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Ice-Structure Interactions by Using Peridynamics

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Despite of its advantages, utilization of the Arctic region for sailing brings new challenges due to its harsh environment. Therefore, ship structures must be designed to withstand ice loads in case of a collision between a ship and ice takes place. Moreover, ice-structure interactions are also important concern for the oil & gas platforms in the Arctic. Although experimental studies can give invaluable information about ice-structure interactions, full scale tests are very costly to perform. Therefore, computer simulations can be a good alternative. Ice-structure interaction modelling is a very challenging process since ice material response depends on many different factors including applied-stress, strain-rate, temperature, grain-size, salinity, porosity and confining pressure.

In this study, a state-of-the-art technique, peridynamics is utilized for ice-structure interaction modelling. Peridynamics is a non-classical (non-local) continuum mechanics formulation which is very suitable for failure analysis of materials due its mathematical structure. Cracks can occur naturally in the formulation and there is no need to impose any external crack growth law.