



Biogeochemistry in the Upcoming CICE Release

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N. Jeffery, E. Hunke, M. Maltrud (LANL)

C. Deal, M. Jin (IARC), J. Stefels (UG Netherlands)

S. Ackley (UTA), S. Oestreicher (U. Minnesota)...

and others

Sponsorship: DOE High Latitude SFA, Cloud Cryosphere, EPSCOR

OUTLINE

PURPOSE –Summarize science and its potential

BACKGROUND –Influence, why the bottom layer

MECHANISM –Arrigo, Jin/Deal, Lavoie

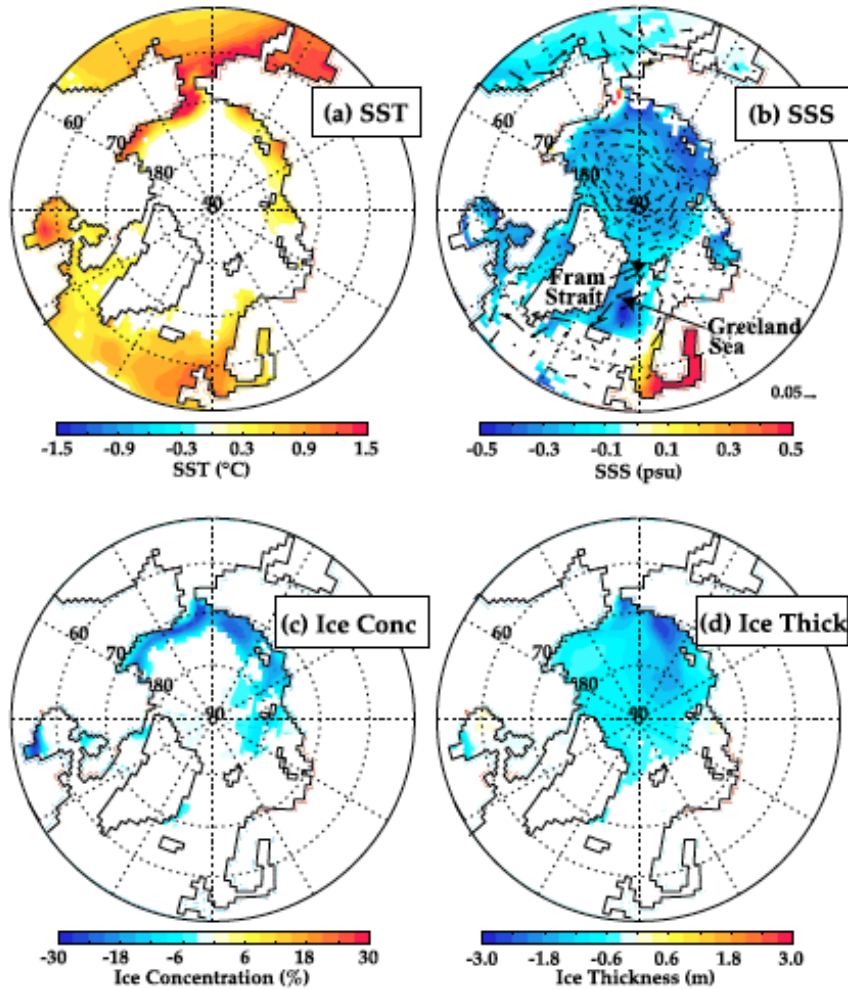
EXAMPLES –Production & toys, DMS, POP couple

FEATURES –Elements, templates, documentation

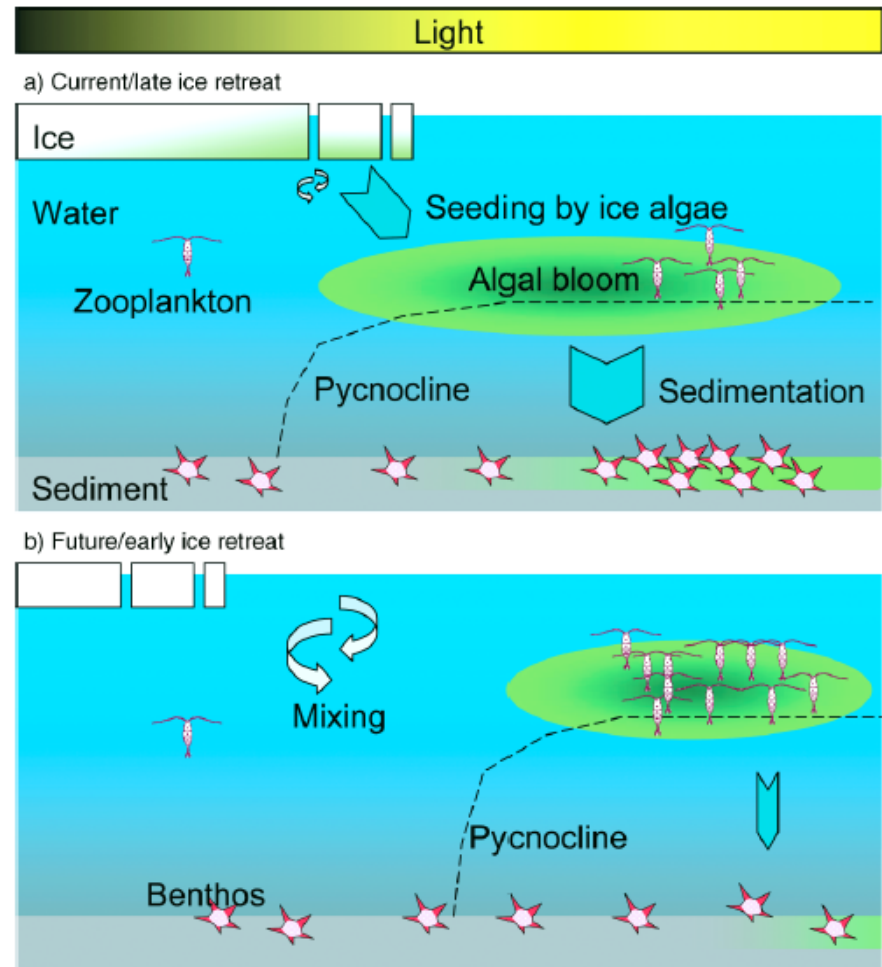
PREVIEW –Experiments, BGC up, pump C, gases, metals

Relevance: Optics, Timing, Carbon and more

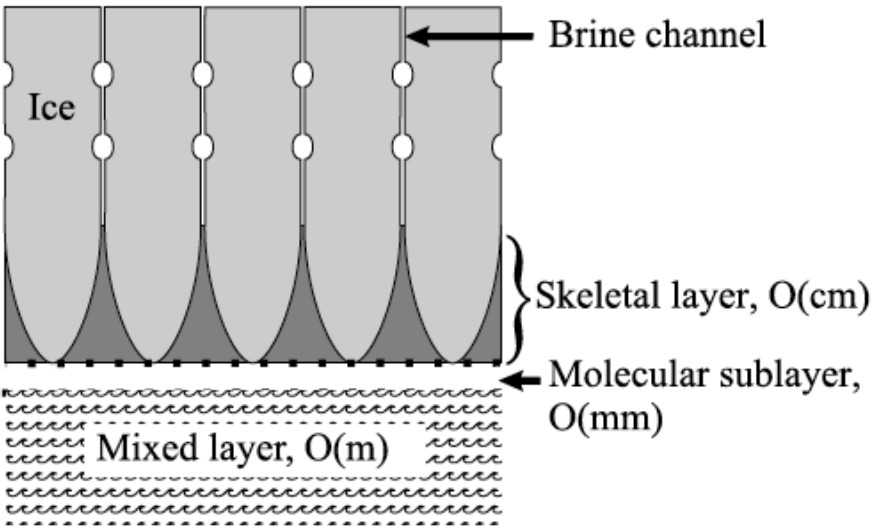
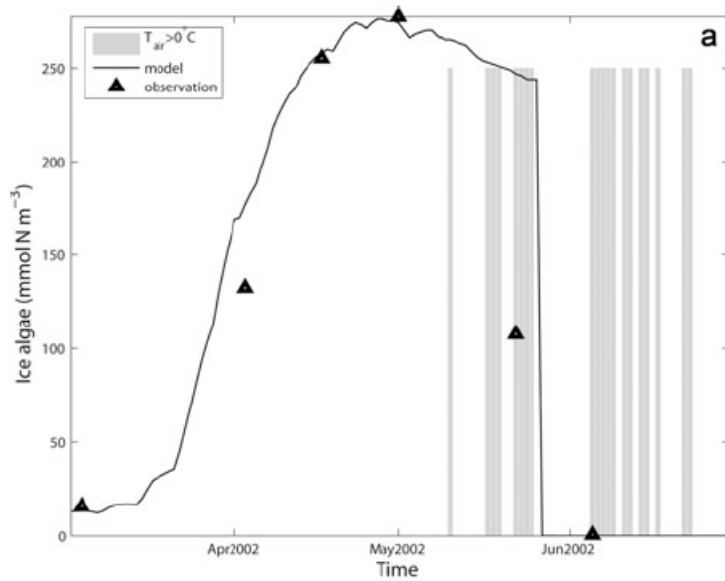
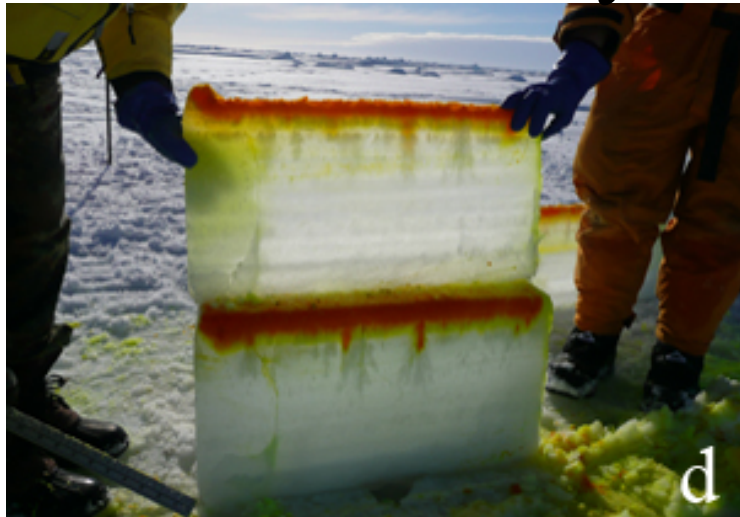
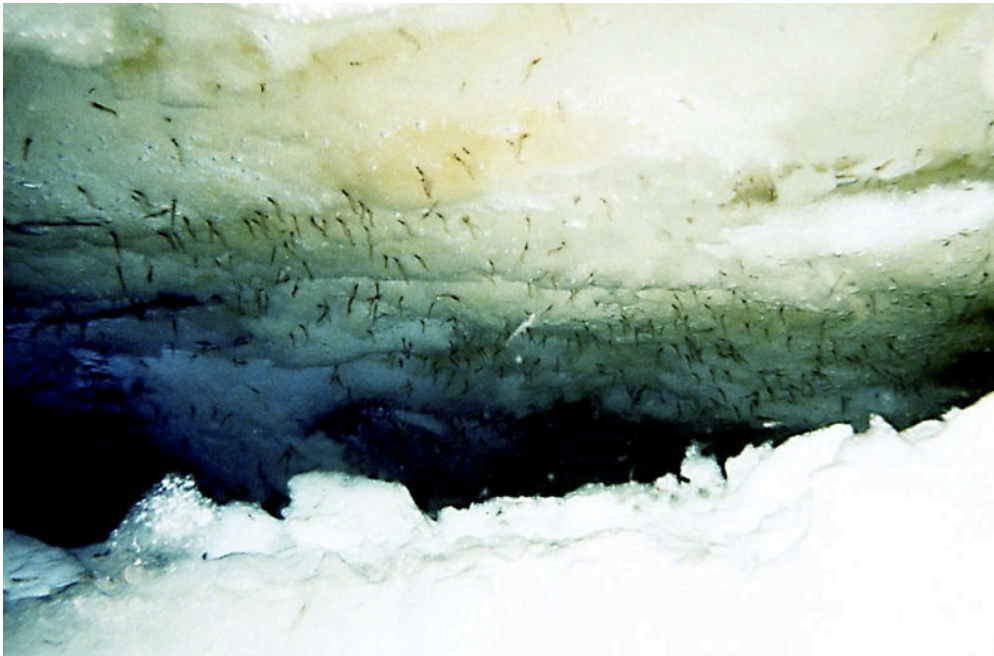
LENGAIGNE ET AL.: BIO-PHYSICAL FEEDBACKS IN THE ARCTIC



Bluhm and Gradinger 2008

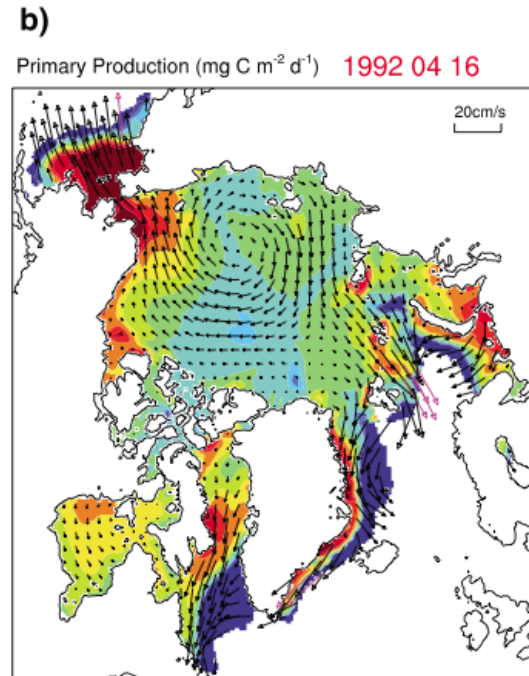
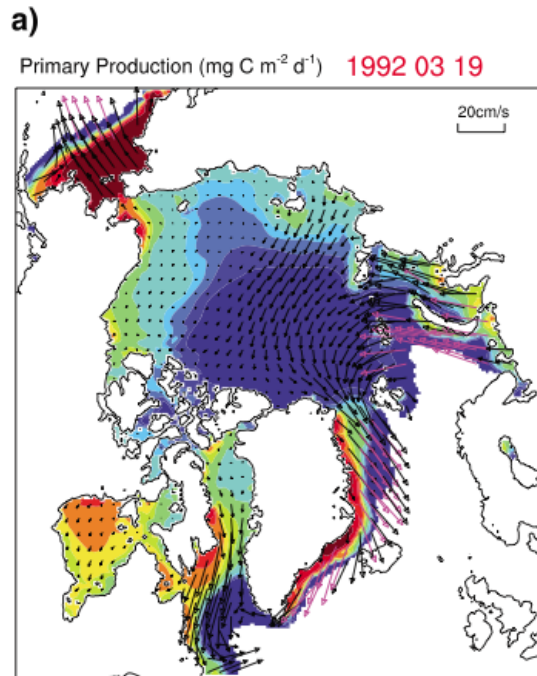


The Bottom Layer



Jin et al. 2006
Lavoie et al. 2006

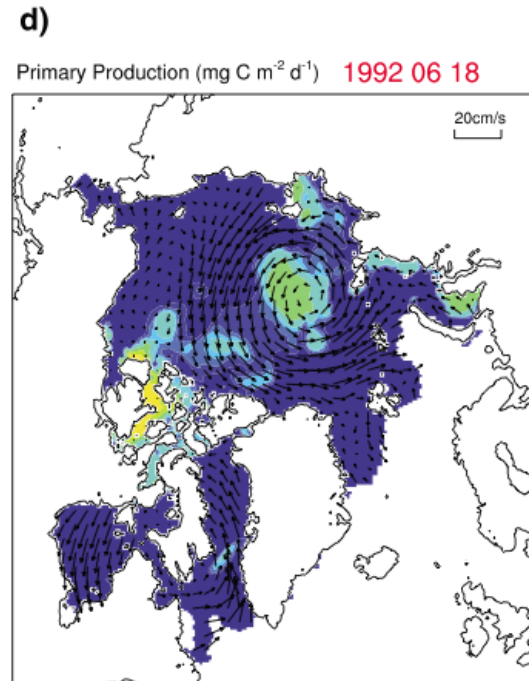
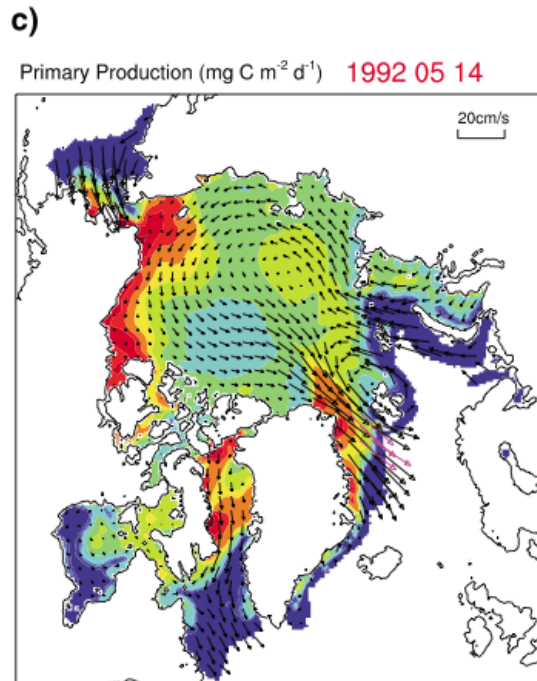
March



April

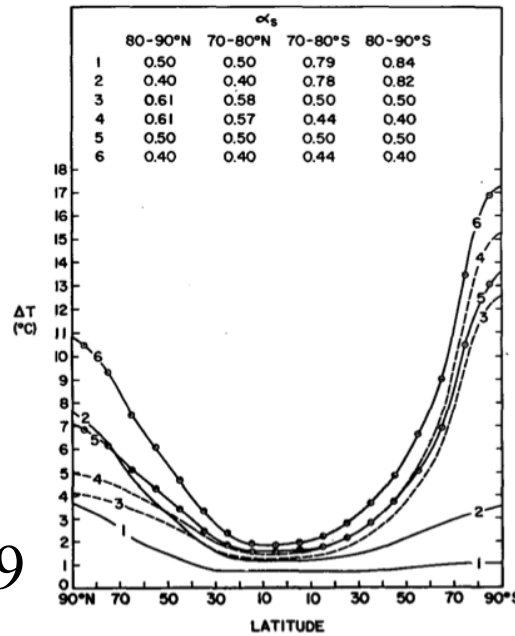
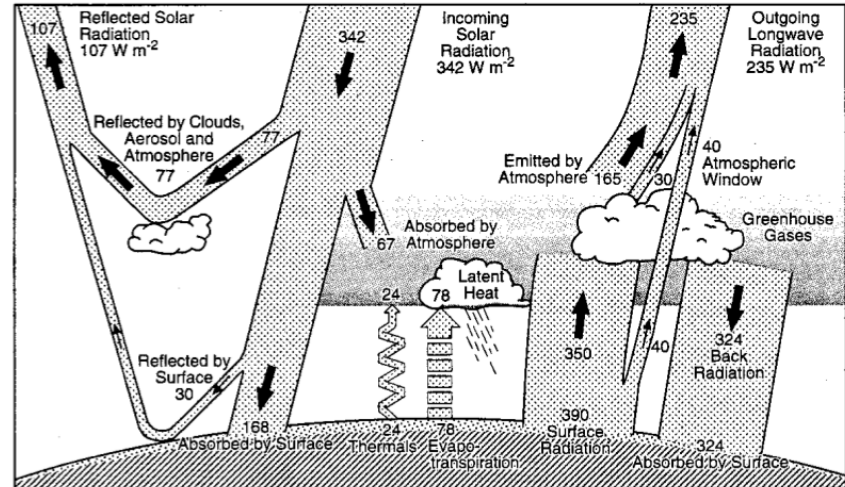
May

*IARC,
LANL
in JGR*



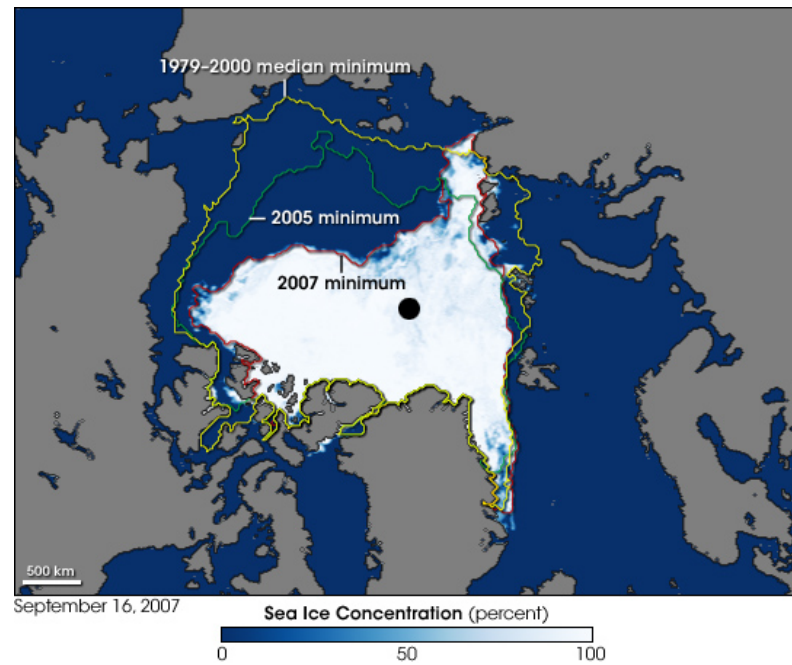
June

A (fantasy) model...



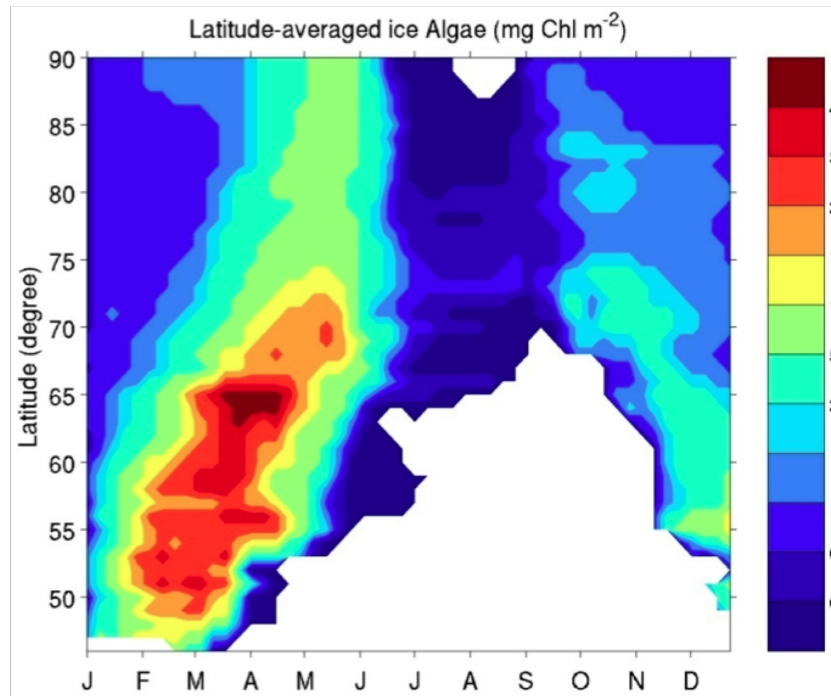
Sellers 1969

FIG. 5. Predicted latitudinal distribution of the mean annual temperature rise associated with albedo manipulation at one of both poles.

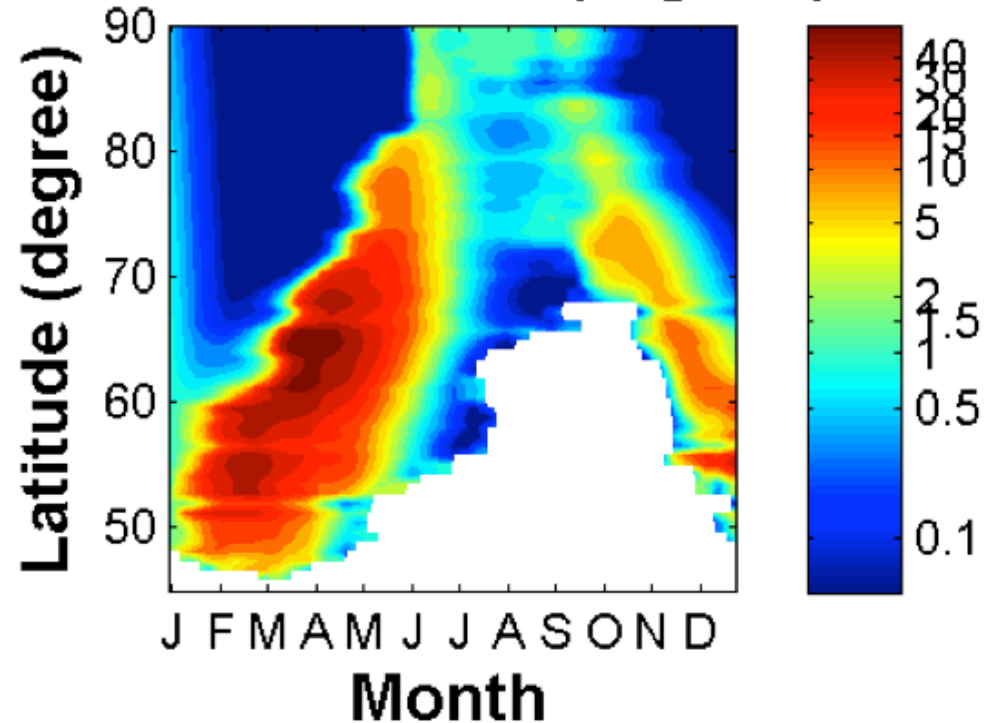


And a real one!

IARC-CICE bottom layer & Samantha's zonal toy

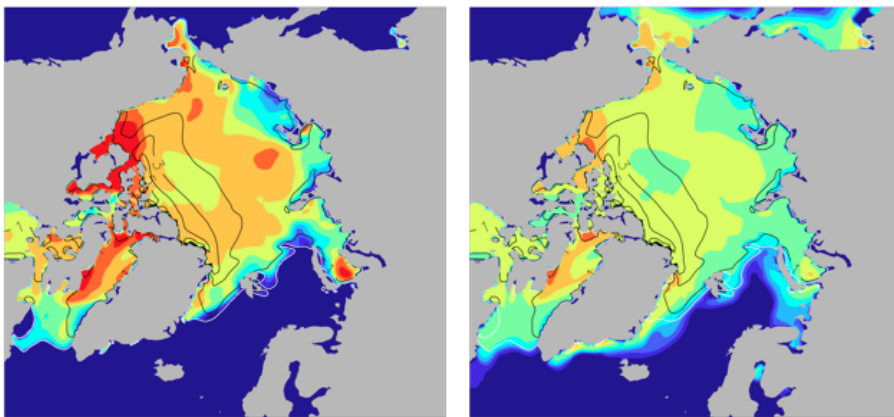
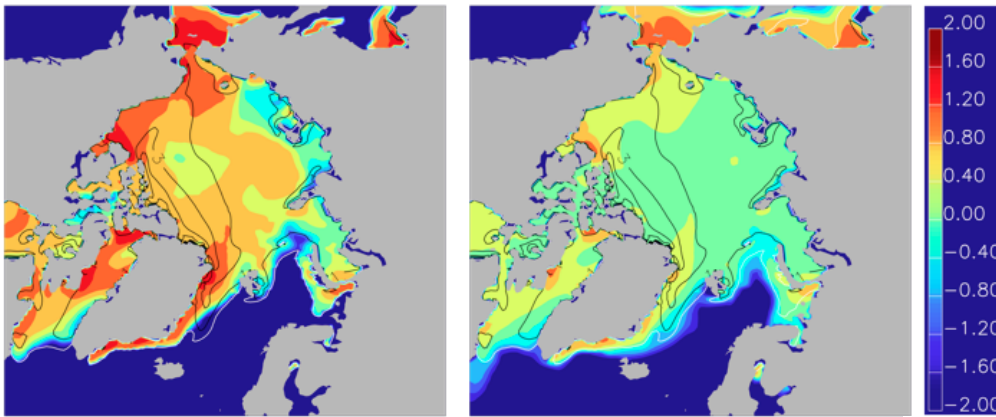


Chla Biomass (mg/m²)



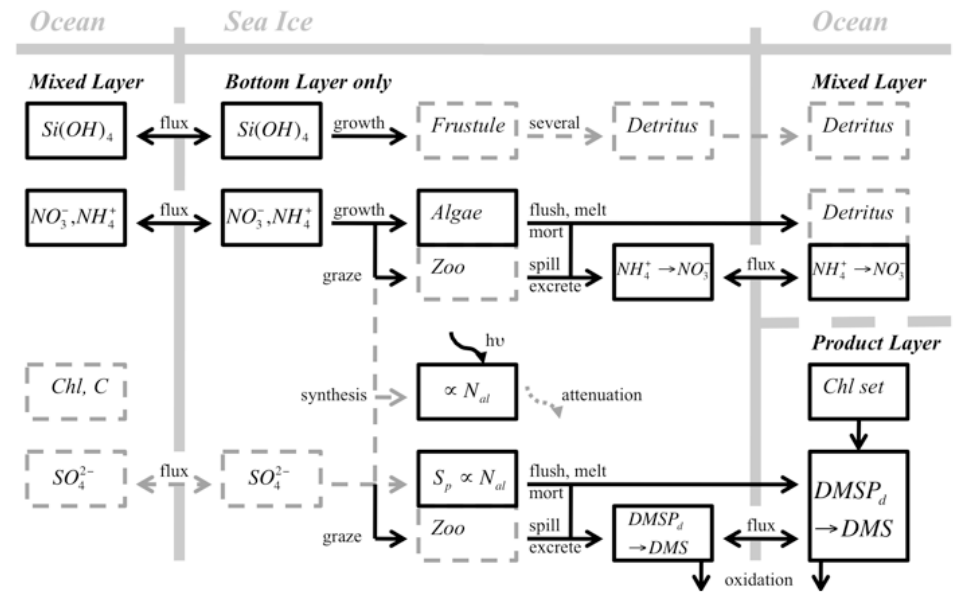
Deal et al. 2010 JGR

Oestreicher et al. 2013 in prep



Log_{10} Chl (mg/m^2), DMS (nM)

April,
August

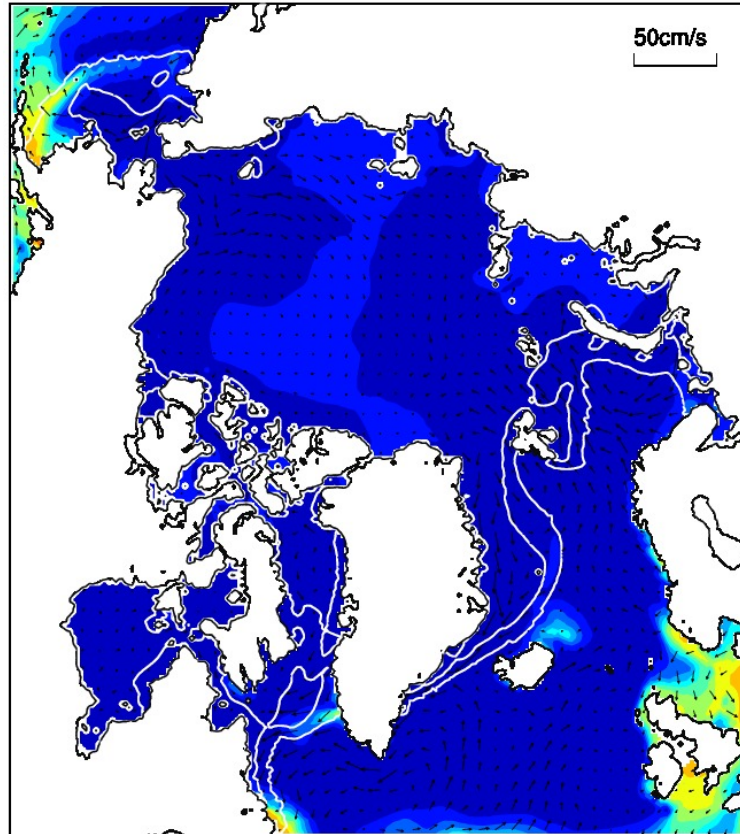


DMS in/from sea ice

Elliott 2012, with IARC/Stefels

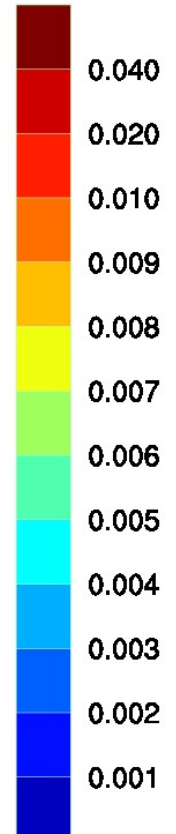
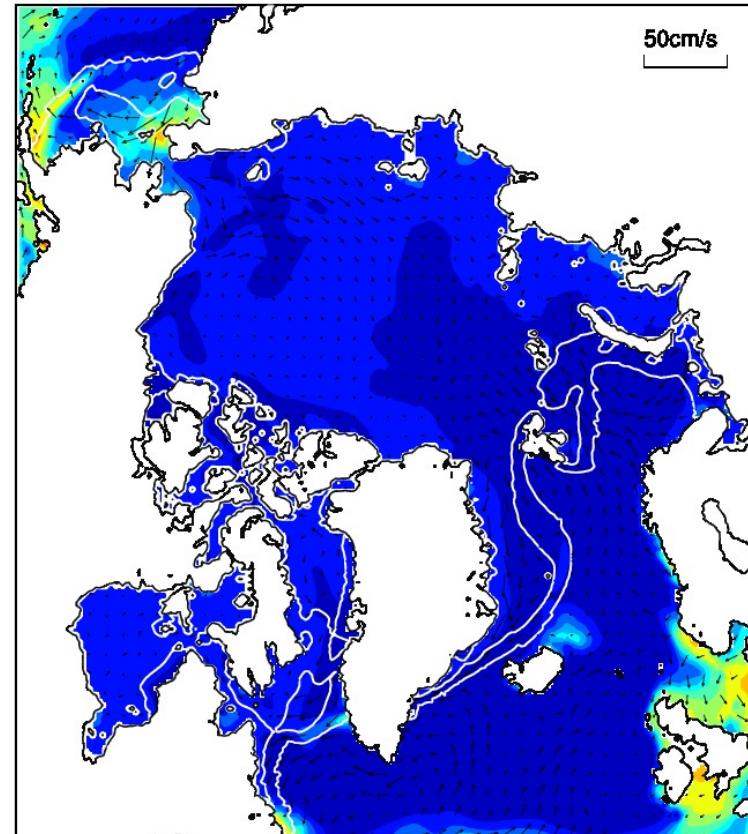
S-ice OFF

DMS (mmol S/m³) 1992 04 01



S-ice ON

DMS (mmol S/m³) 1992 04 01



Jin et al. DSR
Deal et al. in Prep

IARC Coupled Sulfur Cycle:
Early POP/CICE results subdued
Stay calm and carry on...



BGC RELEASE INFO

CODES –CICE bottom and toy

FEATURES –N-Si-C-Chl, byproduct template, fast tests

UNCERTAINTIES –Exchange, retention, optics, porosity

DOCUMENTATION –Jin/Deal, Elliott

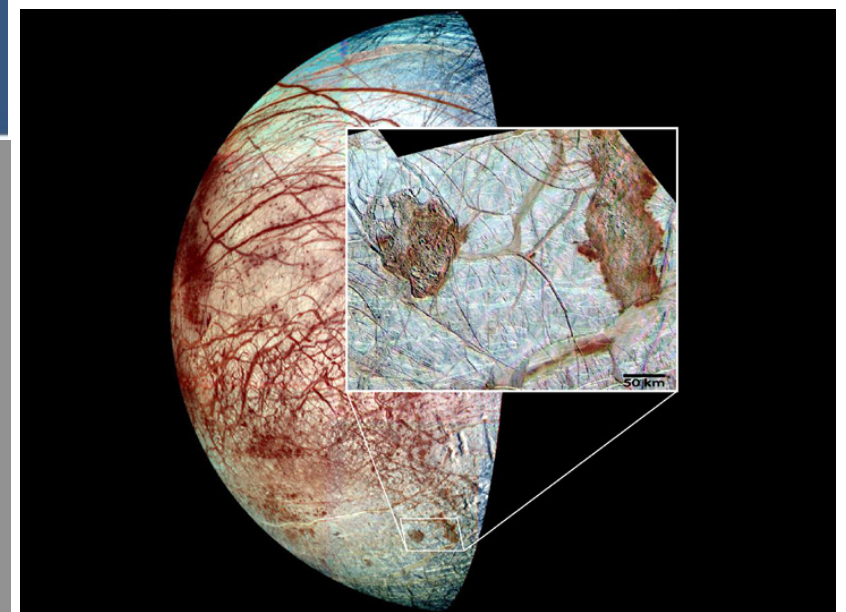
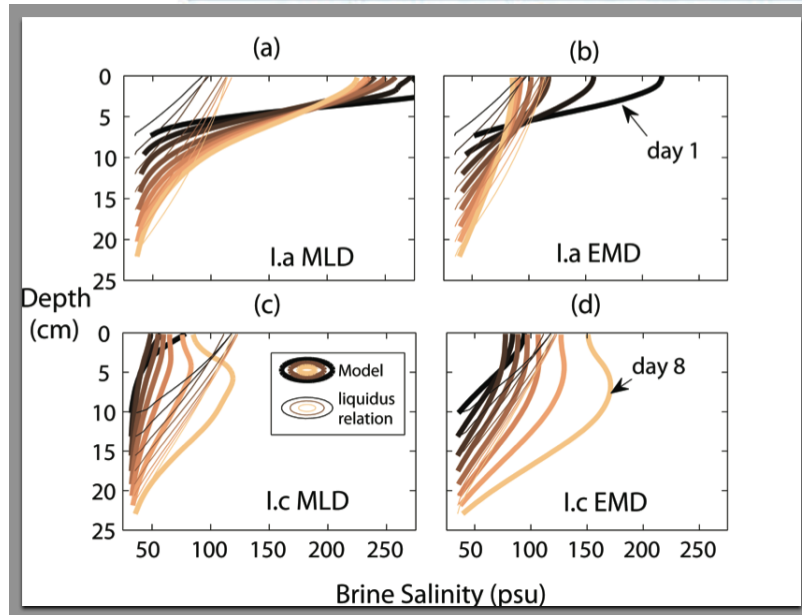
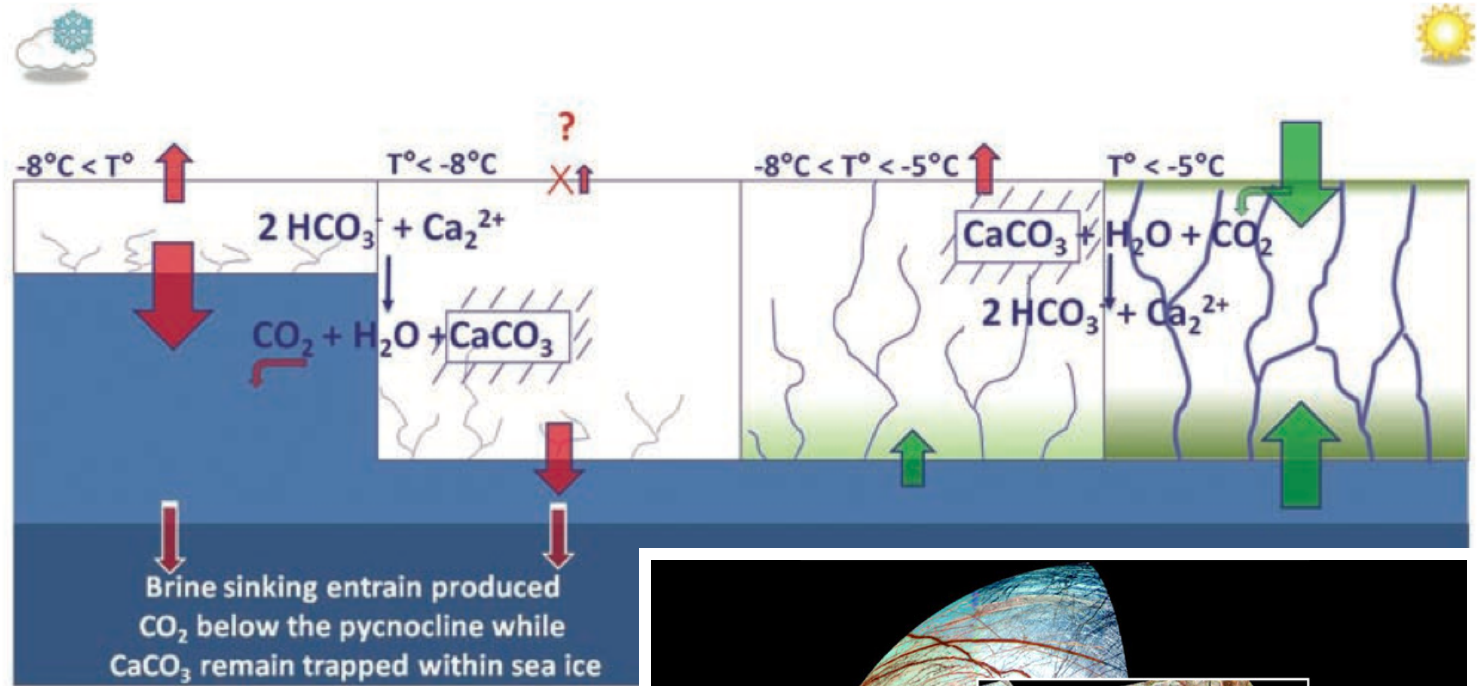
FRAMEWORK –Extend to interior (C, gases, Fe)

PREVIEW –Same sources/sink strategy in vertical

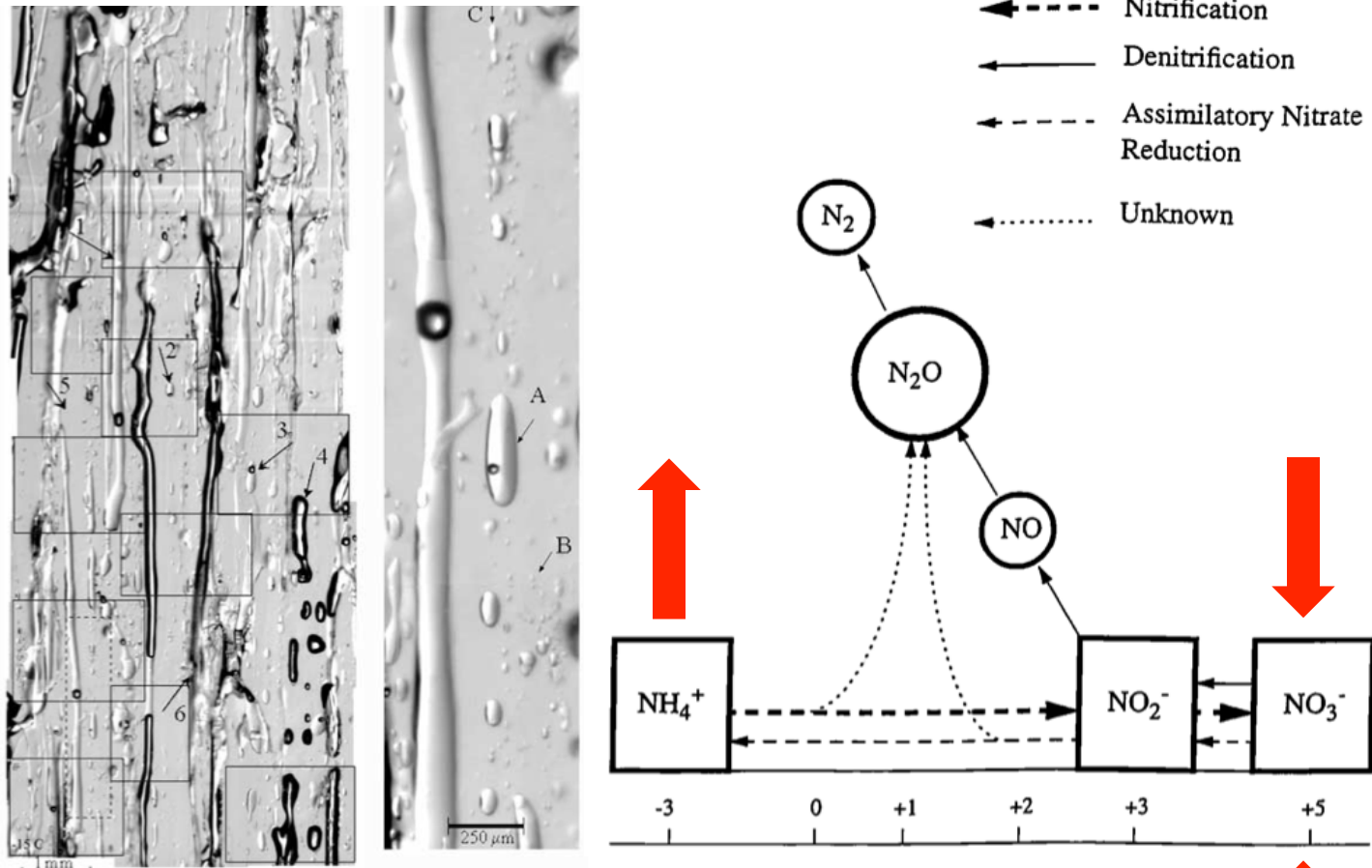
Thermochemistry of Your Immediate Galactic Vicinity

DeLille et al.
SOLAS

Jeffery et al.
JGR

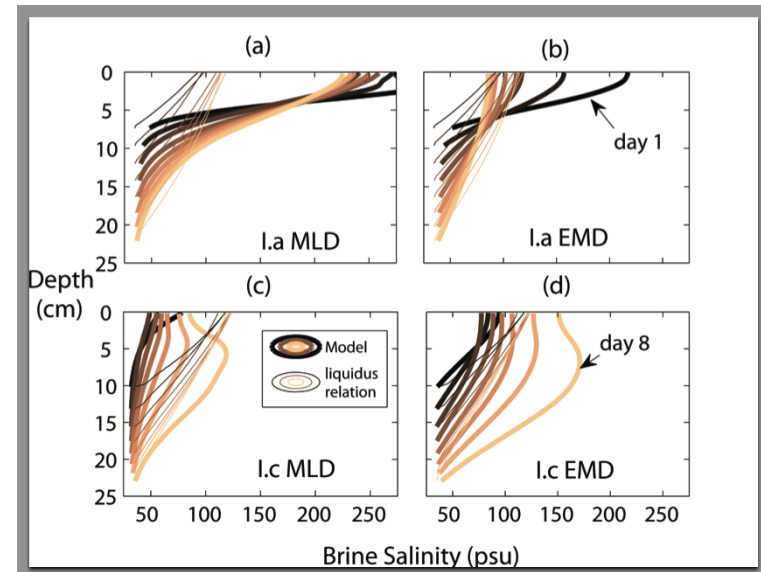
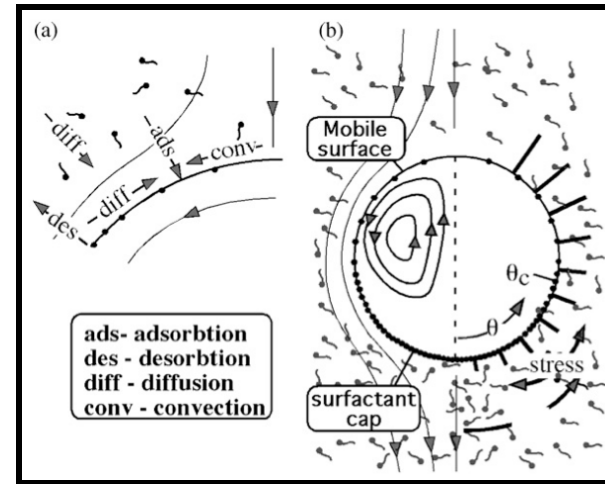
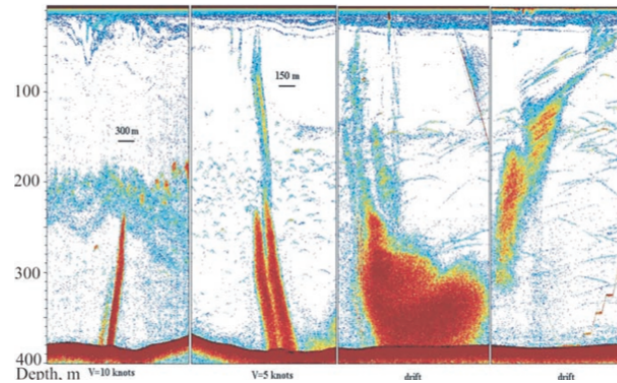


Nitrogen (see scale)



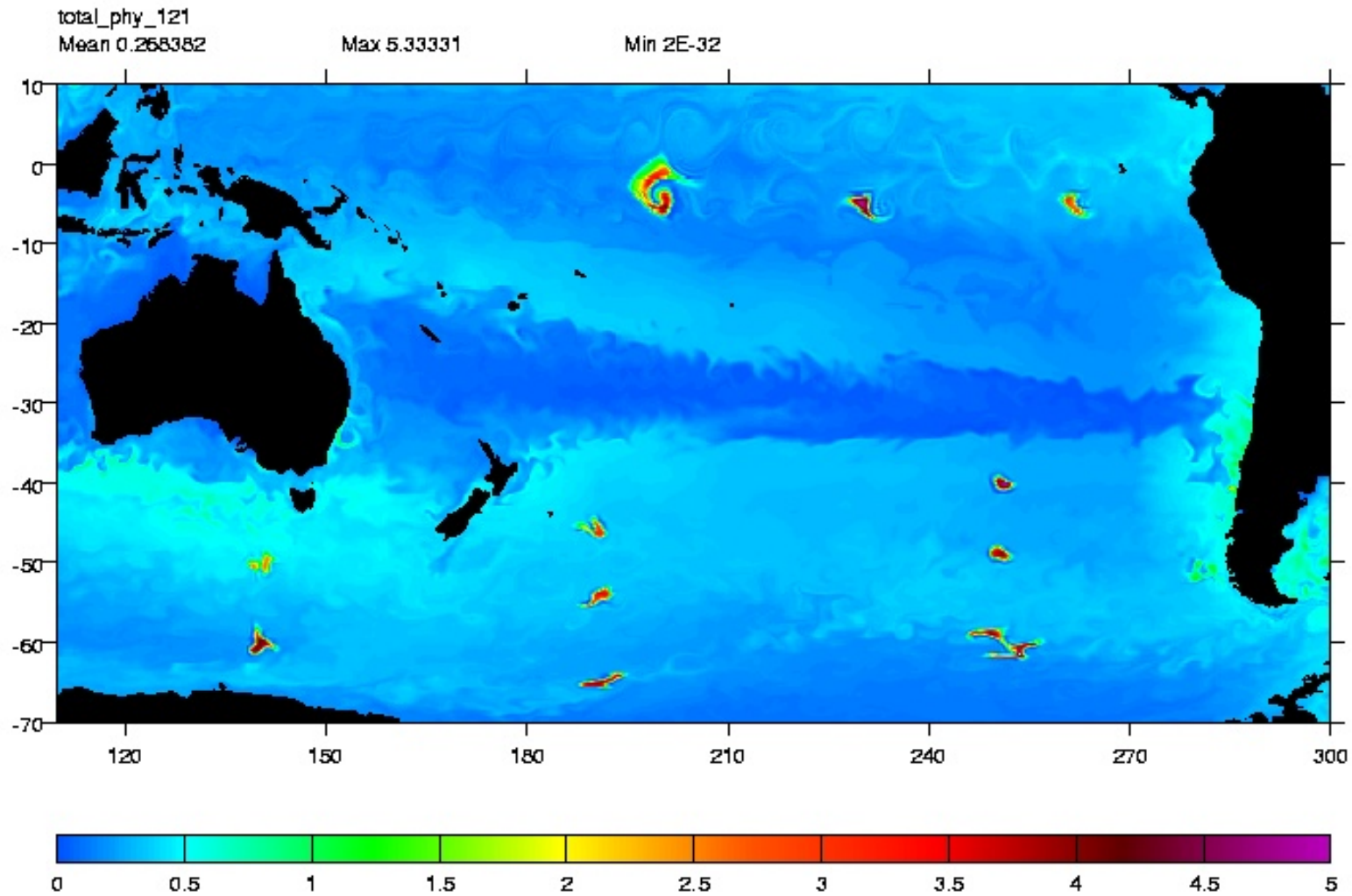
Light 2003, Rysgaard 2004
Thomas and Papadimitriou 2002

Methane from Clathrates



*Obzhirov 2004, Shakhova 2009
...and Chinese oceanography*

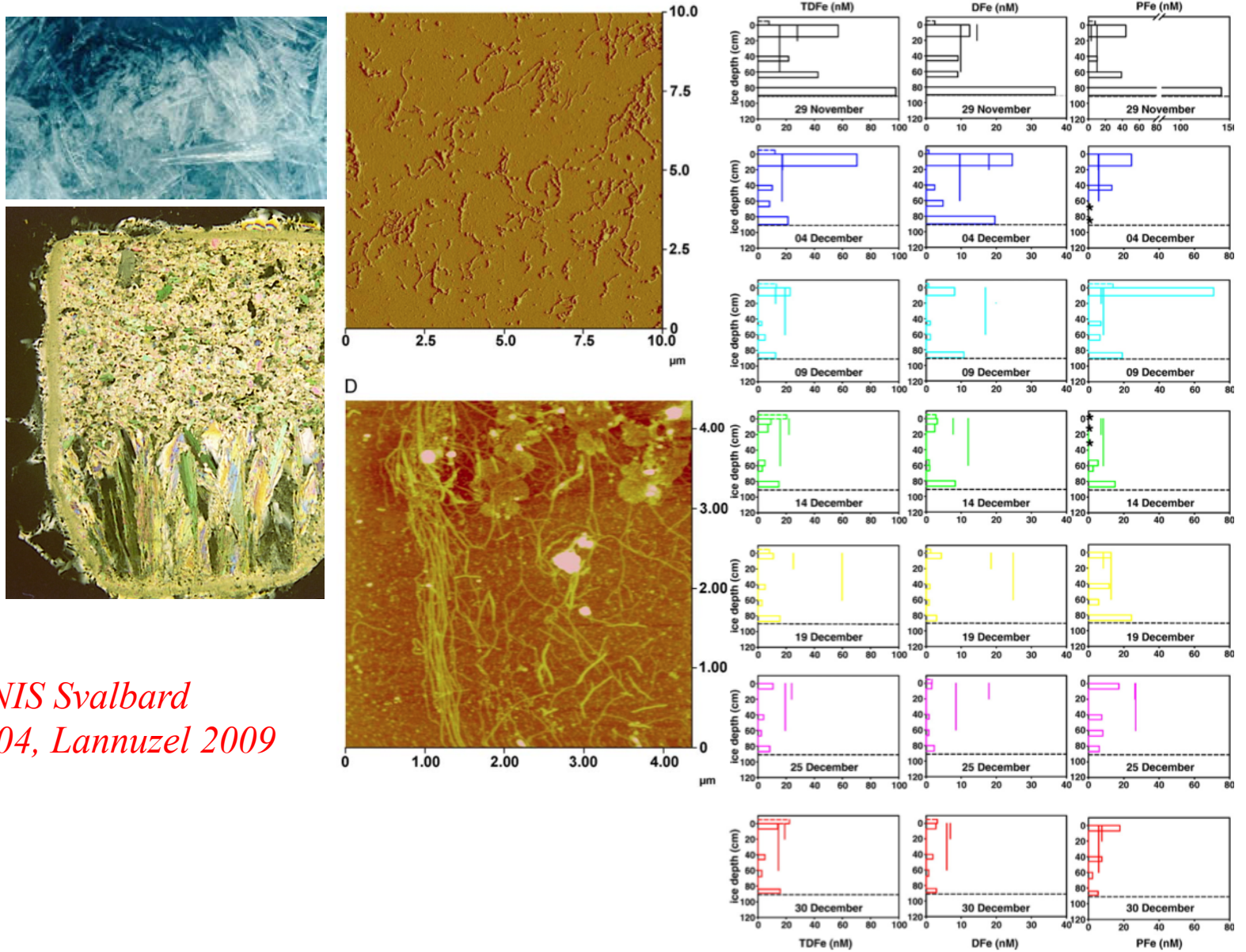
Phytoplankton Concentration (μM) 20 days after Fertilizations



tr10d+tr3d

COSIM, early noughts and unpublished

Trace Metal Chromatography (Fe, Cu?)



*NSIDC, UNIS Svalbard
Verdugo 2004, Lannuzel 2009*

SUMMARY

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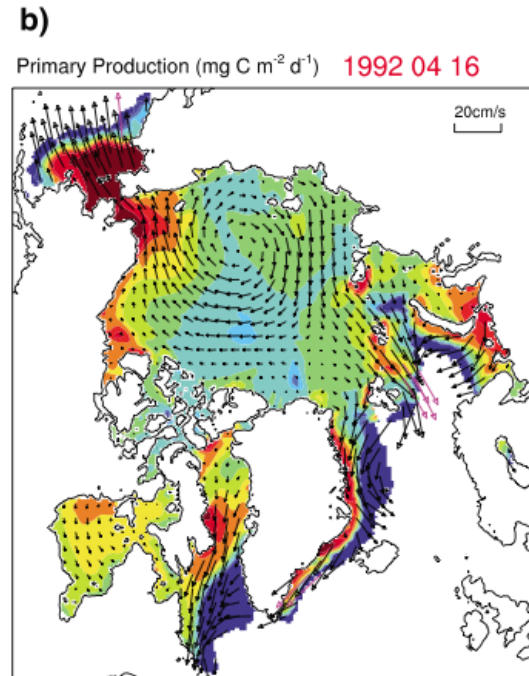
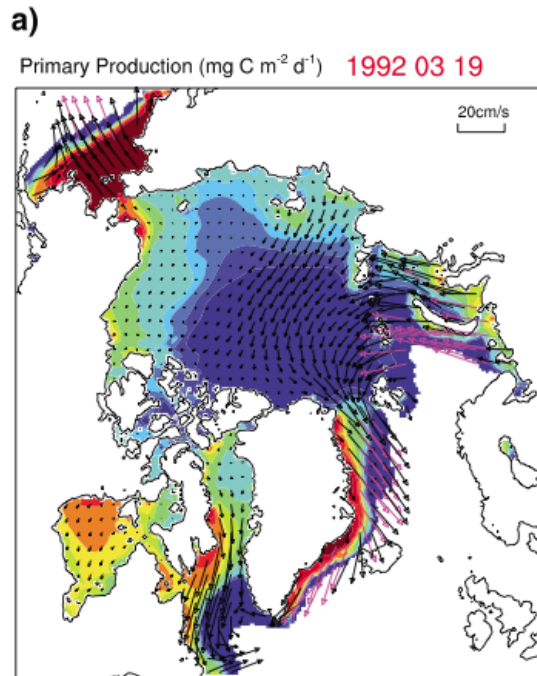
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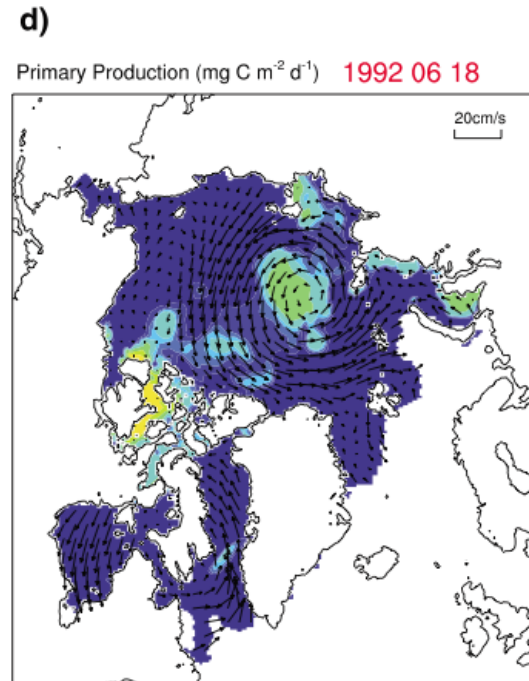
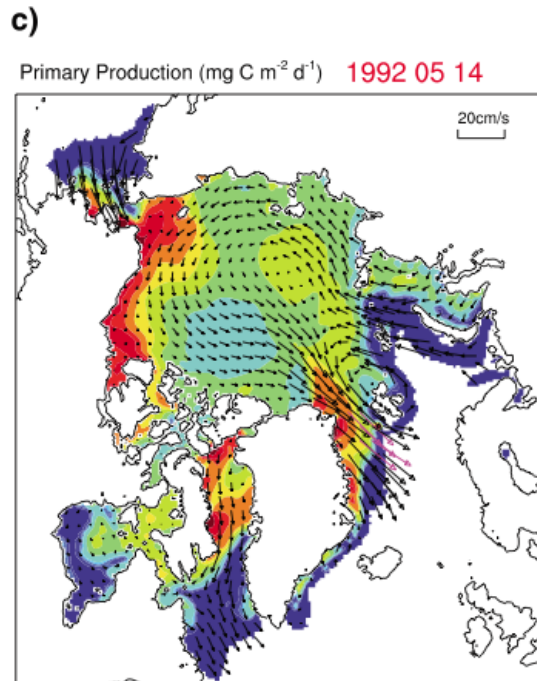
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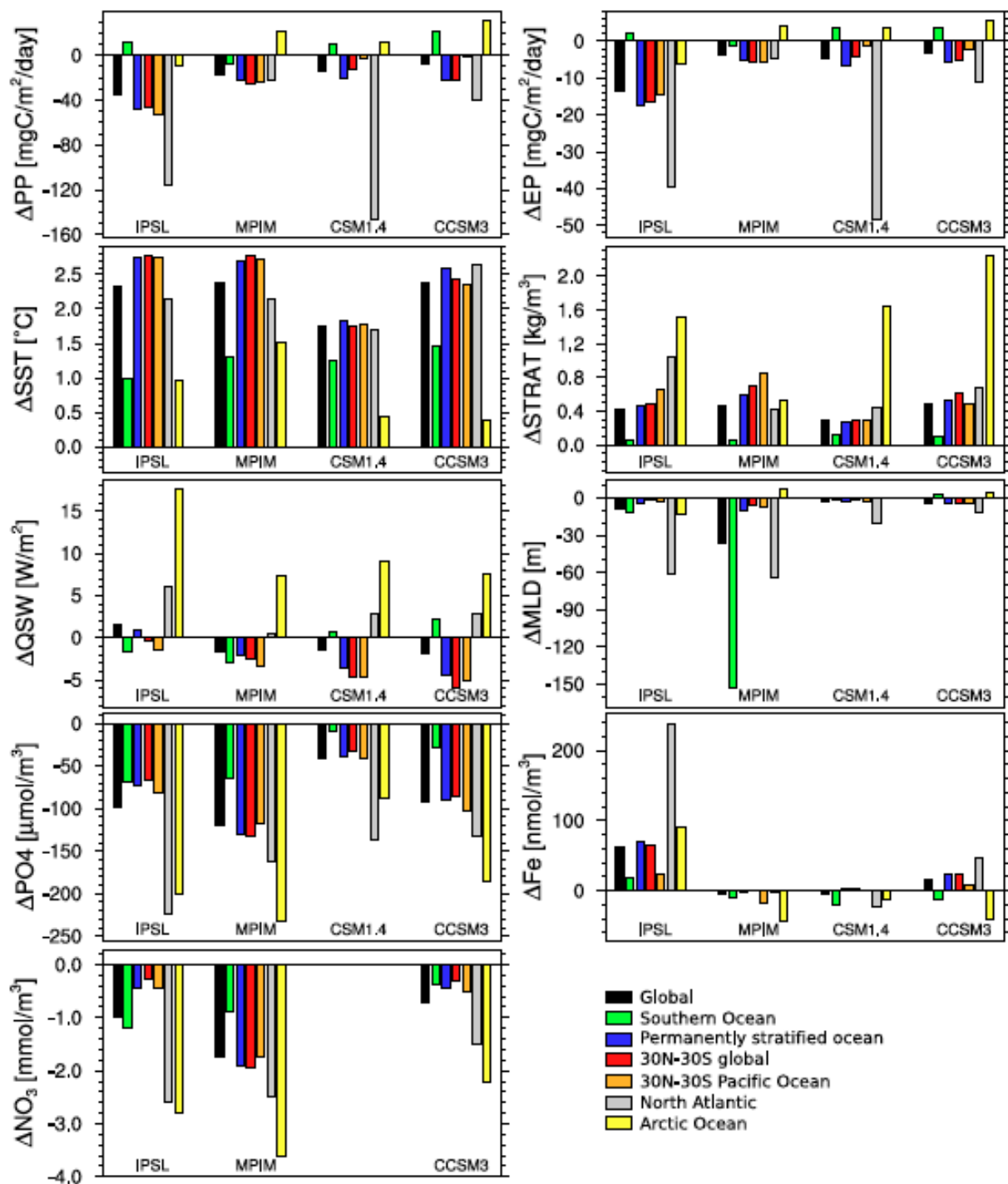
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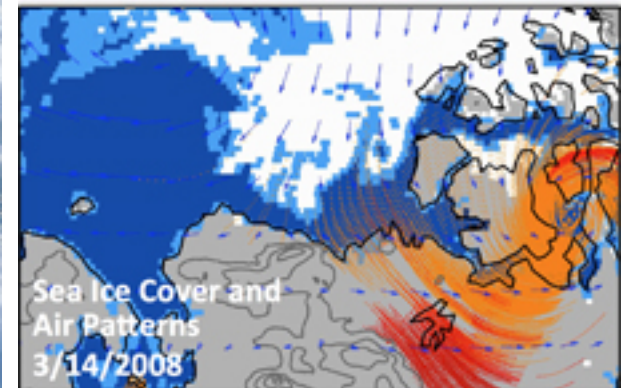
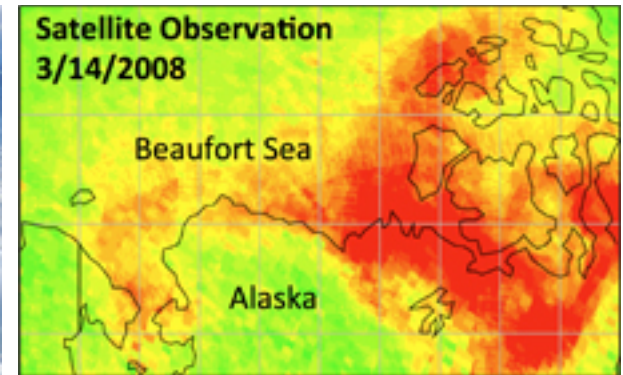
June

*IARC,
LANL,
JGR*

EXTRAS



Frost flowers and bromine



Nghiem