Arctic marine primary production with respect to changes in sea ice cover.

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Questions of interest.

•How has the Arctic marine primary production changed in the last decade?

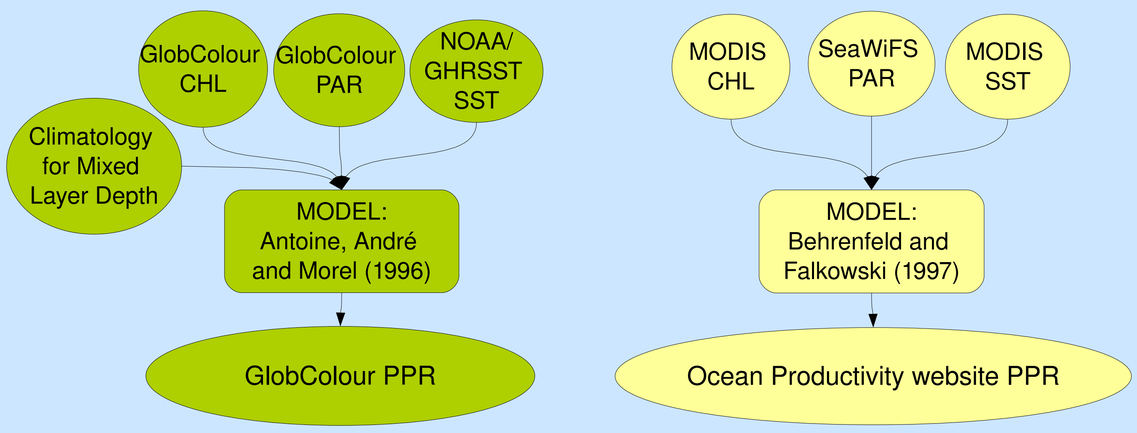
•How did the physical factors (e.g. sea ice extent, sea surface temperature, ocean currents) and phytoplankton biomass influence these changes?

Data used.

Name	Time period	Temporal resolution	Spatial resolution
GlobColour PPR	2003	monthly	9.2 km
VGPM PPR	2002-2007	8-days	1/12°
GlobColour (merged MERIS-MODIS-SeaWiFS) CHL	1999-2009	8-days	4.6 km
MODIS CHL	2002-2007	8-days	1/12°
GlobColour (merged MERIS-SeaWiFS) PAR	2003	monthly	9.2 km
SeaWiFS PAR	2002-2007	8-days	1/12°
MODIS SST	2002-2007	8-days	1/12°
PHAROS group (University of Bremen) SIC (retrieved from AMSR-E)	2002-2009	daily	6.25 km

VGPM – Vertically Generalized Primary production Model,
PPR – Primary Production, CHL – CHLorophyll-a, PAR – Photosynthetically Active Radiation,
SST – Sea Surface Temperature, SIC – Sea Ice Concentration.

Primary production calculation algorythms.



Validation of input data (chlorophyll-a).

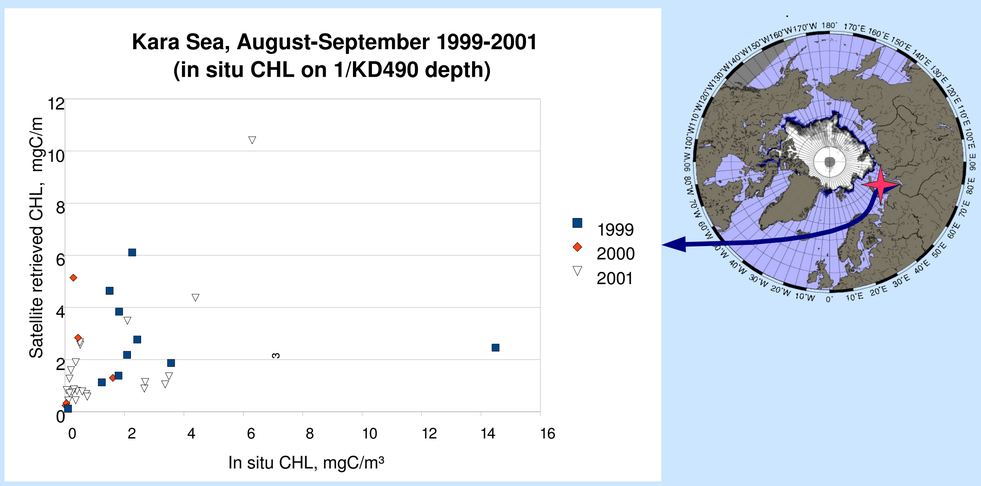


Figure 1. Comparison of GlobColour CHL data [1] to the in situ CHL data from RV "Akademik Boris Petrov" cruise [2,3]. Kara Sea, August-September 1999-2001.

Comparison of PPR datasets.

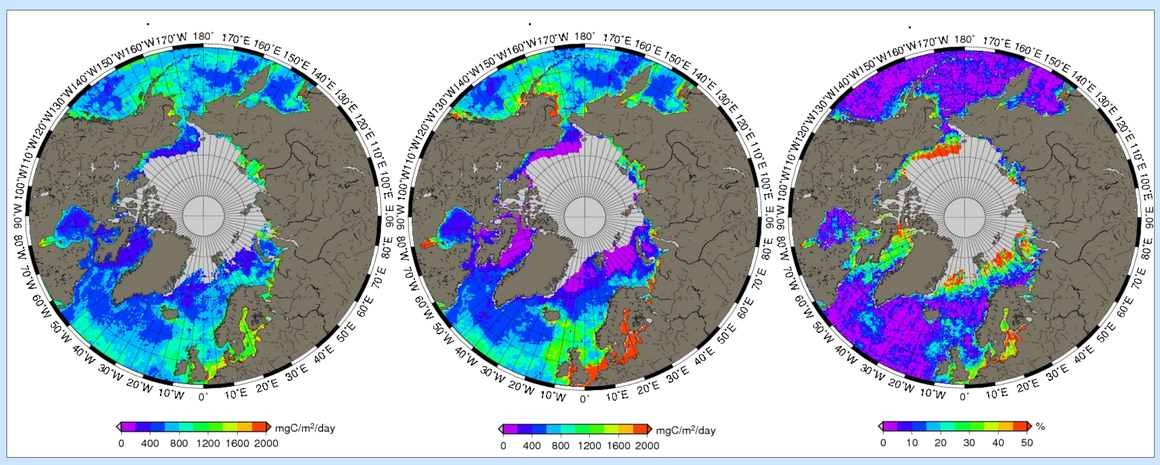


Figure 2. Left: Ocean Productivity website PPR for September 2003. [4]
Middle: GlobColour PPR for September 2003. [1]
Right: Difference between left and middle maps.
Largest disagreement is observed near the sea ice edge and in coastal ares..

Difficulties with obtaining satellite data in high latitudes. Decreasing ice cover not accounted for?

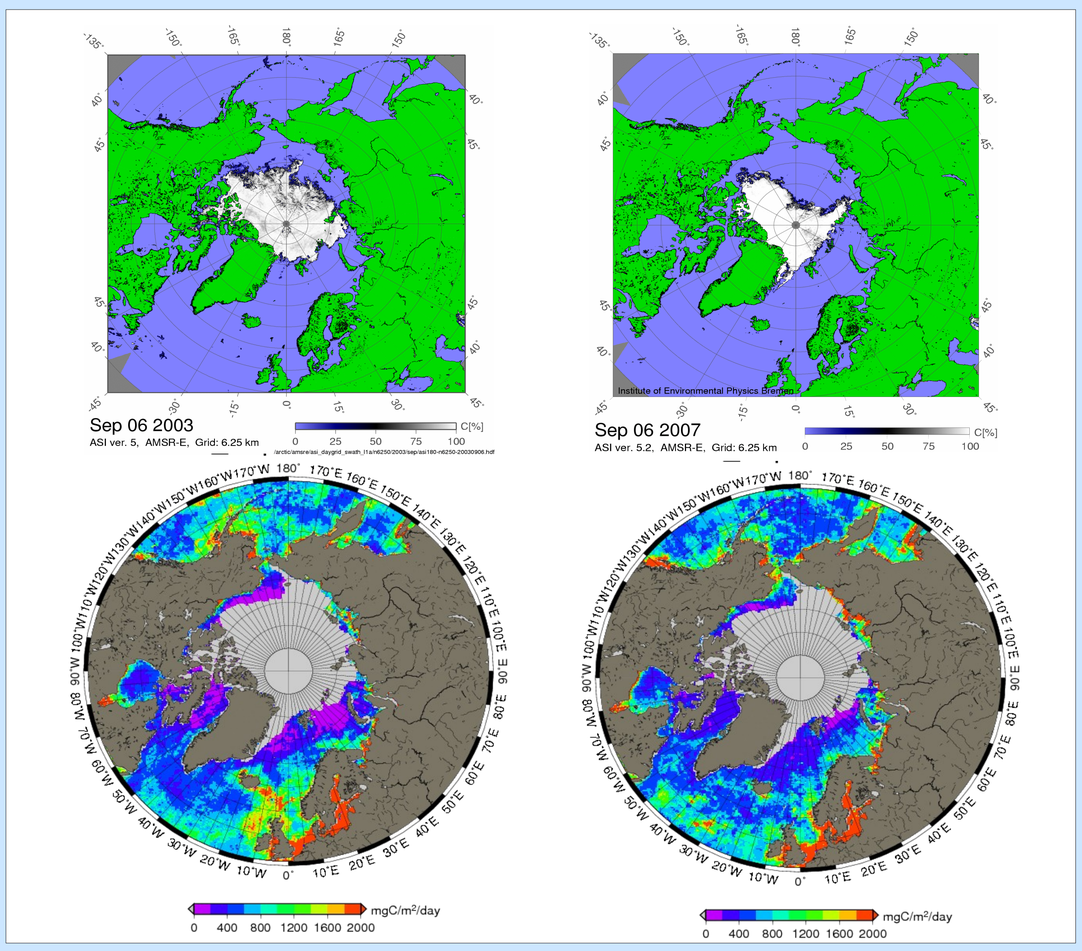


Figure 3. Top: SIC for 6 September, 2003 and 2007 retrieved from data of AMSR-E. [5]
Bottom: VGPM PPR for 6-14 September, 2003 and 2007. [4]

Future work.

- Generate Arctic primary production dataset for 2002-2010 based on GlobColour CHL, PAR produced from ECMWF data and AVHRR SST.
- In order to track the changes in phytoplankton species composition compare the results to SCIAMACHY PhytoDOAS Phytoplankton Types data (from PHYTOOPTICS group, AWI/IUP). [9]
- Compare PPR/PAR/CHL/SIC data fields to those of coupled ocean-ice-ecosystem model by Losch et al (2008). [10]
- Validate the PPR dataset with in-situ data of Polarstern Cruise ARK XXV (June-July 2010).

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