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# Modelling Southern Ocean iceberg drift and decay with FESOM-IB

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Icebergs are commonly ignored in current general circulation models despite their connections to ocean stratification, phytoplankton growth and redistribution of freshwater in the Southern Ocean. On the way to fully including icebergs in ocean circulation models, we present FESOM-IB, the high resolution Finite Element Sea Ice - Ocean Model (FESOM) enhanced by an IceBerg drift and decay module developed at AWI Bremerhaven.

By solving the momentum equations for iceberg drift, the iceberg trajectory is computed from an evaluation of the FESOM ice/ocean velocity fields and sea surface height at every time step. Icebergs are assumed to be cubical-shaped and treated as Lagrangian point masses having properties such as length, width and height. Simple diagnostic equations for computing the melt rates of icebergs are applied and iceberg dimensions are adjusted accordingly. Therefore the numerical method's stability for the solution of the momentum equations has to be independent from iceberg size. Our numerical procedure proved to be stable across the full range of iceberg classes; small to giant icebergs may be modelled.

We present a 3-year simulation of 308 artifical icebergs from 4 different size classes started at 77 circum-Antarctic locations. Melt rates as well as the components of iceberg momentum balance are quantified and the influence of iceberg size on the drift patterns is discussed. In our simulation giant icebergs tend to stay close to the Antarctic coast. They drift westwards in the coastal current and may only leave it at well-defined bifurcation points in the Weddell Sea, the Ross Sea and over the Kerguelen Plateau. In contrast, smaller icebergs show an off-shore drift component early in their lives. Independent of the iceberg size, the dominant iceberg velocity component is changed into eastward as soon as icebergs reach the ACC.