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Vast Holocene diatom mats and their relationship to rapid sinking of ice-edge bloom by deep water convection on the Weddell Sea, Antarctica

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The Southern Ocean is responsible for up to 70 % of global silica new production and is very important for the potential sink of biogenic silica in the World Ocean. However, the mechanisms of the rapid silica burial assuming the form of layered diatom ooze in the sedimentary records are still unclear although conventional interpretation equates the diatom layers with self-sedimentation of phytoplankton blooms as a function of proximity to low salinity meltwater. Here, we report an extensive mat of the diatom Chaetoceros spore as a proof for efficient silica burial from marginal basins near the northwestern Weddell Sea ice edge. We adduce new evidence that these diatom mats may have formed from rapid sinking of ice-edge blooms aided by deep water convection along the Antarctic slope front. The mass sinking of Chaetoceros spore blooms on a scale that is recorded in the sediments, however, may require major cooling conditions, a fact that may facilitate the continuous drawdown of ice-edge blooms driven by the intensification of deep water convection. Export of biosilica from Chaetoceros spore blooms at the marginal ice zone may significantly influence the carbon cycle in the glacial Southern Ocean, especially if deep convection markedly increased all around the Antarctic continental margin during glacial periods.