-conductor lateral</u> <u>behaviour as illustrated by centrifuge tests.</u> Proceedings of ISFOG 2020
- Zulberti, A., Jones, N., Ivey, G. (2020) Observations of Enhanced Sediment Transport by Nonlinear Internal Waves Geophysical Research Letter
- Jones, N., Ivey, G., Rayson, M., Kelly, S. (2020) <u>Mixing Driven by Breaking Nonlinear Internal</u> <u>Waves</u>. Geophysical Research Letter
- Zhechen, H., Sahdi, F., Gaudin, C., Randolph, M. (2020) <u>Centrifuge modelling of pipe-soil interaction in</u> <u>clay with crust layer</u>. Marine Structures 75 (2021) 102876
- Minguez, M., Zhao, W., Gao, Z., Efthymiou, M. (2020) Water Intake Riser Hydrodynamic Damping Modelling for Fatigue Assessment. Offshore Technology Conference (OTC) Asia 2020, KL, Malaysia
- Gao, Z., Efthymiou, M., Cheng, L., Zhou, T., Minguez, M., Zhao, W. (2020) Fatigue analysis of water intake risers: Hydrodynamic damping effect and a hybrid frequency-time domain method. Marine Structures 75 (2021) 102869
- Bartels, A., Cripps, E., Keating, A., Milne, I., Travaglione, B., Hodkiewicz, M. (2020) Framework for Validation of Permanently Installed MEMS-Based Acquisition Devices Using Soft Sensor Models. MDPI CivilEng 2020 1(2), 93-105
- Wang, H., Zhao, W., Draper, S., Wolgamot, H., Taylor, P. (2020) Experimental and numerical study of free-surface wave resonance in the gap between two elongated parallel boxes with square corners. Applied Ocean Research Volume 104, November 2020, 102376
- Tom, J. G., Draper, S., Yao, W. (2020) Estimating seabed shear stress amplification around circular cylinders: an observational method based on laboratory experiments. 10th International Conference on Scour and Erosion. Arlington, Virginia
- Milne, I., Kimmoun, O., Molin, B., Graham, J. (2020) <u>An experimental and numerical study of the vortex</u> shedding dynamics during gap resonance. Proceedings of the 35th IWWWFB workshop, Seoul, South Korea
- Chen, L., Taylor, P., Draper, S., Wolgamot, H., Cheng, L., Ning, D. (2020) <u>Nonlinear wave runup on a</u>
 <u>FPSO bow causing greenwater events</u>. Proceedings of the 35th IWWWFB workshop, Seoul, South Korea
- Gao, Z., Efthymiou, M., Zhao, W., Cheng, L., Zhou, T. (2020) <u>Experimental study of hydrodynamic</u> <u>damping for water intake risers</u>. International Conference on Ocean, Offshore and Arctic Engineering OMAE2019-18119

- Ghasemi, A., Drobyshevski, Y., Kimiaei, M., Efthymiou, M. (2020) <u>Application of peak distribution</u> method for response based analysis of mooring lines under tropical storms. International Conference on Ocean, Offshore and Arctic Engineering OMAE2019-18534
- Hejazi, R., Grime, A., Randolph, M., Efthymiou, M. (2020) <u>A bayesian machine learning approach for</u>
 <u>efficient integrity management of steel lazy wave risers</u>. International Conference on Ocean, Offshore and
 Arctic Engineering OMAE2019-18190

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