



October 09, 2019

Welcome from Phil Watson, OFFshore ITRH Director

It's been a while since we updated you, and a lot has happened!



The Hub has entered a highly productive stage, as we move into the final phase of the research programme. The last of our PhD students have been appointed, with the final project to be underway within the coming months. Congratulations to Michael Bertolacci who will shortly submit his thesis for

examination, becoming the 7th Hub PhD student to complete. While the

research effort continues at pace we are also exploring ways to expand the scope, for example our recent efforts to secure a local field testing site for offshore geotechnical research which may be used beyond the life of the OFFshore Hub.

The Advisory Board met in May and approved the pursuit of our bid for a new ARC Research Hub. While standing apart from the OFFshore Hub, we hope this new research programme will include the current industry partners, as well as a number of new faces drawn from operators, class societies, and contractors/designers. The latter category has been included to increase the speed with which our research is adopted for use on projects, and is consistent with the 'transformational' aspect of the ARC programme. While details are still to be finalised, the new Hub will involve the hybridisation of data based and physics based sciences to solve challenges and create opportunities across the life cycle of energy projects – to inform site definition and project design, to optimise installation and operational phases, and to enable cost effective life extension. Researchers in the new Hub will understand the power of data to inform physics, while the research itself will be aimed at ensuring Australian energy projects remain safe and globally competitive.

In recent months, the research team has been very active in areas related to the OFFshore Hub. Examples include our involvement in physical model testing for industry partners Woodside and Shell; the delivery of a masterclass on pipeline geotechnics by Chief investigators Fraser Bransby and David White; participation in major new research bids with other Australian universities (including the ARC Special Research Initiative in Excellence in Antarctic Science); and involvement in various conferences, including ISFOG 2020 in which Hub researchers have roles in both the organisation and running of a high profile prediction event. It's great to see this level of

engagement – go team!

Enjoy the spring weather!

As always, we thank you for your support - and welcome your involvement.

Hub News

Dr Lijun Deng, a Robert and Maude Gledden Senior Visiting Fellow

The Robert and Maude Gledden Senior Visiting Fellowship promotes and encourages education and research at the University in the disciplines of applied science, particularly related to surveying, engineering, mining or cognate subjects.

As a visiting Gledden scholar, Dr Lijun Deng is currently collaborating with colleagues from UWA's <u>Oceans Institute</u> and the OFFshore ITRH (Phil Watson, Joe Tom and Fraser Bransby) on the seismic response of subsea foundations – linked to the ITRH Project 4: <u>Novel Anchors and Subsea Foundation Systems</u>.

Dr Lijun Deng is an Associate Professor in the Department of Civil and Environmental Engineering at the <u>University of Alberta</u> (UAlberta), Canada. He joined UAlberta in January 2013, after obtaining a PhD degree in 2012 from the University of California, Davis. Lijun's research interests cover geotechnical earthquake engineering, foundation engineering, soil-structure interaction, and



frozen ground engineering. His research has spanned laboratory-scale testing, full-scale testing, and geotechnical centrifuge modelling.

Recently he has focused on the axial performance of screw micropiles and helical piles, and the occurrence of liquefaction triggered by the 2015 Gorkha (Nepal) earthquake. He has published more than 30 journal papers and has attracted over CA\$1 million funding from federal agencies and local industry.

You can catch Lijun live and in action at his upcoming presentation *"The Power of Earth: the 2015 Gorkha" (Nepal) earthquake and case studies"* on Wednesday 23rd of October from 6 to 7 pm in the Fox Lecture Theatre (UWA Arts Building).

Field Trip to Rowley Shoals

Members of both the <u>UWA Ocean Dynamics group</u> and the OFFshore ITRH <u>Project 1</u> (Metocean) team recently returned from a second field campaign on the Australian Northwest Shelf. This campaign was focused just inshore of the Rowley Shoals, a group of three atoll-like coral reefs about 260 km west of Broome. The experiment was a collaboration between IOMRC partners UWA and <u>AIMS</u> (Australian Institute of Marine Science), and field operations were conducted from the AIMS Research Vessel Solander.

The aim of the 2019 Rowley Shoals Field Trip was to deploy and subsequently recover four UWA moorings (150-330 m depth) and one bottom-mounted frame inshore of Imperious Reef. The UWA moorings consisted of three traditional moorings, a profiling mooring with a surface float and one bottom-mounted lander. The moorings and bottom frames, equipped with a range of oceanographic equipment, logged ocean variables including water currents, temperature and salinity for six weeks in 250m of water depth. A Smith-MacIntyre grab was also used to collect sediment from the sea bottom. Further ship-based observations were collected through a series of across-shelf conductivity-temperature-depth (CTD) transects.



The experiment captured the spatial scales of extreme physical oceanographic processes on the North West Shelf, particularly nonlinear internal waves or solitons. Novel near-seabed measurements will be used for PhD studies of oceanic benthic boundary layer dynamics and sediment transport. An ultimate goal of the project is to gain a better understanding of these oceanographic processes to aid in the design and operation of offshore infrastructure.

Watch this space for outputs from this campaign!

Boost for Data Science Skills in the Natural Resource Industry

Congratulations goes out to OFFshore ITRH Chief Investigator Dr Ed Cripps who, in conjunction with Mark Jessell and Mark Lindsay of UWA, are part of a recently announced <u>\$10M ARC Training Centre in Data</u> <u>Analytics for Resources and Environments (DARE)</u> aimed at boosting data science skills in the natural resources sector.



The new Industrial Transformation Training Centre, hosted at the University of Sydney, will develop and deliver both crucial data

science skills and new ways for Australia to become better decision makers when it comes to natural resources.

Professor Sue Thomas, Chief Executive Officer of the <u>Australian Research Council (ARC)</u>, stated that "... the Training Centre will mentor the next generation in industry and develop a workforce that will be ready to innovate, operate and lead in the area of managing natural resources through the use of data sciences. Collaborative research in this area will develop and deliver frontier data science skills and tools for use by Australia's resource industries to make informed, evidence-based decisions when it comes to exploiting and stewarding the nation's natural resources."

The ARC Training Centre will bring together a diverse field of expertise. Researchers from The University of Sydney will collaborate with colleagues at <u>The University of New South Wales</u> and <u>The University of Western</u> <u>Australia</u>, as well with a range of other partners from across the sector including: the <u>Western Australian</u> <u>Biodiversity Science Institute</u>; <u>Geoscience Australia</u>; <u>IAG Insurance</u>; <u>Mckinsey & Company</u>; <u>Natural Resources</u> <u>Commission</u>; <u>Newcrest Mining Ltd</u>; <u>NSW Treasury</u>; <u>Office of Environment and Heritage NSW</u>; <u>Water NSW</u>; <u>The Alan Turing Institute</u> and the <u>University of Leeds</u>.

Conference Skills and Effective Communication Workshop

Dr Krystyna Haq, Graduate Education Officer at UWA, recently stopped by <u>OceanWorks</u> to present a workshop on Conference Skills and Effective Communication to PhD students from the OFFshore ITRH and the <u>Oceans Graduate School</u> (OGS).



Dr Haq has worked in the area of science communication for over 15 years and runs a wide range of programs for UWA research students.

This very popular workshop covered the four stages of structuring a conference presentation: planning, preparation, practice and performance, as well as providing practical advice on how to design a conference poster to achieve maximum effect. Dr Haq provided guidance on the best way to visually communicate one's research during a conference, with the ultimate aim of reaching a wider audience. The use of a presentation as an opportunity to raise your profile and advertise your work was highlighted. The use of a well designed poster to provide the opportunity to unlock opportunities for networking and discussion was reinforced.

Students will put these new found skills to the test at the upcoming Engineering and Mathematical Sciences HDR Conference at UWA.

2019 SJTU Graduate Summer School

OFFshore ITRH member Wenhua Zhao recently attended the opening ceremony of the 2019 International Summer School on Naval Architecture, Ocean Engineering and Mechanics at Shanghai Jiao Tong University (SJTU). As an invited keynote speaker, Wenhua addressed both students and professors on the importance of ocean engineering and its various aspects, including climate change, renewables, and aqua-culture.



The international summer school provides an opportunity for PhD and

Master's students to learn about the latest theories and applications in naval architecture, ocean engineering and mechanics through academic and cultural immersion. A wide range of courses in various disciplines are offered by world-class professionals and researchers, and is combined with local excursions, cultural activities and field trips.

The summer school runs over two weeks and includes lectures by international scholars, seminars, poster exhibitions, museum and cultural tours, field trips to research institutions and industry scientific research labs.

Wenhua's opening address was well received by both students and professors alike and set a positive tone for the international course. Since its inception in 2009, the summer school has been providing a valuable learning opportunity and forum for students from around the world.

OMAE 2019 – 38th International Conference on Ocean, Offshore and Arctic Engineering

It's that time of year again when members of the OFFshore ITRH head off to present their current research to an international audience at the annual conference of Ocean, Offshore and Arctic Engineering (OMAE). This year's

conference marks its 38th anniversary and was held at the Scottish Event Campus (<u>SEC</u>) in Glasgow, Scotland from the 9th to 14th of June.

For the past 38 years OMAE has provided an international forum for researchers, engineers, technicians and students from both scientific and industrial communities with the opportunity to present advances in technology and its application in industry. It also allows for global participants to exchange ideas and promote collaboration across ocean, offshore and arctic engineering.

Offshore ITRH members Rasoul Hejazi, Joe Tom, Conleth O'Loughlin, Lifen Chen and David White all presented at the conference, while behind the scenes Wenhua Zhao acted as session organizer for the Offshore Technology segment.

The annual conference is organized by the American Society of Mechanical Engineers (ASME).

Hub Spotlight

Tianqiang Jia is a PhD student within the Project 4: Novel Anchors and Subsea Foundation Systems project stream. His research focus is on tolerably mobile foundations which have the ability to move in response to pipeline expansion and contraction. Movement of the mobile foundation alleviates the loads acting on pipeline end terminations (PLETs), permitting a smaller size foundation to be used. In turn, this reduces the required lifting capacity of an installation vessel.



"I have used both experiments and theory to analyse the behaviour of mobile foundations. A series of centrifuge tests were conducted on both kaolin clay and carbonate silt in order to provide experimental data. A framework was

then created to predict the horizontal resistance, settlement and formation of berms due to the typical operating pattern of a PLET which results in cyclic sliding and periods intervening consolidation."

Using tolerably mobile foundations, smaller in size and weight, means potential cost savings through more efficient installations.

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

 Tom, J., White, D. (2019) <u>Drained Bearing Capacity of Shallowly Embedded</u> <u>Pipelines.</u> Journal of Geotechnical and Geoenvironmental Engineering. Volume 145 Issue 11 - November 2019



- O'Loughlin, C., Zhou, Z., Stanier, S., White, D. (2019) <u>Load-controlled cyclic T-bar tests: a new method to assess the combined effects of cyclic loading and consolidation.</u> Géotechnique Letters July 2019
- Manderson, A., Rayson, M., Cripps, E., Girolami, M., Gosling, J.P., Hodkiewicz, Ivey, G., Jones, N. (2019) <u>Uncertainty quantification of density and stratification estimates with implications for predicting ocean dynamics.</u> Journal of Atmospheric and Oceanic Technology, July 2019
- N. Fana, W.C. Zhang, F. Sahdi, T.K. Nian, M. F. Randolph (2019) <u>Vertical response of a pipeline under the impact of submarine slides.</u> 2nd International Conference on Natural Hazards & Infrastructure 23-26 June, 2019, Chania, Greece
- Stanisic, D., Efthymiou, M., White, D., Kimiaei, M. (2019) <u>Mooring system reliability in tropical cyclone and</u> <u>North Sea winter storm environments</u>. Ocean Research, Volume 88, July 2019, Pages 306-316
- Sahdi, F., Gaudin, C., Tom, J., Tong, F. (2019) <u>Mechanisms of soil flow during submarine slide-pipe</u> <u>impact.</u> Ocean Engineering, Volume 186, 15 August 2019, 106079
- Zhao, W., Taylor, P., Wolgamot, H., Eatock Taylor, R. (2019) <u>Amplification of random wave run-up on the front face of a box driven by tertiary wave interactions.</u> Journal of Fluid Mechanics Volume 869 25 June 2019, pp. 706-725
- Gong, Y., Rayson, M., Jones, N., Ivey, G. (2019) <u>The effects of remote internal tides on continental slope internal tide generation.</u> Journal of Physical Oceanography
- Zhang, X., Draper, S., Wolgamot, H., Zhao, W., Chen, L., Cheng, L. (2019) <u>CFD Investigations of 2D</u> <u>Greenwater Overtopping of a Floating Offshore Vessel. International</u> Conference on Ocean, Offshore and Arctic Engineering OMAE2019-95865
- Tom, J., Rijnsdorp, D., Ragni, R., White, D. (2019) <u>Fluid-Structure-Soil Interaction of a Moored Wave</u> <u>Energy Device.</u> International Conference on Ocean, Offshore and Arctic Engineering OMAE2019-95419
- Chen, L., Zhang, X., Taylor, P., Draper, S., Wolgamot, H. (2019) <u>CFD Modelling to Investigate Design of a</u> <u>Whaleback-Type Forecastle for Greenwater Protection.</u> International Conference on Ocean, Offshore and Arctic Engineering OMAE2019-95198
- Hejazi, R., Grime, A., Randolph, M., Efthymiou, M. (2019) <u>The Impact of Second-Order FPSO Motions on</u> the <u>Fatigue Performance of Large Diameter SCRs</u>. International Conference on Ocean, Offshore and Arctic Engineering OMAE2019-96451
- Milne, I., Tong, F., Graham, J. (2019) <u>Vortex Shedding and Roll Damping from Hulls with Rounded</u> <u>Bilges.</u> International Conference on Ocean, Offshore and Arctic Engineering OMAE2019-95629
- Chen, L, Taylor, P., Draper, S., Wolgamot, H., Milne, I., Whelan, J. (2019) <u>Response based design</u> metocean conditions for a permanently moored FPSO during tropical cyclones: estimation of greenwater risk. Applied Ocean Research, Volume 89, August 2019, Pages 115-127
- Astfalck, L., Cripps, E., Hodkiewicz, M., Milne, I. (2019) <u>A Bayesian approach to the quantification of extremal responses in simulated dynamic structures.</u> Ocean Engineering Volume 182, 15_June 2019, Pages 594-607

• Zhou, Z., O'Loughlin, C., White, D. (2019) An effective stress analysis for predicting the evolution of SCRseabed stiffness accounting for consolidation. Géotechnique ISSN 0016-8505 | E-ISSN 1751-7656

To register your interest in receiving the OFFshore ITRH newsletter please click here

Copies of all previous newsletters are available here.



ARC Research Hub for Offshore Floating Facilities All rights reserved.