

Sea ice provides slow food for microscopic plants

Christina Schallenberg

Chaetoceros debilis
(marine diatom)
a colonial plankton organism
250 x magnification

First Light Symposium
Hobart, 1-3rd July 2019

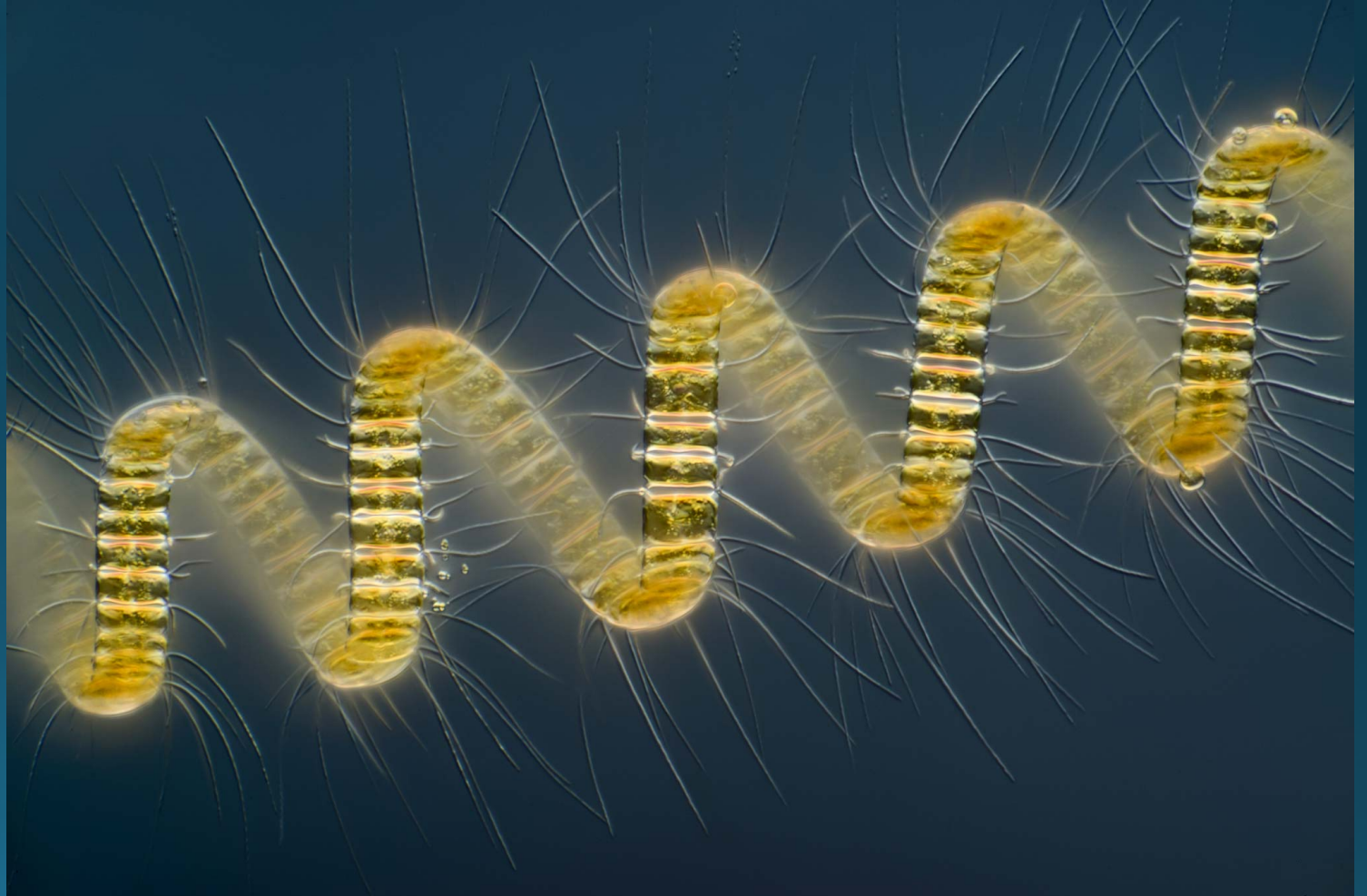


Photo credit: Wim van Egmond

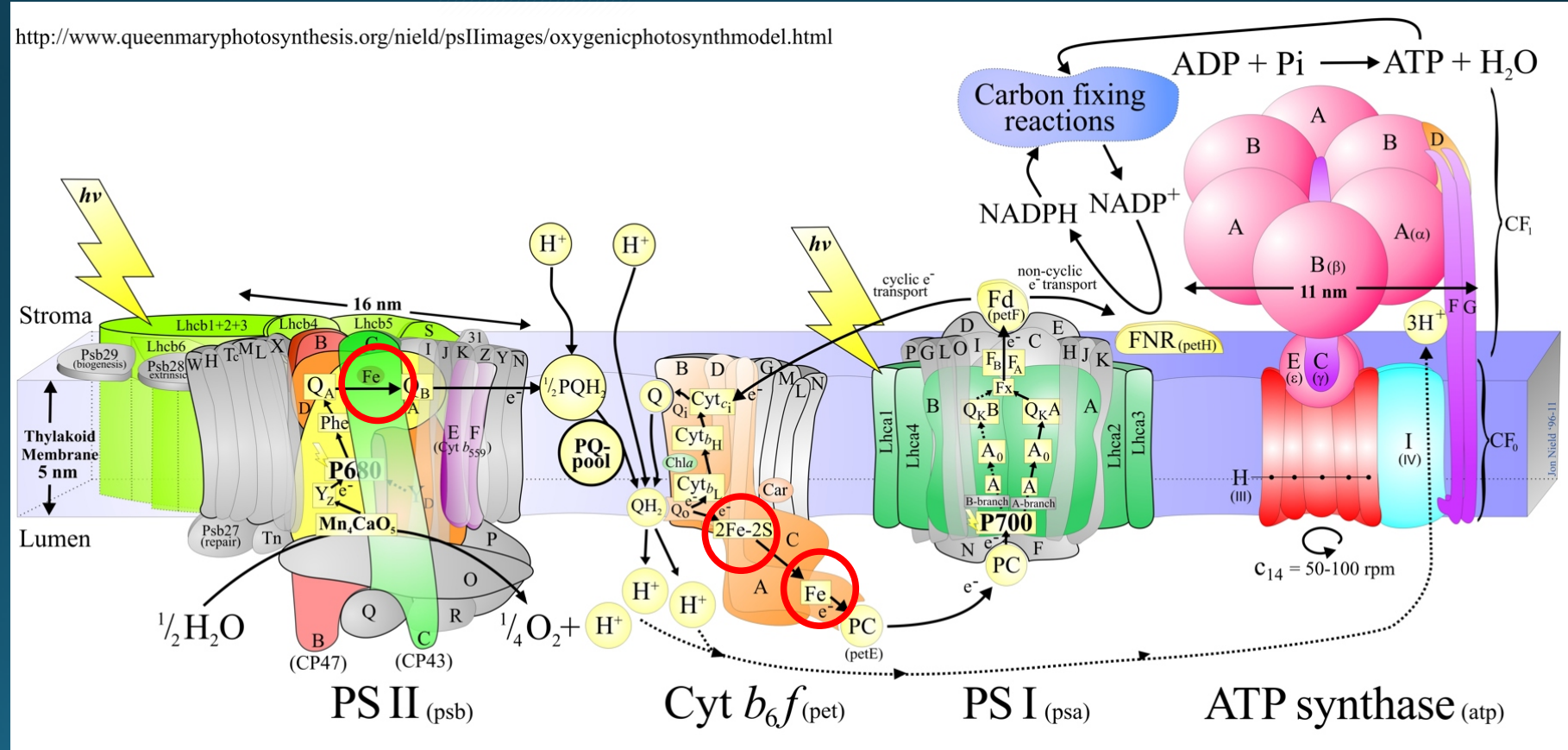


Being a phytoplankton is all about... making more phytoplankton



Photosynthesis

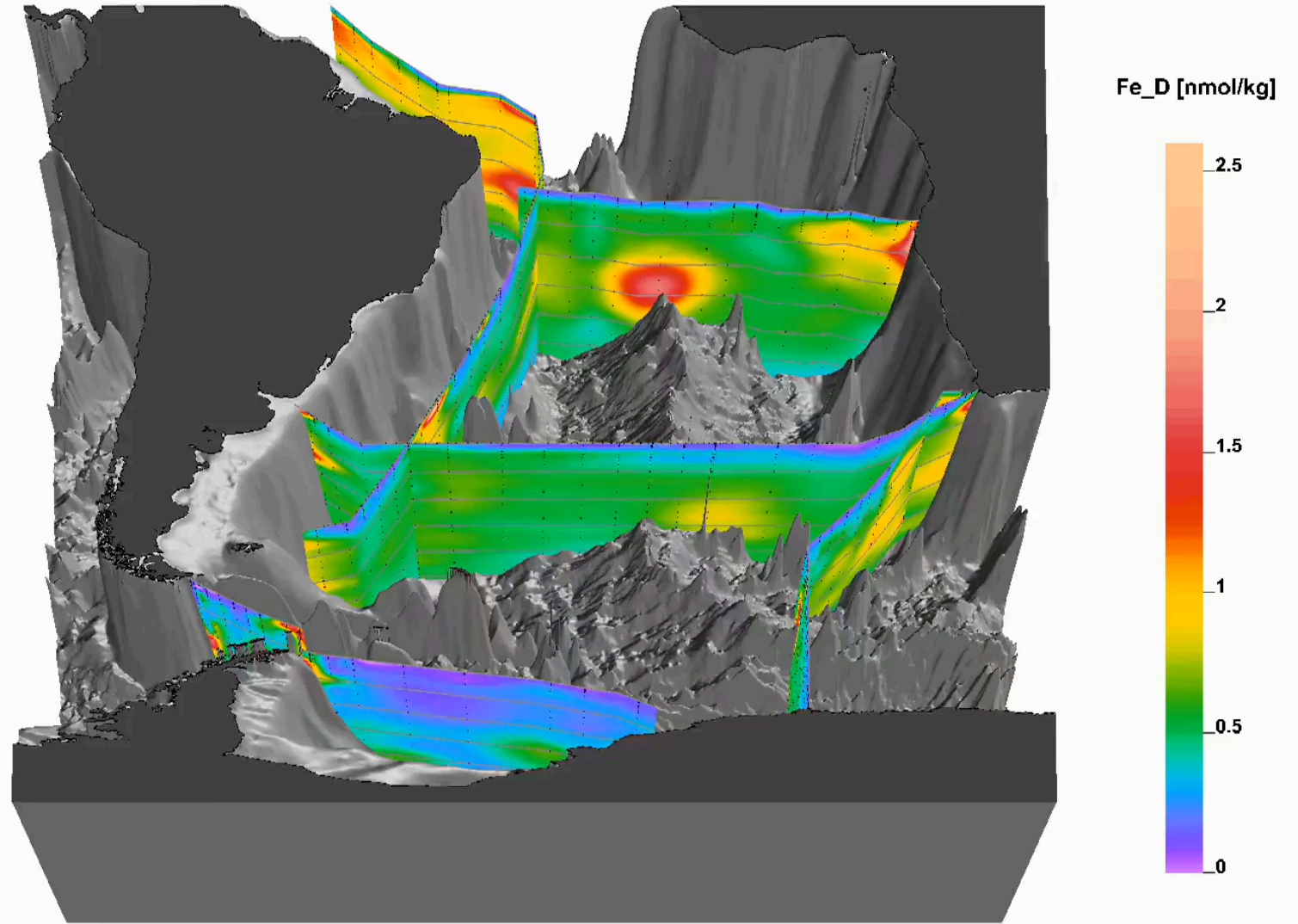
is complicated, an amazing feat of nature, and requires iron (among other things)



But iron can be in short supply in the ocean, especially in the Southern Ocean

3D-animation from the GEOTRACES 2017 data product for iron in the Atlantic Ocean

Why so few data?...



Data: Cyril Abadie, Eric P Achterberg, Hein J de Baar, Kenneth W Bruland, Fanny Chever, Tim Conway, Gideon M Henderson, Seth John, Maarten Klunder, Patrick Laan, Francois Lacan, Rob Middag, Abigail Noble, Micha J A Rijkenberg, Mak A Saito, Christian Schlosser, Charles-Edouard Thuroczy

Graphics: Reiner Schlitzer

...because it's really hard to get clean samples



Image credit: Rob King



Image credit: Delphine Lannuzel



Why is the Southern Ocean so poor in iron?

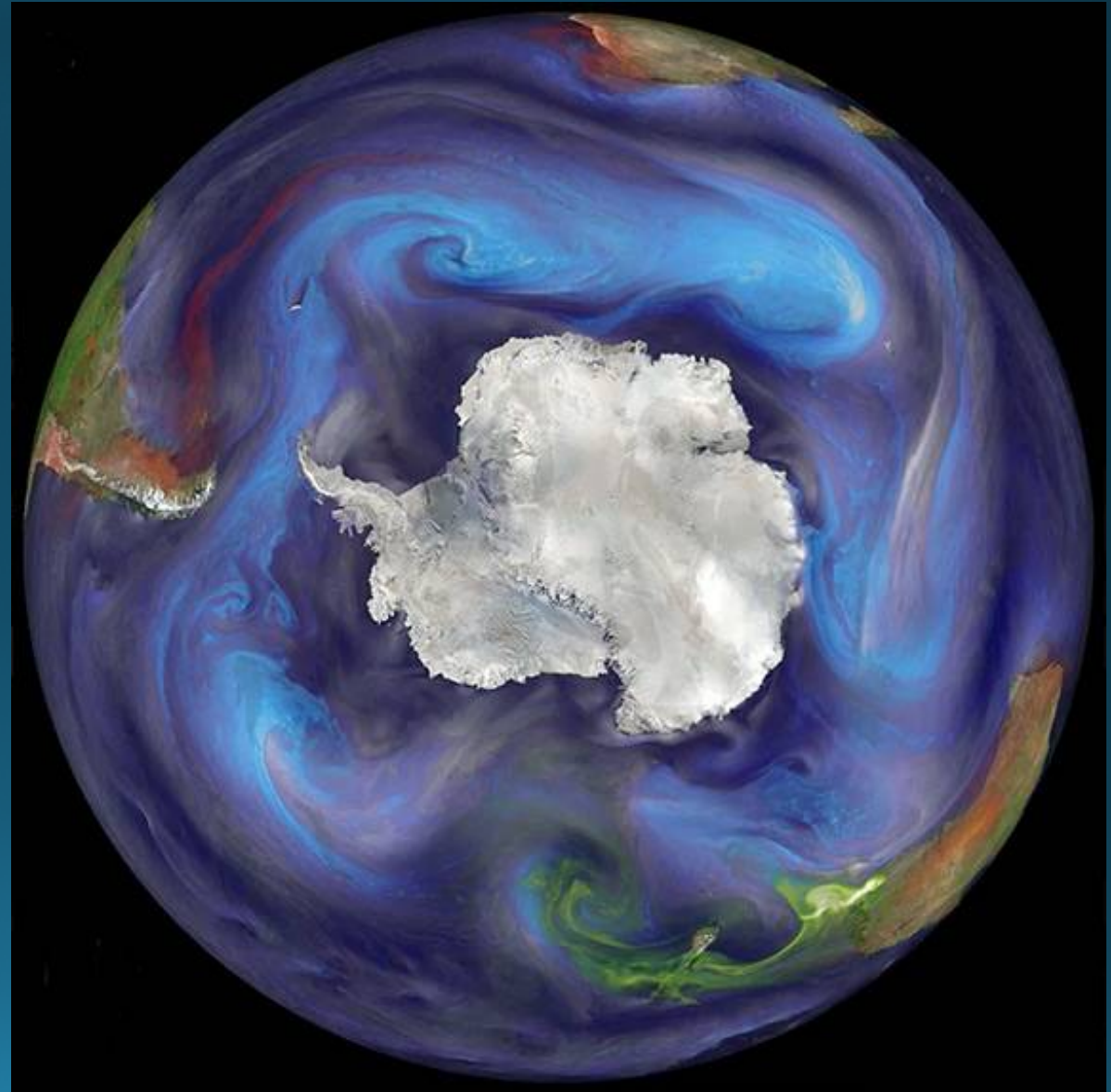
No dust, no iron

Emission and transport of dust and other important aerosols to the Southern Ocean on Dec. 30, 2006.

Dust is represented with **orange to red**
sea salt with **blue**,
organic and **black carbon** with **green to yellow**,
and
sulfates with **ash brown to white**.

The majority of particles in the atmosphere above the Southern Ocean are sea salt, and thus not enriched in iron.

*Image credit: William Putnam and Arlindo da Silva,
NASA/Goddard Space Flight Center*

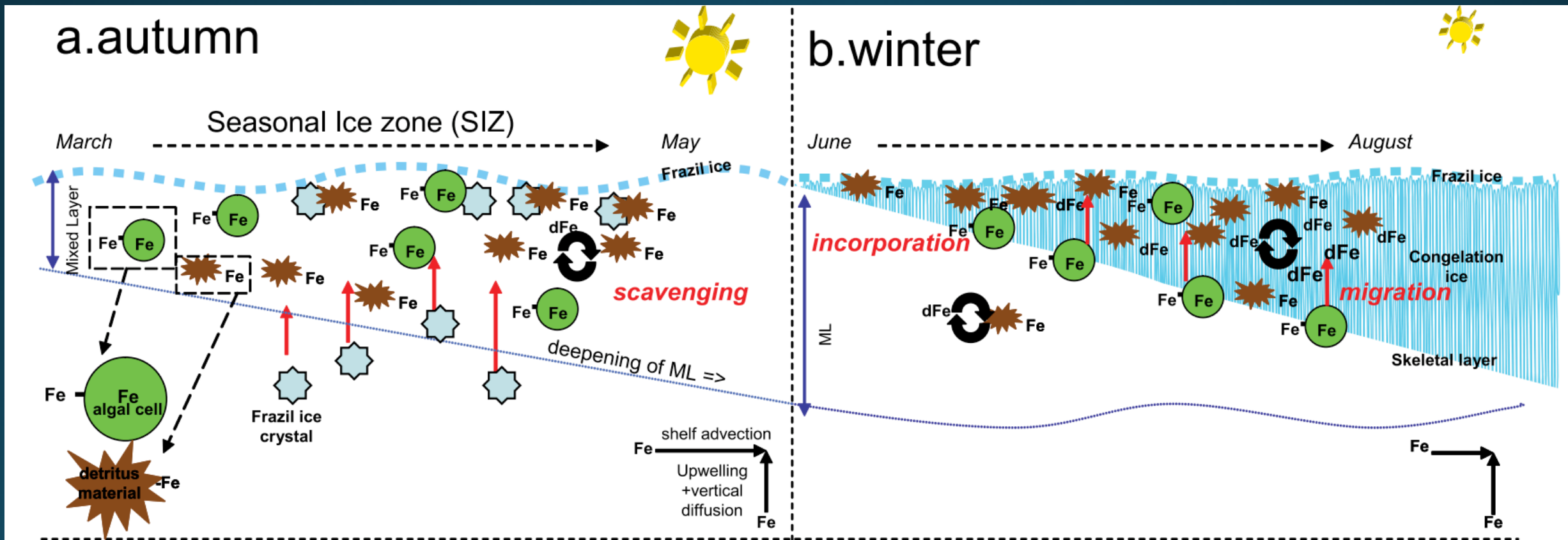


But sea ice can “deliver”:

Iron-rich particles are incorporated in the ice during sea ice formation

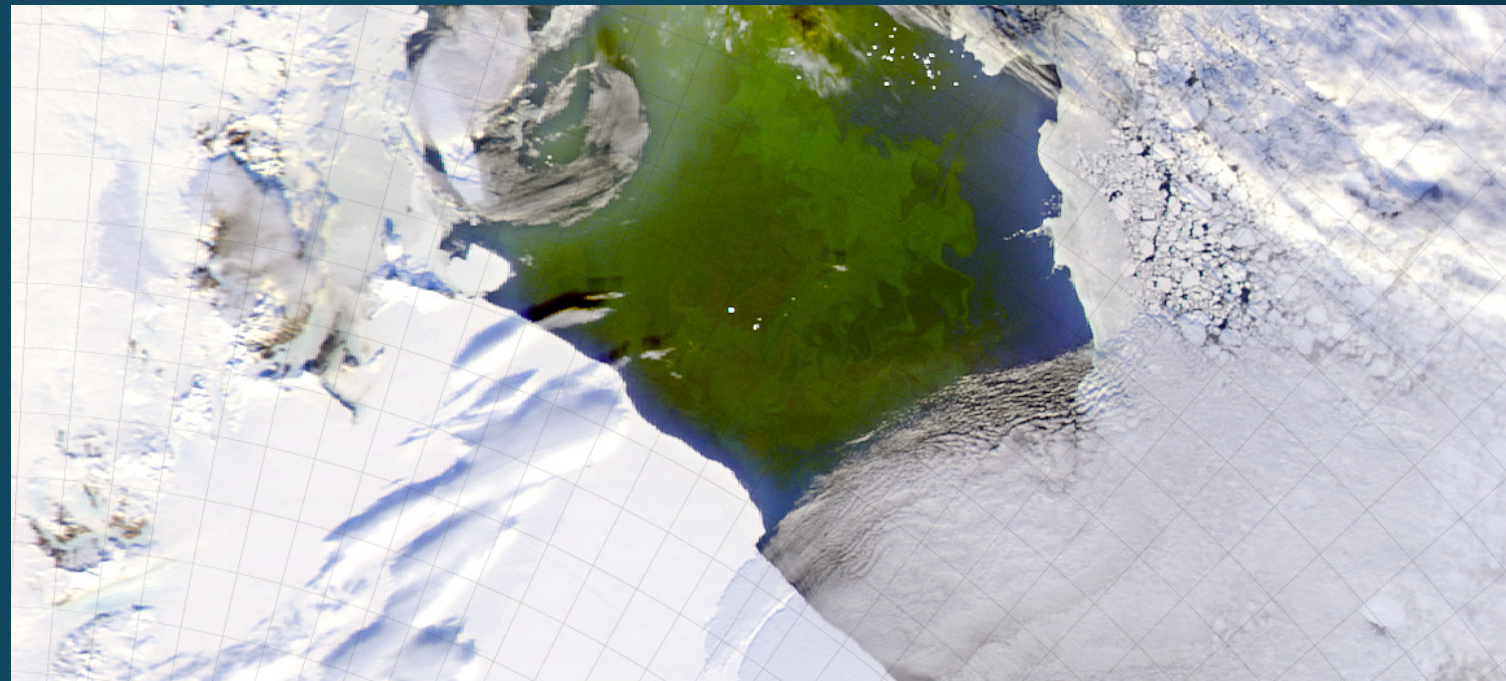
Over winter, the ice-bound iron is transformed into a more “palatable” form

The ice drifts north due to the prevailing winds
In spring the iron is delivered to the ocean as the ice melts



Why does it matter?

Phytoplankton blooms at the retreating ice edge provide a much-needed food source after winter



Phytoplankton bloom in the Ross Sea in December 2004

Image credit: NASA



Southern Ocean krill: *Euphausia superba*

Photo credit: Uwe Kils