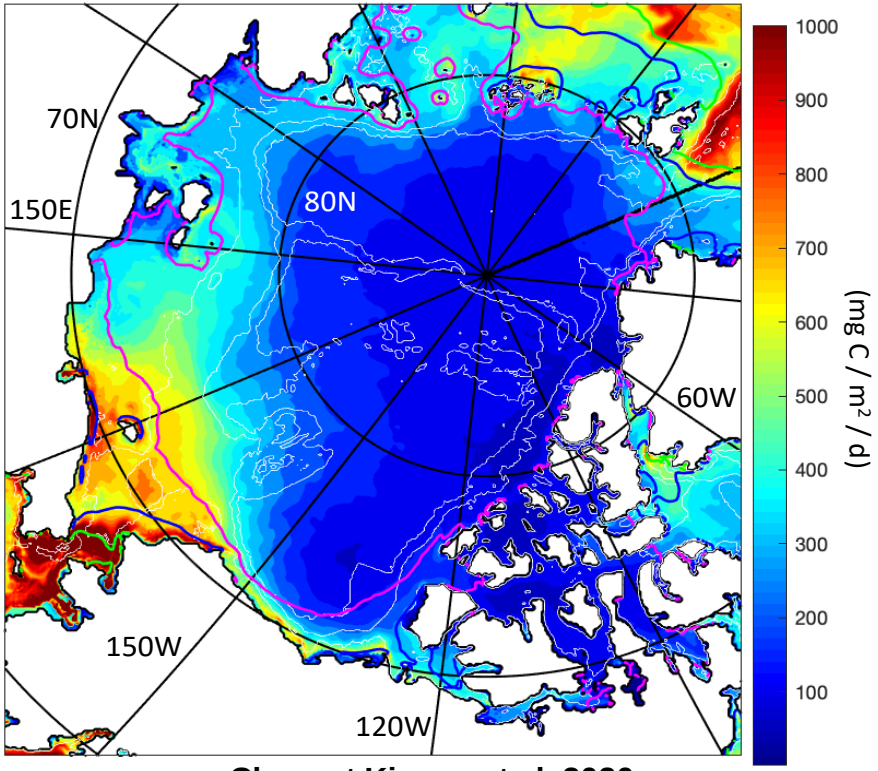
Uncovering the hidden primary production beneath Arctic sea ice

Jaclyn Clement Kinney | HiLAT-RASM

Growth of pelagic phytoplankton beneath Arctic sea ice

- Previously believed to be negligible
- RASM compares well with limited observations
- Most primary production (63%) in the Arctic Ocean and interior seas occurs under sea ice that is at least 50% in concentration
- Important carbon cycle implications - Remote sensing is currently not sufficient to provide a complete picture



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Mean primary production (mg C / m^2 / d) during June averaged over 1980-2018. Green, blue and magenta contour lines represent ice concentration (15, 50, and 85%, respectively).

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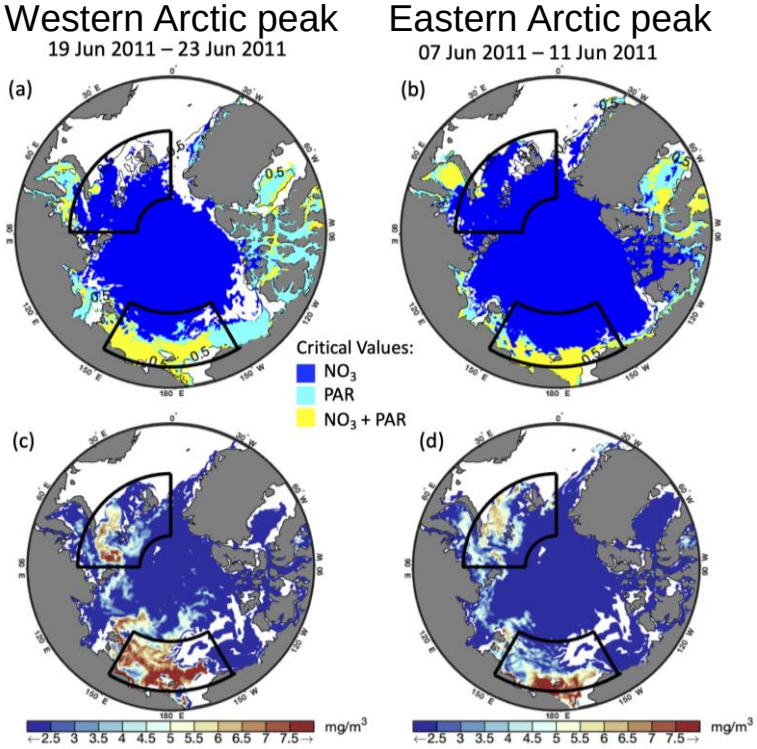
Advected bloom or truly under sea ice?

- Majority of ice-covered Arctic waters have sufficient surface nitrate levels to sustain growth
- PAR reaching the ocean surface through the sea ice in early summer only exceeds critical levels in the western Arctic in most years
- Western Arctic under-sea ice blooms are truly formed under sea ice
- Future work
  - quantify the importance of melt ponds
  - model intercomparison project developed as part of CAMAS



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Top row: critical light and nutrient conditions during the peak under-ice growth periods in the western Arctic (a) and eastern Arctic (b) regions. Lower row: surface chl-*a*.