# Inter-annual variation of primary productivity in the Bering and Chukchi Seas from satellite using absorption-based model

T. Hirawake, K. Shinmyo, A. Fujiwara and S-I. Saitoh

Faculty of Fisheries Sciences, Hokkaido University, Japan

# Uncertainty of chlorophyll estimation

- *The chlorophyll a and primary productivity estimation from satellite are not trusted, because……*

- Pigment package effect due to large cell size of diatom bloom induce underestimation, and
- High colored dissolved organic matter (CDOM) induce overestimation.

(e.g. Cota et al., 2004)

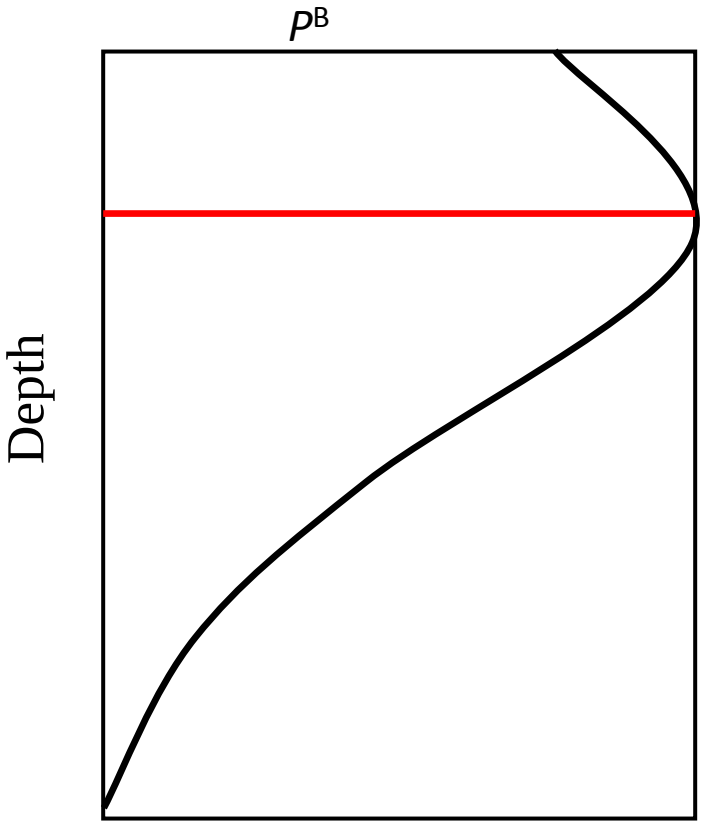
# Absorption-based PP model

- Primary productivity model eliminated chl.*a* concentration can resolve the uncertainties.
- Light absorption coefficient is strong predictor of surface primary productivity (Marra et al, 2007).
- We have developed the absorption-based PP model in the polar oceans without using chl.a (Hirawake et al., 2011, Hirawake et al., in review).

# Absorption based primary production model (ABPM)

$$PP_{eu} = f\left[\tilde{a}_{\mathrm{ph}}(0\text{-})\right] \times Z_{eu} \times \frac{0.66125 \times E_0}{E_0 + 4.1} \times DL$$

VGPM (Behrenfeld & Falkowski, 1997)




Function of SST in VGPM

$P^{B}_{opt} \times Chl_{surf}$

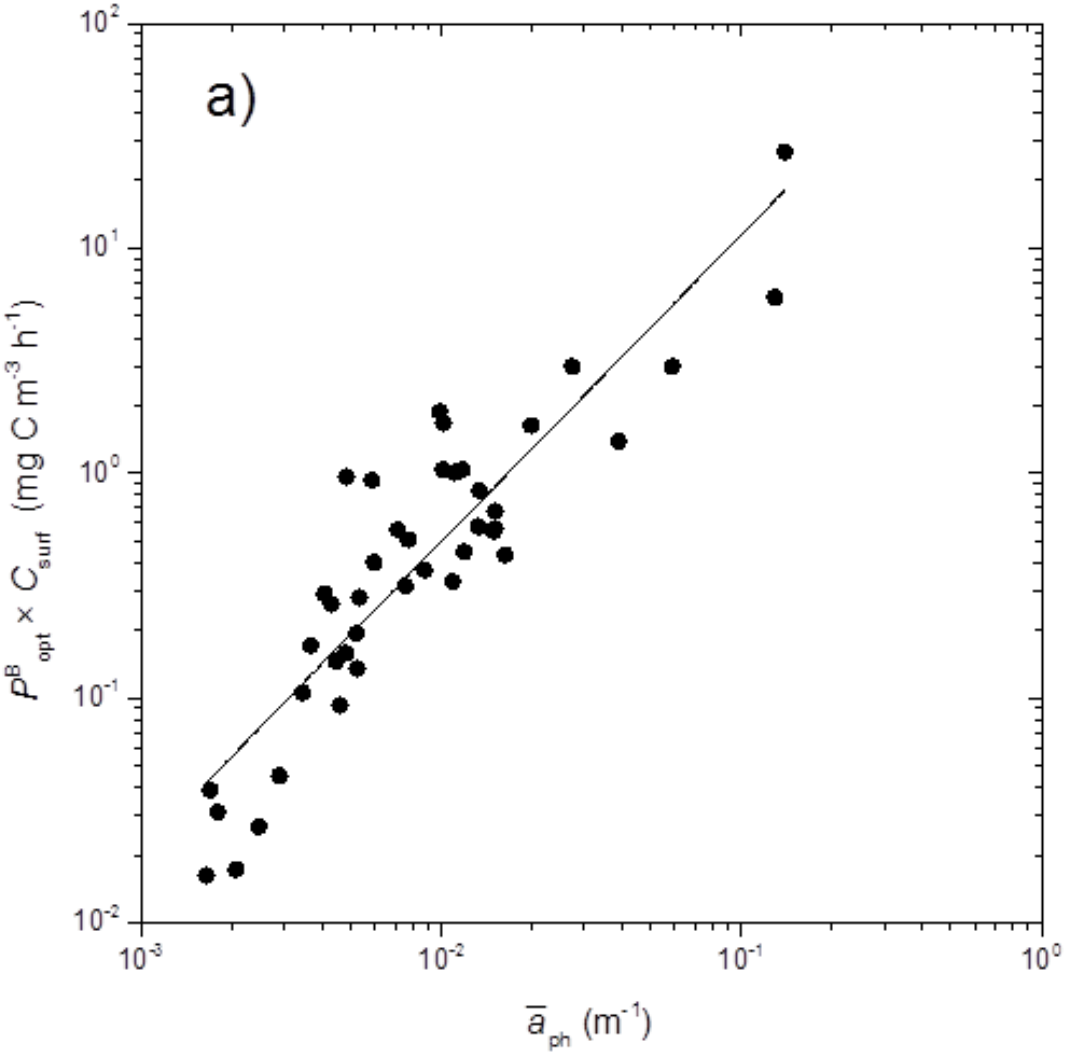
$\tilde{a}_{\mathrm{ph}}(0\text{-})$

Absorption coefficient at the sea surface

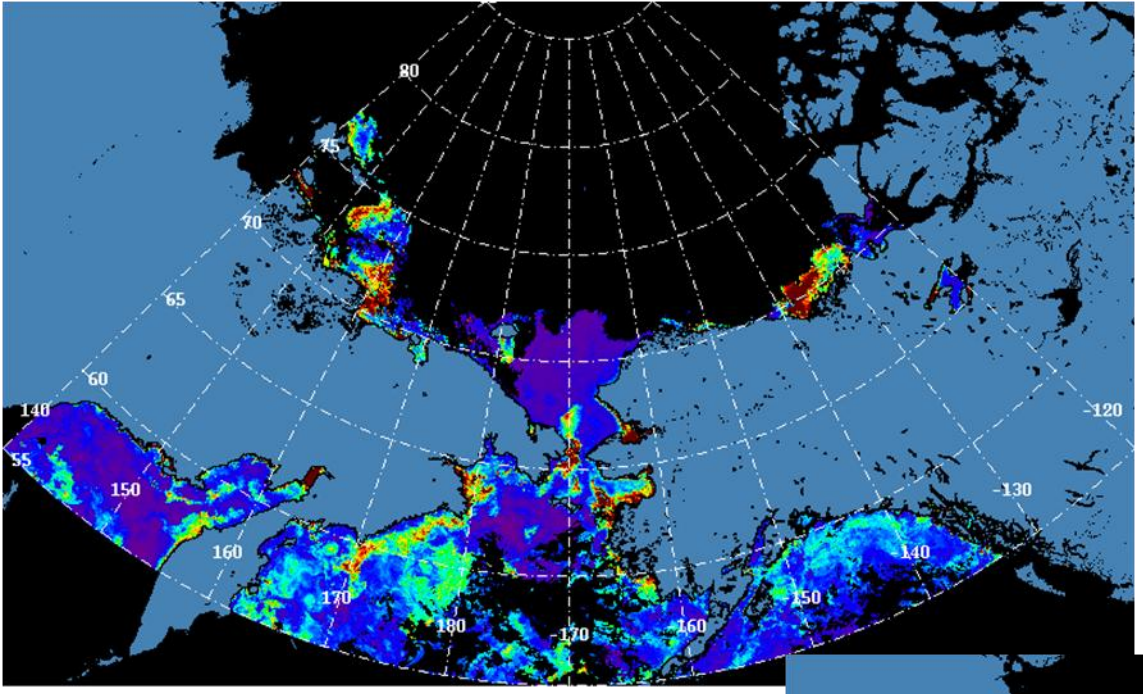
Chl *a* and SST were not used.

Hirawake et al. 2011 Polar Biology

# Light absorption vs. surface production

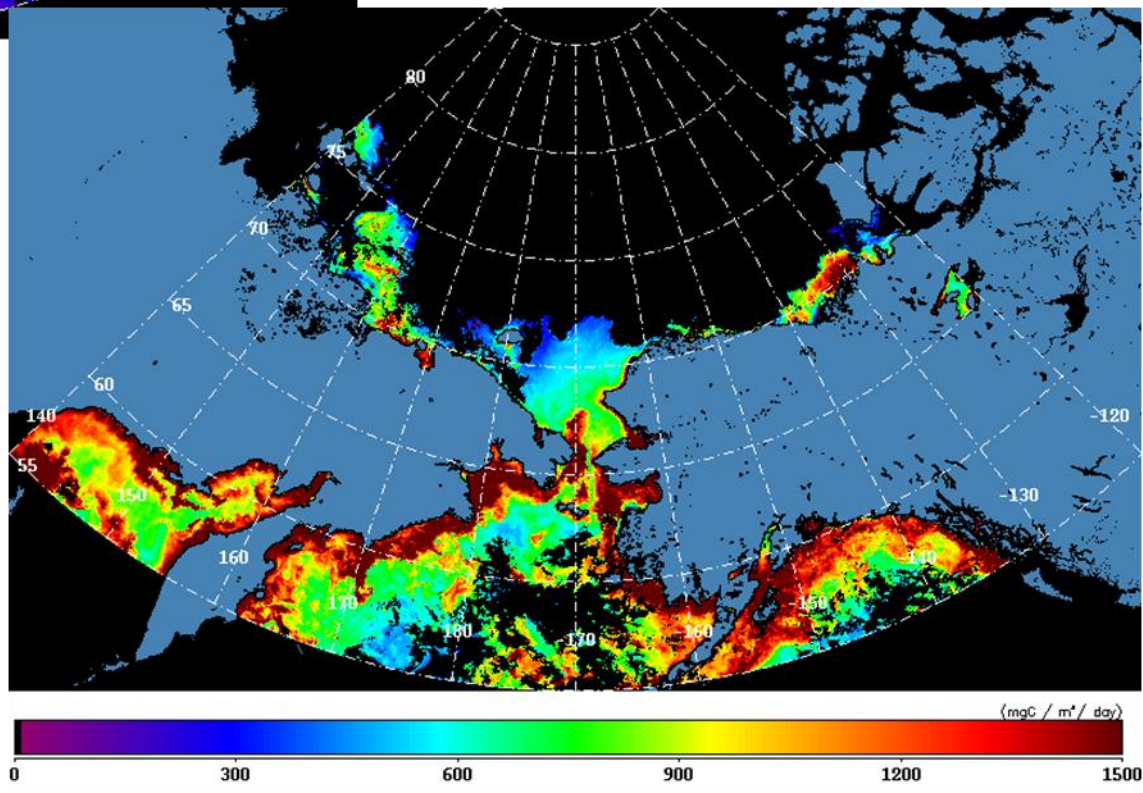


# Column integrate daily primary productivity in July 2002 (mg C $m^{-2}$ $d^{-1}$)

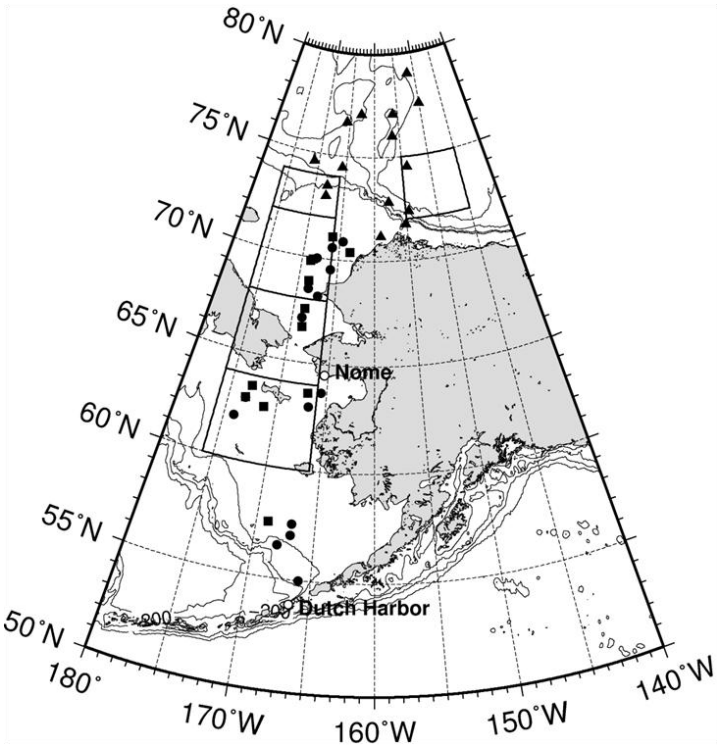


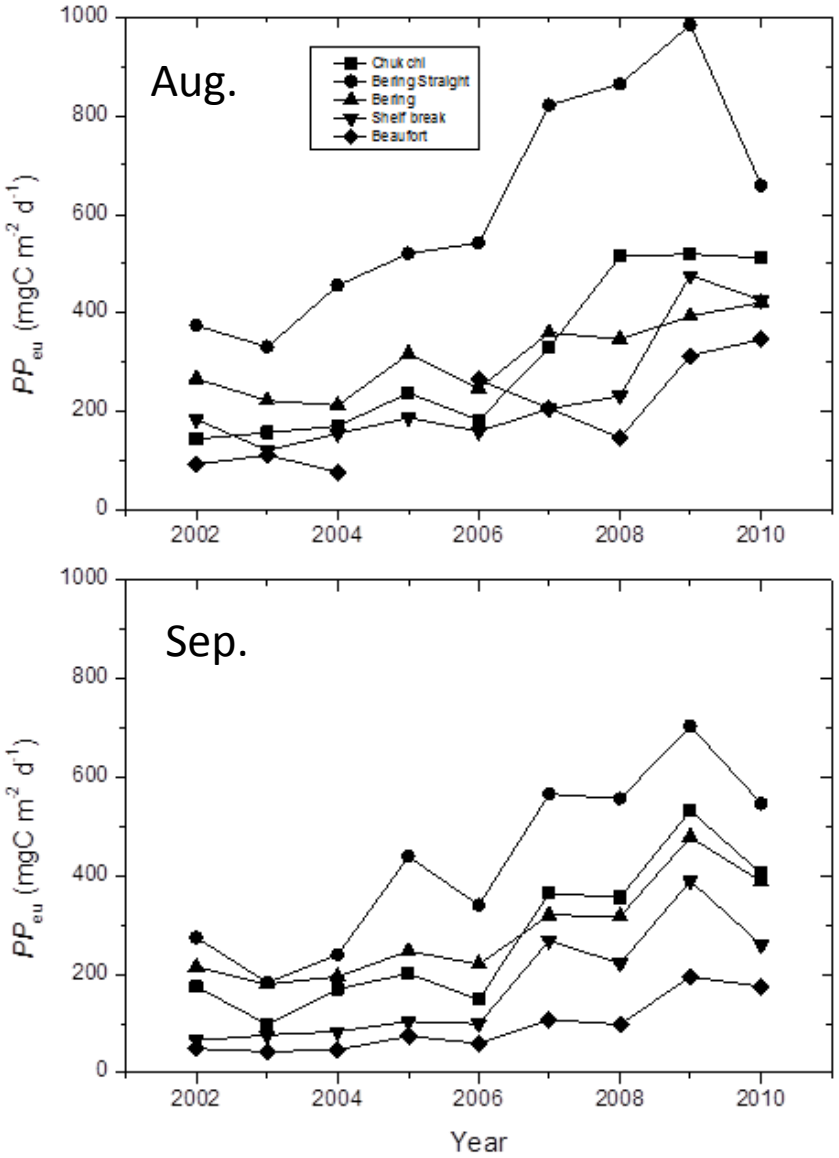

Absorption-based

VGPM



# Inter-annual variation in PP



# Summary

- Absorption-based model has the advantage of reducing effects of the pigment packaging and high CDOM concentrations in the Arctic Ocean.
- Column integrated daily primary productivity is gradually increasing.