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New concepts regarding the role of sea ice in structuring Southern Ocean ecosystems

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Studies in different sectors of the Southern Ocean have shown that sea ice structures Antarctic marine ecosystems in multiple and complex ways. Sea ice acts as a biogeochemically active barrier for atmosphere—ocean gas exchange, serves as a temporal reservoir for nutrients, controls light availability for phytoplankton, serves as habitat for microalgae, and provides a refuge for pelagic herbivores. Antarctic sea ice is also changing with different sectors of the Southern Ocean exhibiting opposite trends in both sea ice extent and ice cover duration. Models predict a significant decline in Antarctic ice extent and ice volume by the end of the century, and these changes are expected to have significant ramifications for Southern Ocean ecosystems. In this presentation we will provide an overview of new and emerging concepts of the changing role of sea ice in structuring ecosystems in different sectors of the Southern Ocean. We will discuss the applicability of recently developed Arctic concepts, identifying snow as a key driver of ice algal and phytoplankton phenology, to the Southern Ocean, and highlight new research questioning the paradigm of the Antarctic sea ice – ice algae – krill relationship. Using recent findings on the physical drivers of Antarctic ice algal temporal and spatial variability, this presentation will demonstrate the need to better understand sea ice quality rather than quantity to understand its role in structuring marine ecosystems. Furthermore, the potential (and limitations) to infer biological sea ice properties from large-scale physical observations will be discussed.