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Computation Fluid Dynamics based model for a better prediction of fluid forces acting on iceberg capsize

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The objective of this on-going research work is to introduce the Computation Fluid Mechanics in the Geoscience field applied to the study of iceberg calving. The ultimate goal is to better quantify ice mass loss due to iceberg calving at marine terminating glaciers. Based on our recent work, this can be done by coupling iceberg calving simulation and inversion of the seismic waves generated by these events, recorded at teleseismic distances [3]. One of the major questions in climate science is indeed to improve the accuracy of sea-level rise prediction, for which mass loss of the polar ice caps has a significant contribution.

In this work, the focus is on buoyancy-dominated fall and capsize of large size subaqueous icebergs (cubic kilometer scale), leading to specific seismic signals. The seismic waves generated during such events and recorded continuously from three decades provide a unique tool to study the evolution of such large icebergs capsize.

To achieve the ambitious task to quantify the space-time evolution of the mass loss of the Groenland ice cap, by using seismic signals, an accurate fluid/structure model of the iceberg capsize is required, to obtain an accurate temporal force of the iceberg acting on the glacier termini to be compared with the inversed force deduced from the seismic signal. First work using the experimental data of an iceberg capsize in [2] show the inadequacy of simplified fluid model. On the contrary, [1] showed the ability of CFD computations to precisely reproduce the kinematics for different cases. More advanced CFD configurations, including the presence of the rigid glacier and a model of the contact between the glacier and the iceberg will be presented as the next steps, before investigating more advanced fluid-structure interaction by taking into account the dynamic response of the glacier.

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