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Vertical dynamic interaction between suction caissons in tetrapod arrangements for offshore wind turbines

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ABSTRACT

Offshore wind energy is playing an important role in the future mix of renewable sources for electrical power production. Although floating technology is taking off in a powerful way, more mature fixed wind turbines are still strongly growing in number and capabilities [1]. For challenging soft soils, suction caissons are often considered for geotechnical and ease of installation/removal reasons. In this contribution, the vertical dynamic interaction of a tetrapod arrangement of suctions caissons is studied through an specially tailored boundary element - shell finite element coupled model. The model is an evolution of a previous one [2], where the boundary element hypersingular formulation required to deal with the shell coupling is no longer needed, and an already available multilayered viscoelastic half-space Green's function [3] can be hence used. The discretization is thus reduced to only the suction caisson skirt and lid. The dynamic interaction is observed from the point of view of stiffnesses. The influence of the foundation spacing and soil properties on the resulting impedance matrix is studied. As expected, the most relevant factor on the dynamic interaction is the spacing. Impedance curves contain local minima and maxima at frequencies corresponding to wavelength fractions of the spacing.

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