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TITLE: Icebergs, sea ice, blue carbon and Antarctic climate feedbacks

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ABSTRACT:

Sea ice, including icebergs, has a complex relationship with the carbon held within animals (blue carbon) in the polar regions. Sea-ice losses around West Antarctica's continental shelf generate longer phytoplankton blooms but also make it a hotspot for coastal iceberg disturbance. This matters because in polar regions ice scour limits blue carbon storage ecosystem services, which work as a powerful negative feedback on climate change (less sea ice increases phytoplankton blooms, benthic growth, seabed carbon and sequestration). This resets benthic biota succession (maintaining regional biodiversity) and also fertilizes the ocean with nutrients, generating phytoplankton blooms, which cascade carbon capture into seabed storage and burial by benthos. Small icebergs scour coastal shallows, whereas giant icebergs ground deeper, offshore. Significant benthic communities establish where ice shelves have disintegrated (giant icebergs calving), and rapidly grow to accumulate blue carbon storage. When 5000 km2 giant icebergs calve, we estimate that they generate approximately 106 tonnes of immobilized zoobenthic carbon per year (t C yr-1). However, their collisions with the seabed crush and recycle vast benthic communities, costing an estimated 4 × 104 t C yr-1 We calculate that giant iceberg formation (ice shelf disintegration) has a net potential of approximately 106 t C yr-1 sequestration benefits as well as more widely known negative impacts.This article is part of the theme issue 'The marine system of the West Antarctic Peninsula: status and strategy for progress in a region of rapid change'.

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