



Centre for Offshore Research
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Technical Talk

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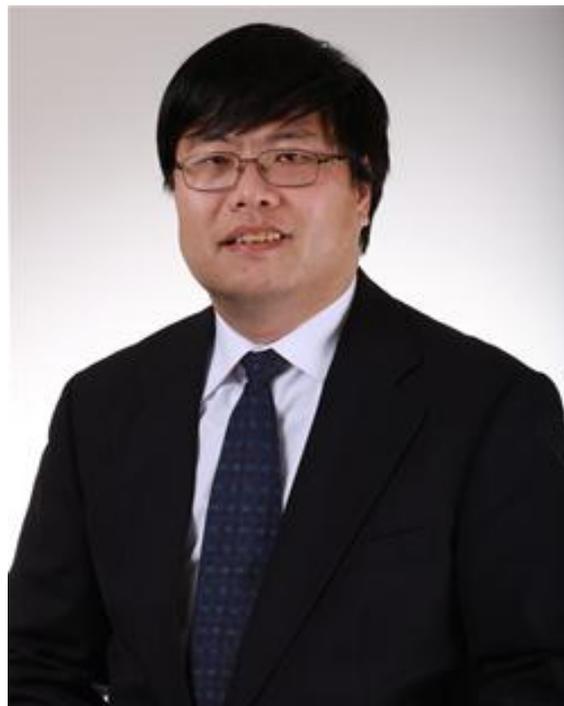
The Society of Naval Architects and Marine Engineers Singapore (SNAMES)

The Joint Branch of the RINA and the IMarEST (Singapore)

Centre for Offshore Research & Engineering (CORE), NUS

Study of Nonlinear Internal Waves and their Impact on Drilling Systems

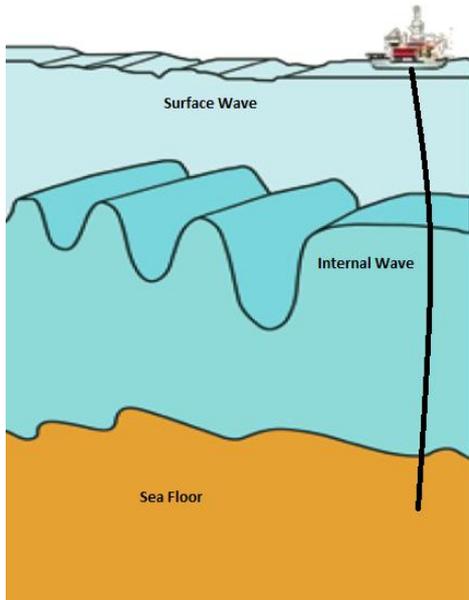
By



Dr. Shan Shi, PhD, PE

Date : 13th April 2017, Thursday.
Time : 6:30 pm to 7:00 pm Registration & Refreshment
Talk begins at 7:00 p.m. and ends at 8.00 p.m.
Venue: LT18A, Singapore Polytechnic
500 Dover Rd, 139651

Abstract



Internal waves near the ocean surface have been observed in many parts of the world including the Andaman Sea, Sulu Sea and South China Sea among others. The factors that cause and propagate these large amplitude waves include bathymetry, density stratification and ocean currents. Although their effects on floating drilling platforms and its riser systems have not been extensively studied, these waves have in the past seriously disrupted offshore exploration and drilling operations. In particular a drill pipe was ripped from the BOP and lost during drilling operations in the Andaman Sea. Drilling riser damages were also reported from the South China Sea among other places.

The purpose of the study is to present a valid numerical model conforming to the physics of internal waves and to study the effects on offshore drilling semisubmersibles and riser systems. The pertinent differential equation that captures the physics is the Korteweg-de Vries (KdV) equation which has a general solution involving Jacobian elliptical functions. The solution of the Taylor Goldstein equation captures the effects of the pycnocline. Internal wave packets with decayed oscillations as observed from satellite pictures are specifically modeled.

The nonlinear internal waves are characterized by wave amplitudes that can exceed 50 ms and the presence of shearing currents near the layer of pycnocline. The offshore drilling system is exposed to these current shears and the associated movements of large volumes of water. The effect of internal waves on drilling systems is studied through nonlinear fully coupled time domain analysis. The numerical model is implemented in a coupled analysis program where the hull, moorings and riser are considered as an integrated system. The program is then utilized to study the effects of the internal wave on the platform global motions and drilling system integrity.



The study could be useful for future guidance on offshore exploration and drilling operations in areas where the internal wave phenomenon is prominent.

About the Speaker

Dr. Shan Shi has over 20 years extensive work experience for the design and analysis of Offshore Floating Systems. Specialized in complex top-tensioned and flexible riser system design/analysis. Expertise in coupled dynamic analysis for offshore deep-water systems. Proficient in structural dynamics and finite element analysis. Safety-trained and certified for long-term work on offshore facilities.

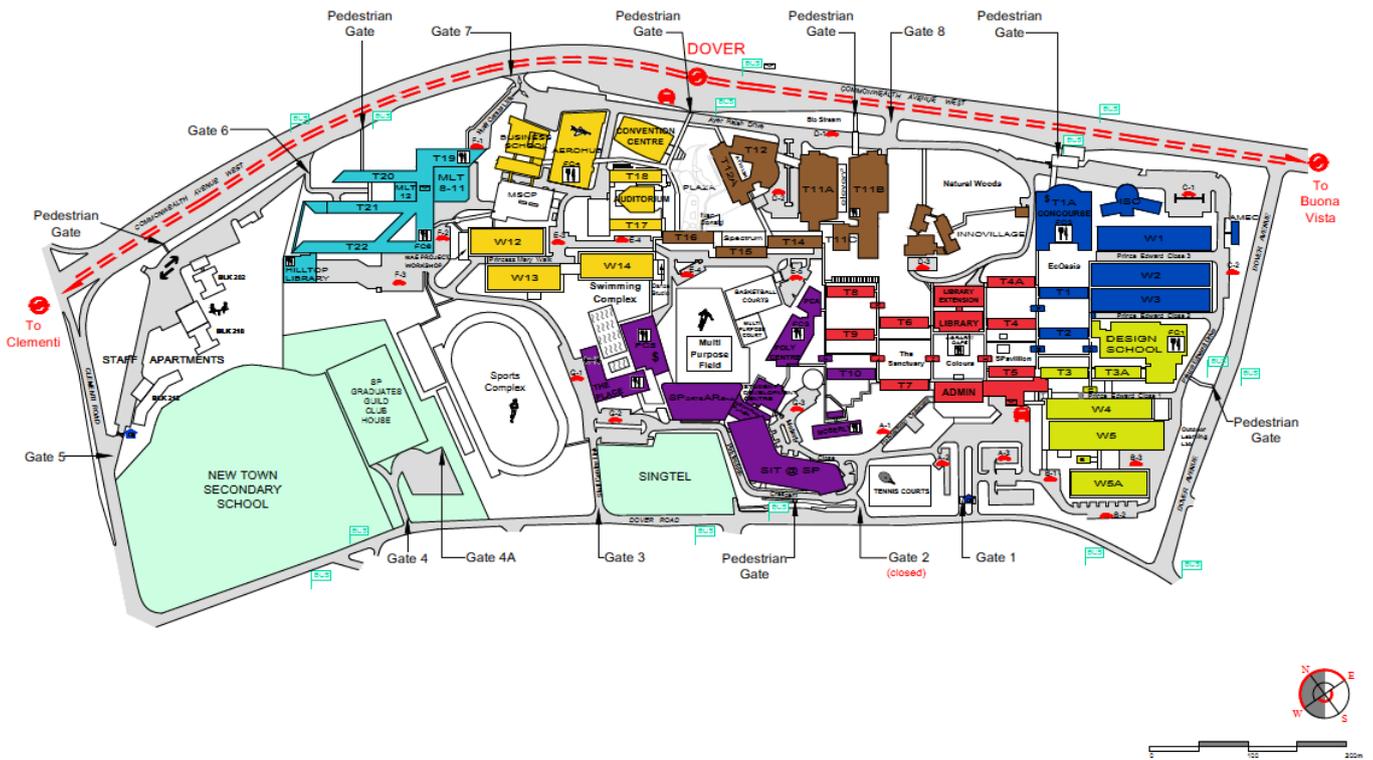
Has performed engineering of top-tensioned risers, steel catenary risers, umbilicals, hydrodynamics, naval architecture, mooring, and structural engineering in multi-disciplinary conceptual developments, FEEDs and detailed designs.

Dr. Shan Shi is currently the President of Offshore Dynamics, Inc. He received a BE degree in Naval Architecture & Ocean Engineering from Harbin Engineering University, also an MS and a PhD degree in Structural Dynamics and Earthquake Engineering from the University of Illinois at Urbana-Champaign.



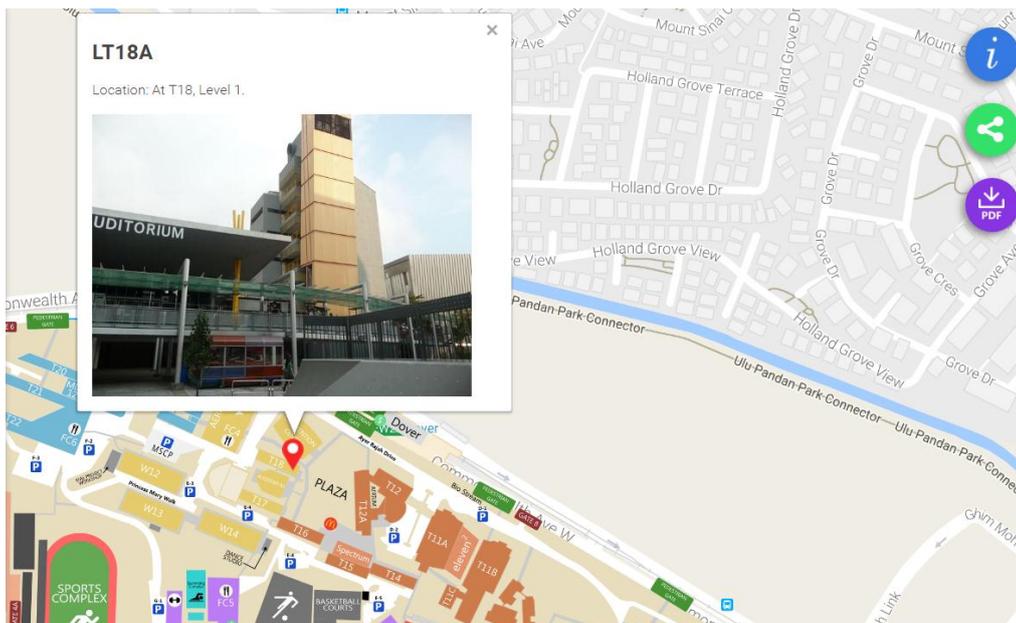
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Location Map



SINGAPORE POLYTECHNIC CAMPUS

Website: www.sp.edu.sg Main Line : 6775 1133 Mar 2017



**All members are welcome and admission is free
but early registration is needed.
No filming or walk-in guest is allowed for this event.**