

Modeling and Characterization of Novel Deepwater Composite Risers

Amaechi Chiemela Victor¹

1st Year PhD Student – Engineering Department

Supervisor: Prof. Jianqiao Ye

¹Email: c.amaechi@Lancaster.ac.uk

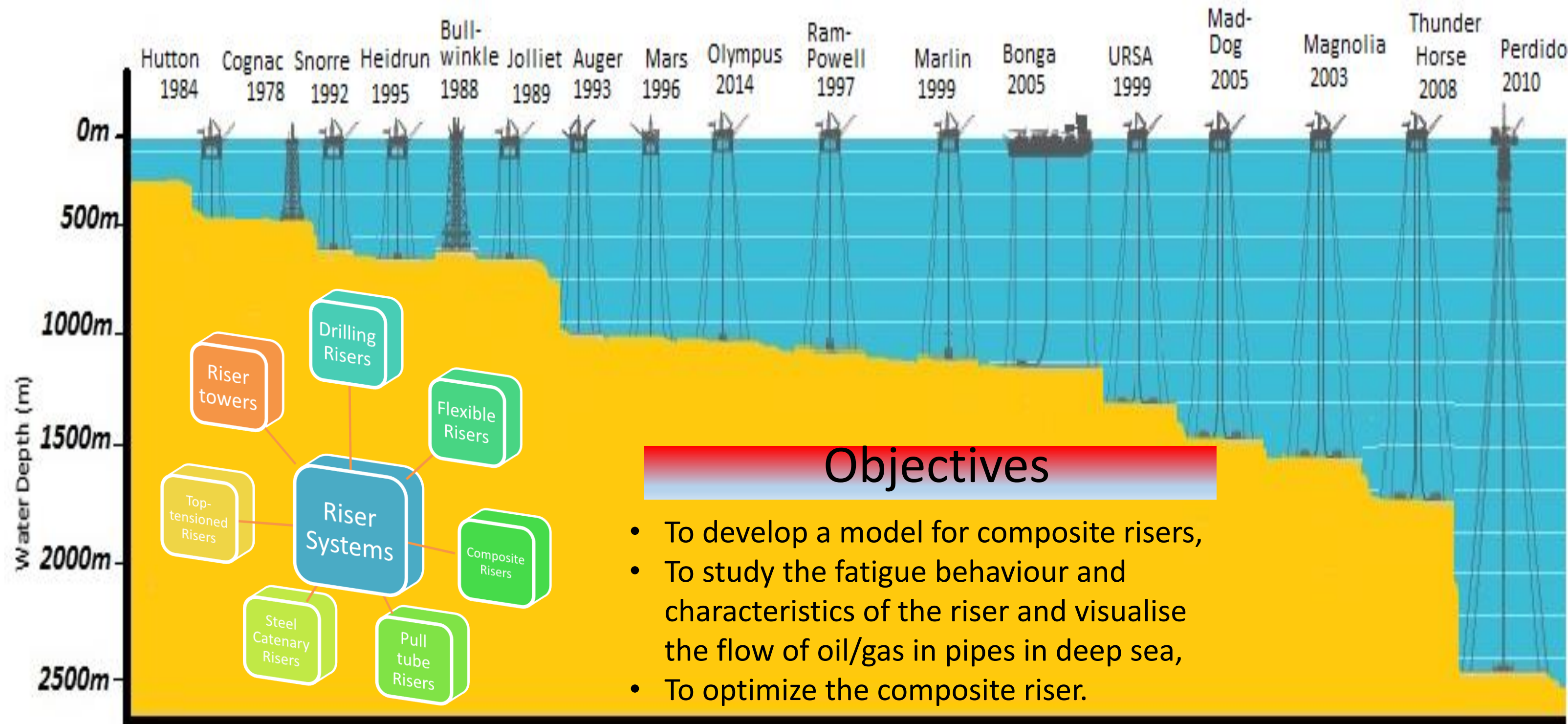


Motivation

- Different types and sizes of pipes are used, like the drill pipes, risers and the horizontal pipes. The dimensions could be 30" (76cm) or more as they are large capacity pipelines.
- The earliest known oil wells were drilled in China in 347 AD or earlier. They had depths of up to about 800 feet (240 m) and were drilled using bits attached to bamboo poles.
- The history of oil exploration dates to 1891 when the first oil well was drilled at Grand Lake St Mary's, Ohio.
- In 2003 in Gulf of Mexico, only 35% of production was from wells at depths of >300m. By 2015, that figure was 95%.

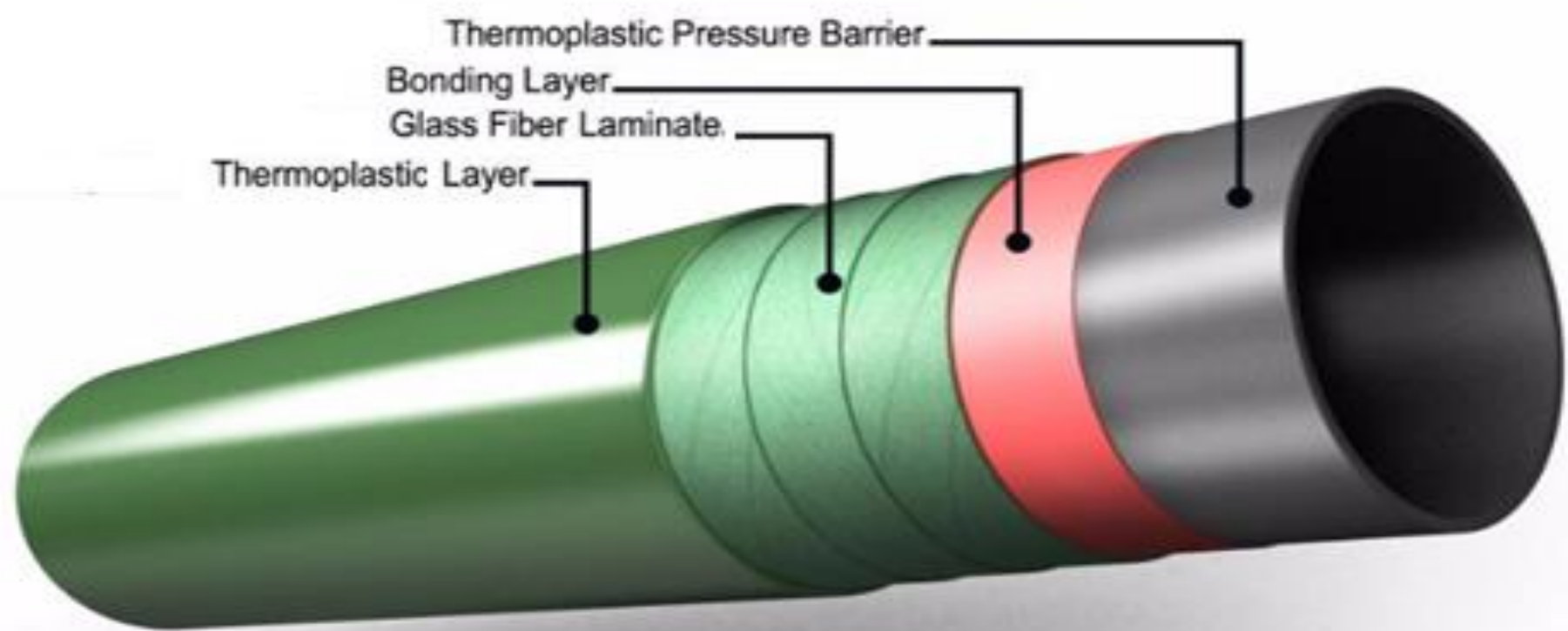
Why Choose Composite Risers?

History on Offshore Deepwaters

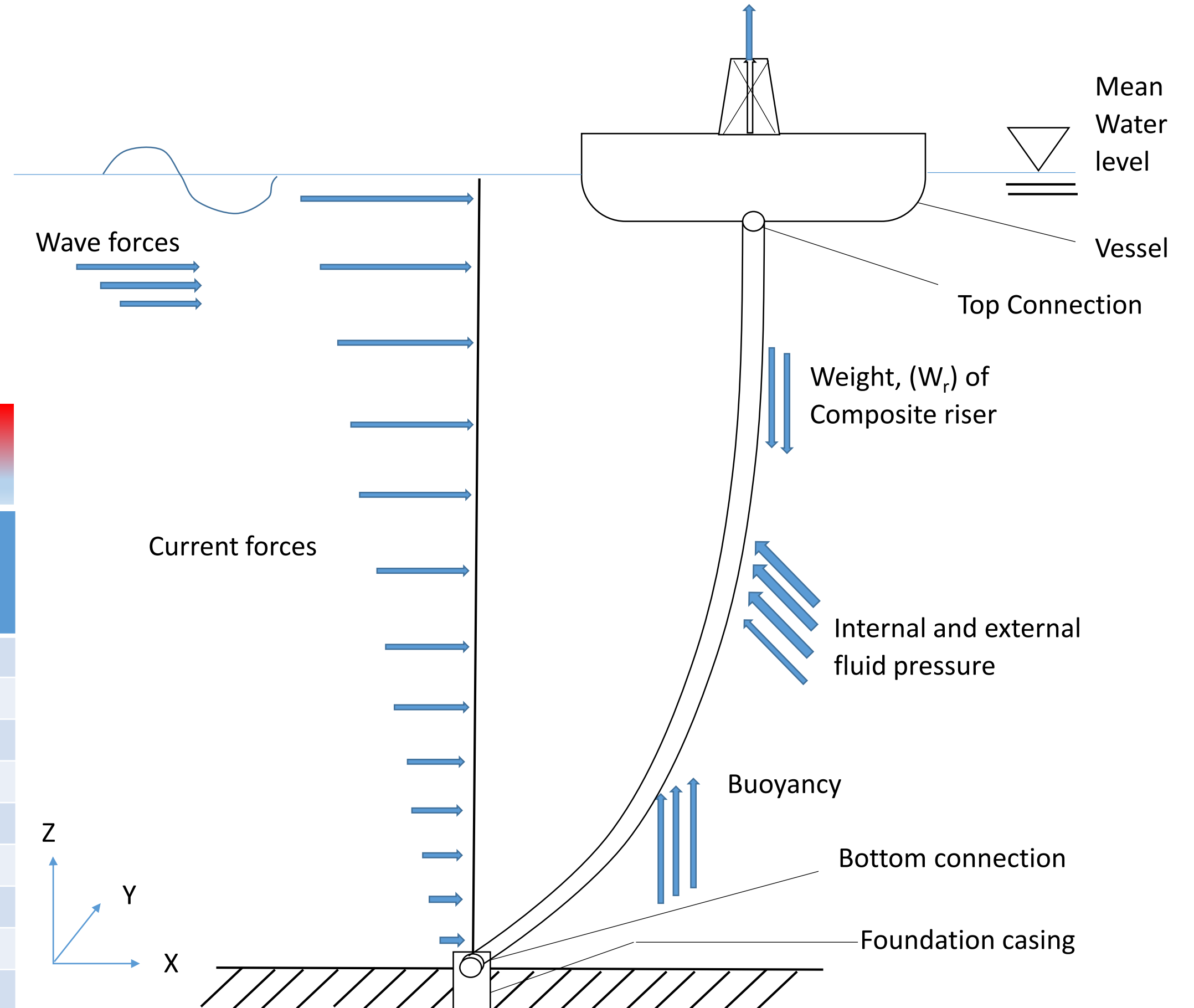


- Objectives**
- To develop a model for composite risers,
 - To study the fatigue behaviour and characteristics of the riser and visualise the flow of oil/gas in pipes in deep sea,
 - To optimize the composite riser.

Composite Tubes



Loads on Composite Risers



Material Properties

PROPERTY	Specific Gravity	Density (kg/m ³)	Thermal conductivity γ (w/m-°C)	Heat capacity (J/kg/°C)	Poisson ratio V ₁₂	Young's modulus (GPa)
Sea Water	1.0	1,030	0.6	4,200	0.5	2.15
Steel	7.8	7,850	50	480	0.30	200
Titanium	4.43	4430	19	540	0.342	113.8
Aluminium	2.78	2780	204.26	910	0.33	68.9
AS4-Epoxy	1.53	1530	---	---	0.32	---
AS4-PEEK	1.56	1561	---	---	0.28	66
P75/Epoxy	1.78	1776	---	---	0.29	---
P75/PEEK	1.77	1773	---	---	0.30	33
PEEK	1.32	1300	---	---	0.40	5.15
Composite Riser	1.68	1680	0.5	1,200	0.28	---

Conclusion

Composite riser behave differently from Steel Risers, they were first deployed in deepwaters in 2002, and there are some challenges, e.g. lack of standards on Composite Risers. Composite materials offer a range of benefits that could improve riser technology.

References

- Azar, J. (2006). Drilling Problems and Solutions. In R. F. Larry W. L., *Petroleum Engineering Handbook; Volume II - Drilling Engineering* (pp. 433-454). Texas: Elsevier Ltd.
- Bai, Y., & Bai, Q. (2005). *Subsea Pipelines and Risers*; First Edition, 2013 Reprint; Oxford, UK: Elsevier Ltd.
- Fischer, F. J. (1995). Composite Production Risers for Deepwater Offshore Structures. *Oil & Gas Science And Technology* 50(1), 35-43.

Acknowledgment

- I wish to acknowledge the support of my Supervisor Prof. Jianqiao Ye.
- I also appreciate my sponsors NDDC and Lancaster University Engineering.
- Special thanks to the staff and members of the Engineering Department.
- Also, my colleagues Charles Odijie, Yakubu Tsado and Adeayo Sotayo.



PGRC 2016, 7th May 2016

Parametric of a Composite Riser Tube

