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Interaction between floater and sea ice simulated with dilated polyhedral DEM. (English)

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Summary: The polyhedral discrete element method with polyhedral elements is developed to simulate the interaction between ice floes and offshore structure. The dilated polyhedral elements are constructed by Minkowski sum theory and Voronoi tessellation algorithm. The normalized Hertz contact force model is introduced to calculate the contact force considering the various contact modes between dilated polyhedral elements. Then a bonding-failure model between bonded elements with the elastic force, which acts on the shared common plane between contacted elements, is adopted to simulate the breaking process of level ice. Meanwhile, the buoyancy and buoyancy moment, the drag force and drag moment on the ice floes are calculated by meshing every polyhedral element as tetrahedrons. Considering different ice thickness, floe concentration, floe size, etc., the ice load on offshore structure is simulated by this polyhedral DEM. In the simulations the offshore structure model is generated analogously as a rigid body. Finally the sensitive analysis of ice load on structure is performed based on the DEM simulations.

For the entire collection see [Zbl 1361.00015].

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