

Editorial

John Owen BEng, PhD, CEng, FICE, SFHEA, MInstP
Associate Professor, Department of Civil Engineering, University of
Nottingham, Nottingham, UK

There has been a rapid growth in the number of large-scale offshore wind farms in recent years. Even neglecting the complications of considering the whole wind farm system, the modelling of an isolated wind turbine poses many challenges: it is subjected to dynamic loading from wind and waves; it is formed from a variety of different materials ranging from advanced composites to high-strength grout; its behaviour is greatly influenced by complex soil–structure interaction under repeated loading and varying tide and sea states. This themed issue of *Engineering and Computational Mechanics* includes four papers that cover the full breadth of these challenges.

Wang and Soutis (2016) describe the detailed finite-element modelling of the behaviour of composite T joints, typical of those found in wind turbine blades. Using an ABAQUS model validated against experimental tests, they demonstrate the advantages of through thickness reinforcement on the joint performance.

Cui and Bhattacharya (2016) consider the dynamic soil–structure interaction that can have a significant effect on the behaviour and design life of an offshore monopile. Using the discrete-element method, they investigate the effects of the number of load cycles on foundation performance, in particular the distributions of stress around the monopile. They predict an increase in soil stiffness that agrees with small scale tests. This is due to soil flow and consequent densification, and can lead to an unwelcome increase in natural frequency.

The other two papers address more applied topics in modelling the response of offshore wind turbines. Tziavos *et al.* (2016) present a review of numerical modelling approaches suitable for the investigation of grouted connections. They consider the different sources of loading on offshore structures and how they can be modelled in an appropriately simplified manner

before moving on to address the issue of modelling the grouted connection.

Ward (2016) looks at a simplified approach to estimating the natural frequencies of offshore wind turbines. This paper specifically addresses the needs of the designer in the early stages of the design process, when a quick prediction of the natural frequency is required without the time for a detailed structural model to be developed.

We hope you enjoy this themed issue of *Engineering and Computational Mechanics* on engineering and computational mechanics in offshore wind, and as always, we welcome your comments on this issue, and on the journal as a whole.

REFERENCES

- Cui L and Bhattacharya S (2016) Soil–monopile interactions for offshore wind turbines. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **169**(4): 171–182. <http://dx.doi.org/jenclm.16.00006>.
- Tziavos NI, Hemida H, Metje N and Baniotopoulos C (2016) Grouted connections on offshore wind turbines: a review. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **169**(4): 183–195. <http://dx.doi.org/jenclm.16.00004>.
- Wang Y and Soutis C (2016) Modelling the effect of tufted yarns in composite T-joints. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **169**(4): 158–170. <http://dx.doi.org/jenclm.16.00002>.
- Ward IP (2016) Natural frequency analysis of offshore wind turbine monopiles. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **169**(4): 196–208. <http://dx.doi.org/jenclm.16.00003>.