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High fidelity modelling of iceberg capsizes

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One of the major questions in climate science is 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 capsizes of large icebergs.

To better quantify ice mass loss due to iceberg calving at marine terminating glaciers, coupling iceberg calving simulation and inversion of the seismic waves generated by these events is necessary. To achieve our task, a complex fluid/structure model of the iceberg capsizes is required to obtain accurate forces history acting on the glacier terminus. Therefore, based on our recent work, we implement a Computation Fluid Dynamics (CFD) approach to reach a high fidelity modelling of the iceberg capsizes. First work using the experimental data of an iceberg capsizes showed the need and ability of CFD computations to precisely reproduce the iceberg kinematics for different cases. We will present more advanced CFD configurations, including the contact between the capsizing iceberg and a rigid glacier front. Computation results are compared and validated against lab scale experiments, where we outline that some 3D effects cannot be neglected. We will also present full scale capsizes simulations, in which the mixing of ocean layers occurs. In particular, we will quantify the transport of particles within the ocean to illustrate the potential change of nutrients distribution or of pressure experienced by local fauna due to iceberg calving.

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