PICES sixteen annual meeting

S2 BIO/POC topic session: Decadal changes in carbon biogeochemistry in the North Pacific

S2-4068

Interannual variability of the biological pump in the northwestern North Pacific

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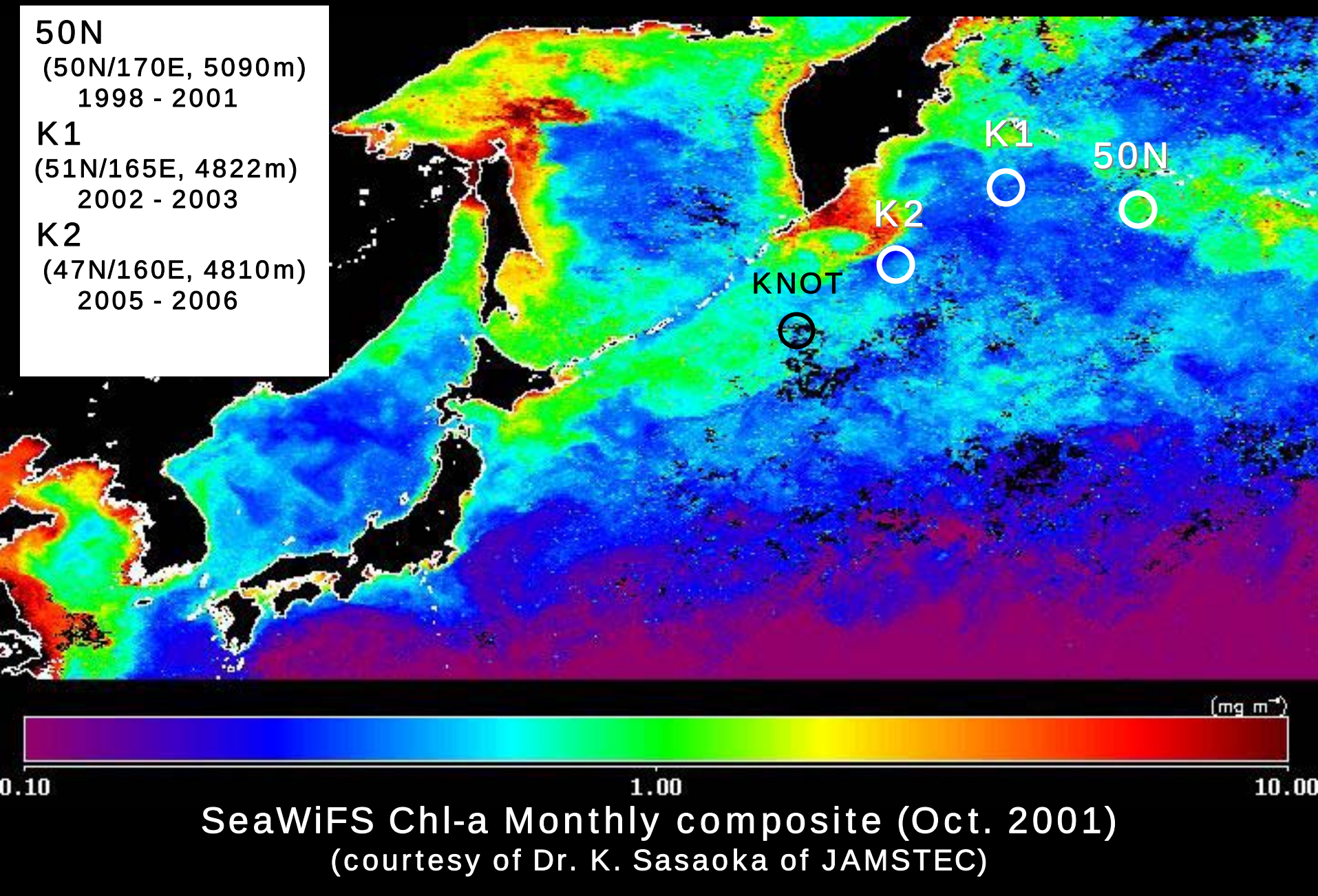
Sorry for cancellation of my talk

Enjoy the meeting and stay!

Sediment trap experiment in the NW North Pacific



SeaWiFS Chl-a Monthly composite (Oct. 2001)

(courtesy of Dr. K. Sasaoka of JAMSTEC)

Sediment trap
McLane Mark 7G-21 (or 7G-13)

Preservative
Seawater based 5% buffered formalin

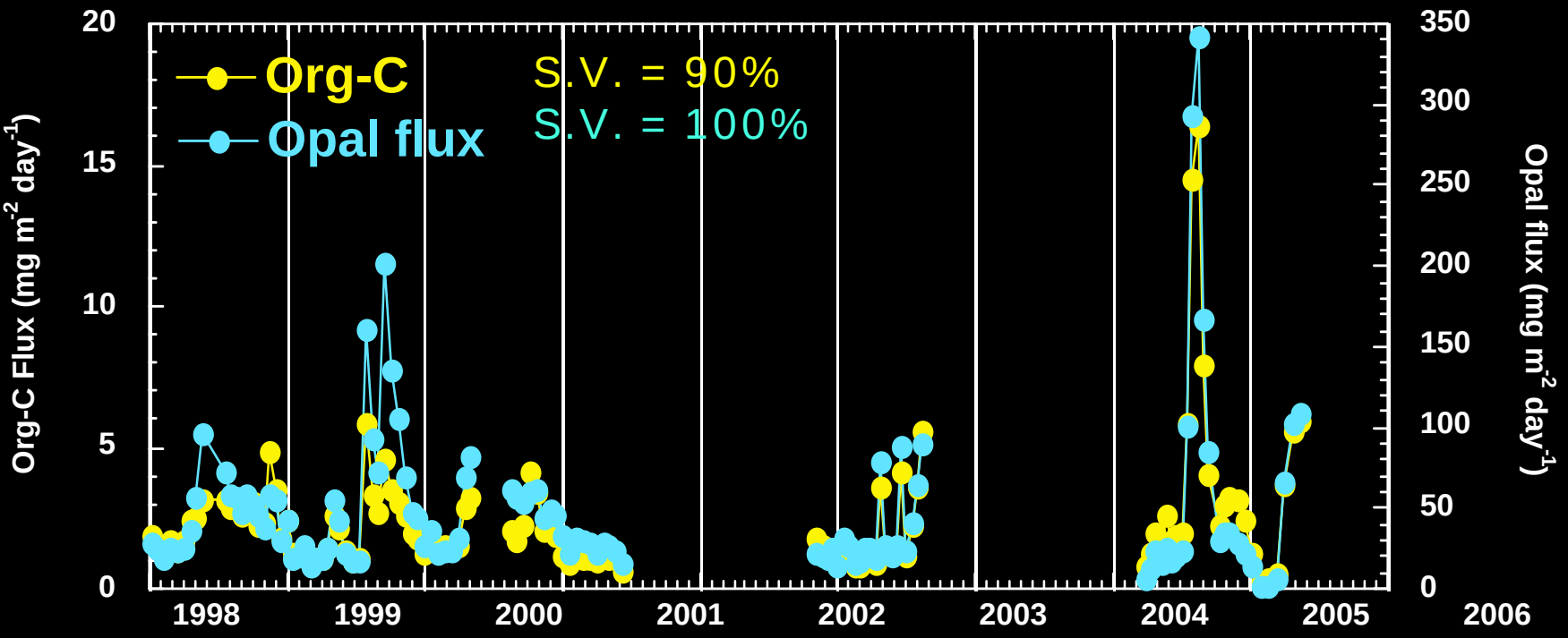
Swimmer
1 mm mesh sieving

Sampling interval
14 ~ 21 days

CHN (Org-C, Inorg-C)
Elemental analyzer

Trace elements
(Si, Ca, Al, Ti, Fe etc.)
ICP-AES

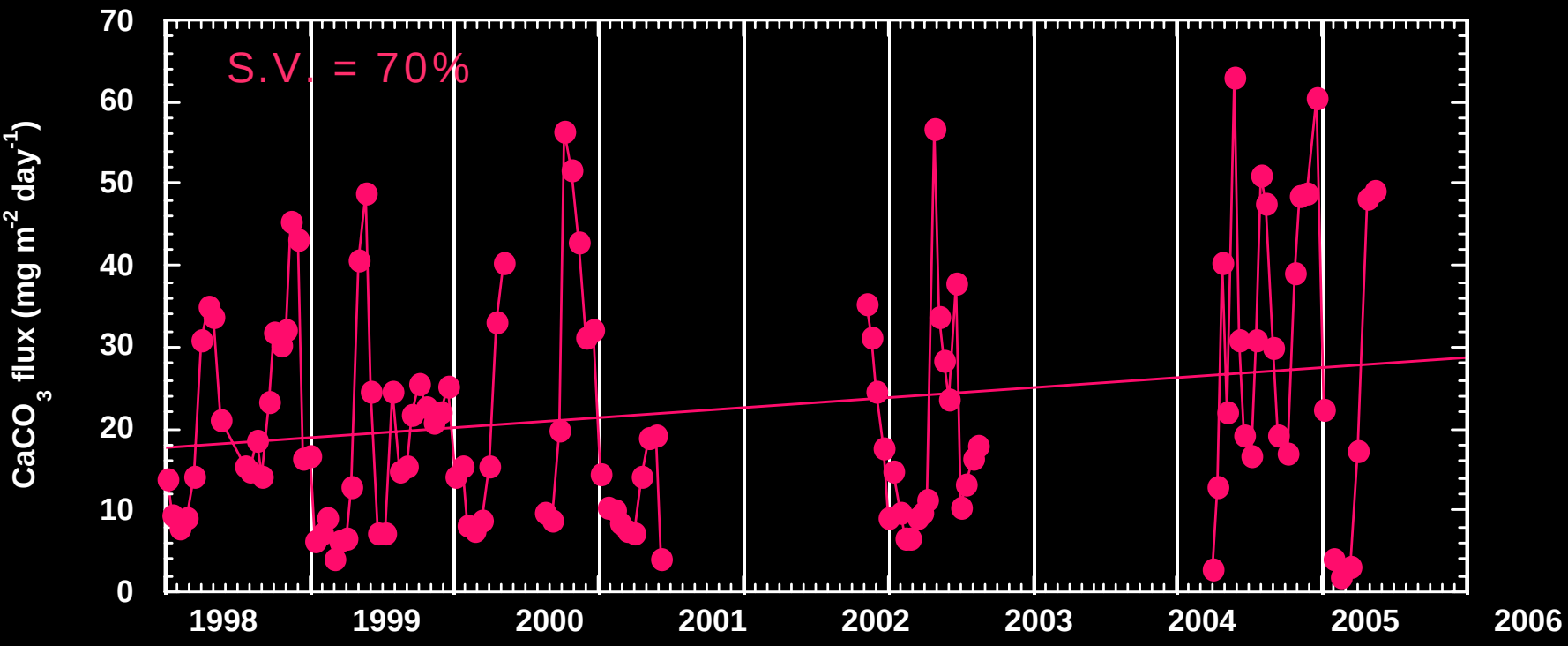
Organic carbon and Biogenic Opal fluxes



Organic carbon and biogenic opal fluxes synchronized well.

These fluxes did not show statistically significant long-term linear change.

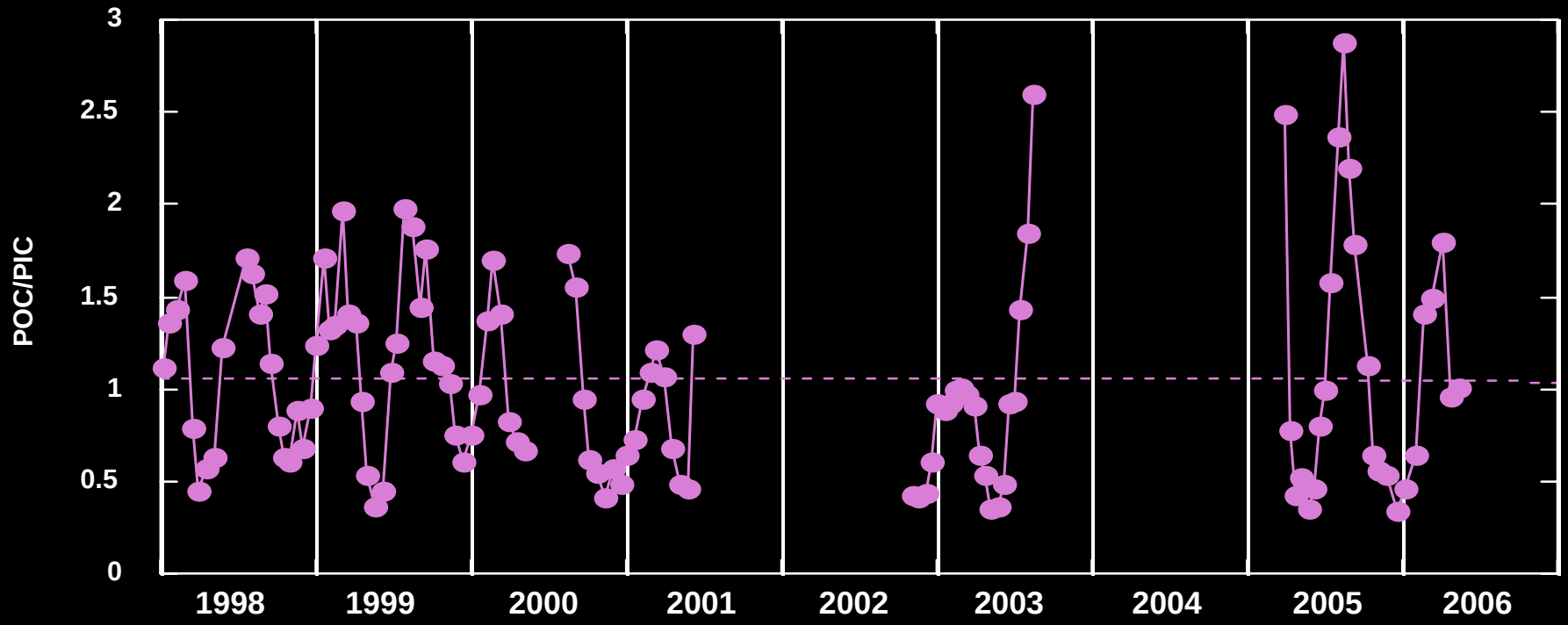
$CaCO_3$ flux



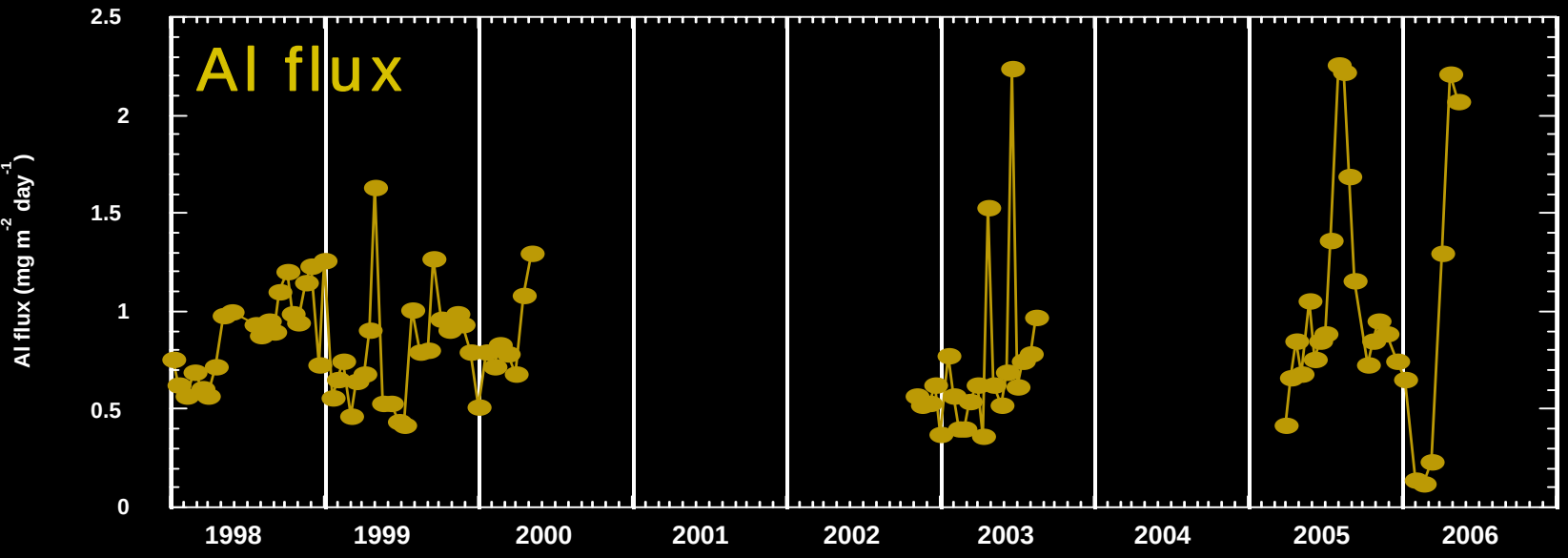
Compared with Org-C and Opal fluxes, seasonal variability in $CaCO_3$ flux is relatively small.

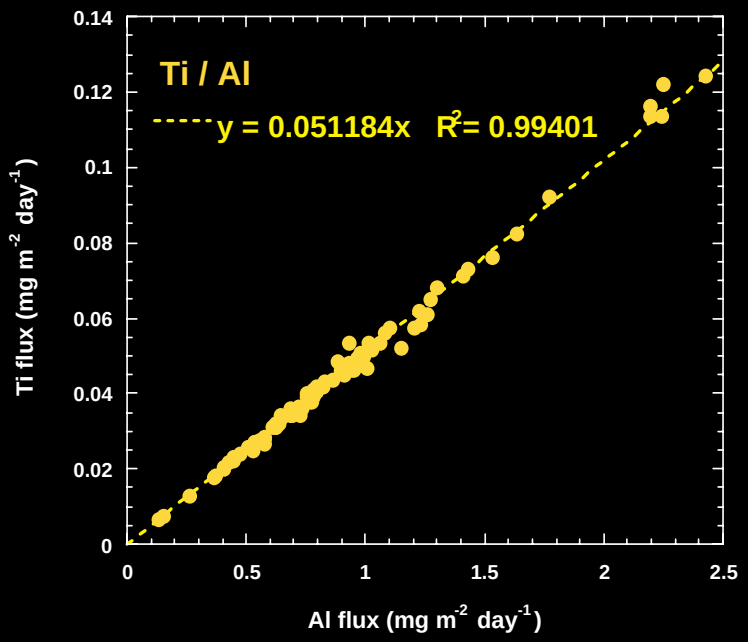
$CaCO_3$ flux tended to increase with time ($R = 0.2$, $p < 0.02$).

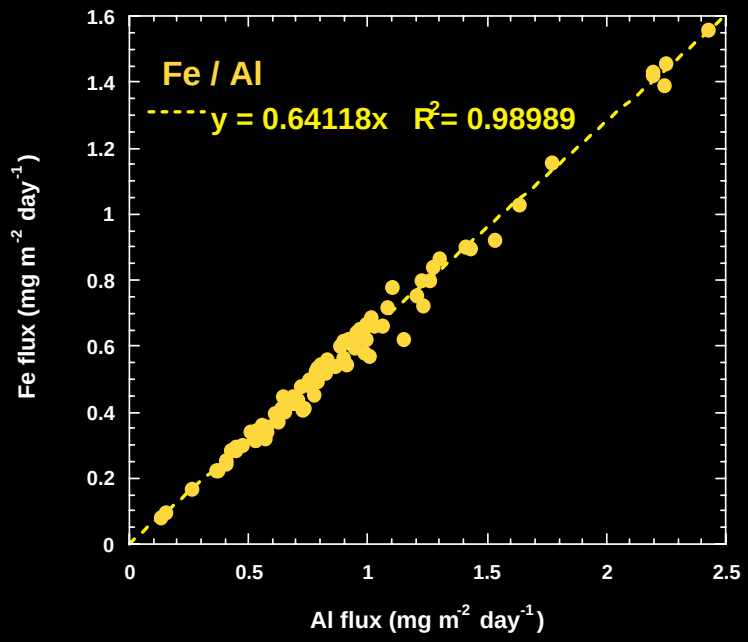
Rain ratio (POC / PIC)



Rain ratio (POC / PIC), which is an index of efficiency of biological CO_2 uptake, tended to decrease slightly. However it was not statistically significant. Because Org-C flux also tended to increase while $CaCO_3$ flux increased.

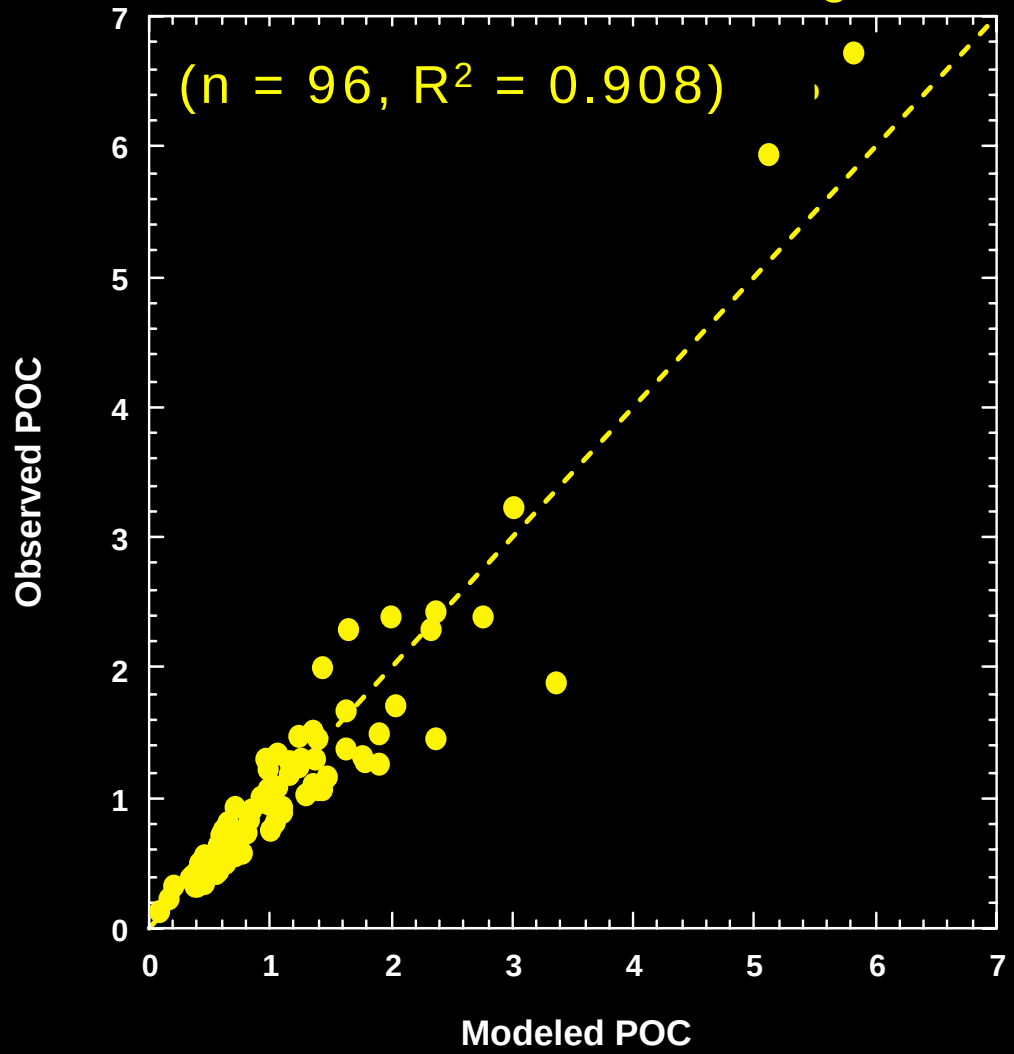




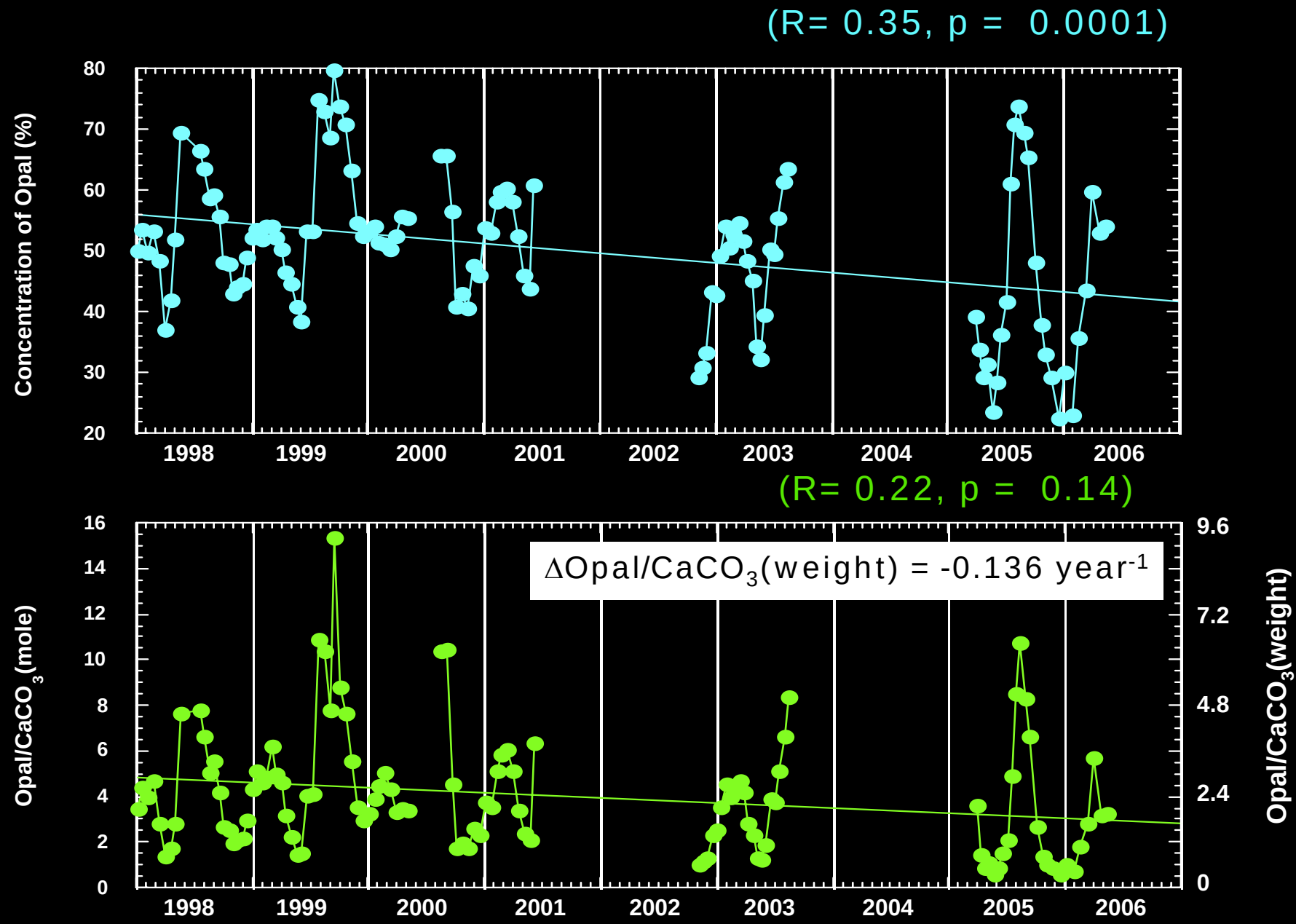


Al and other lithogenic materials did not show long-term change.

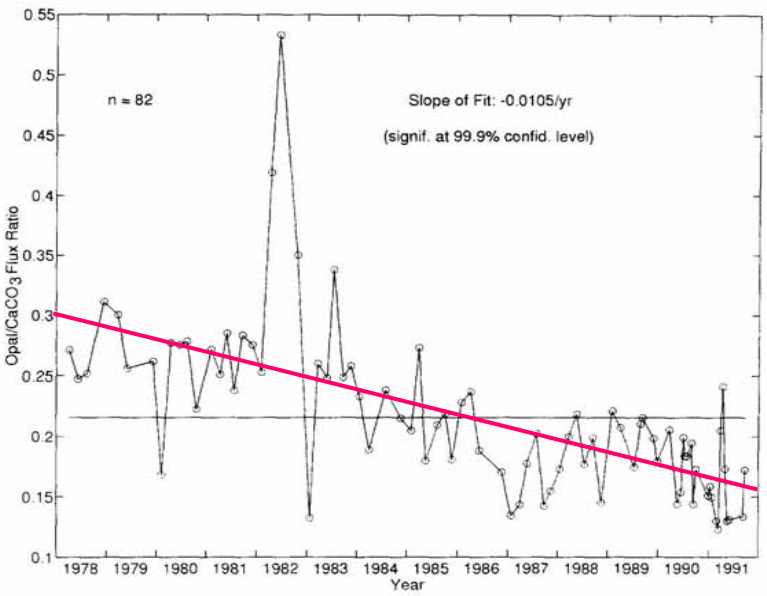
POC = 0.706 Opal + 0.165 $CaCO_3$ + 0.174 LM



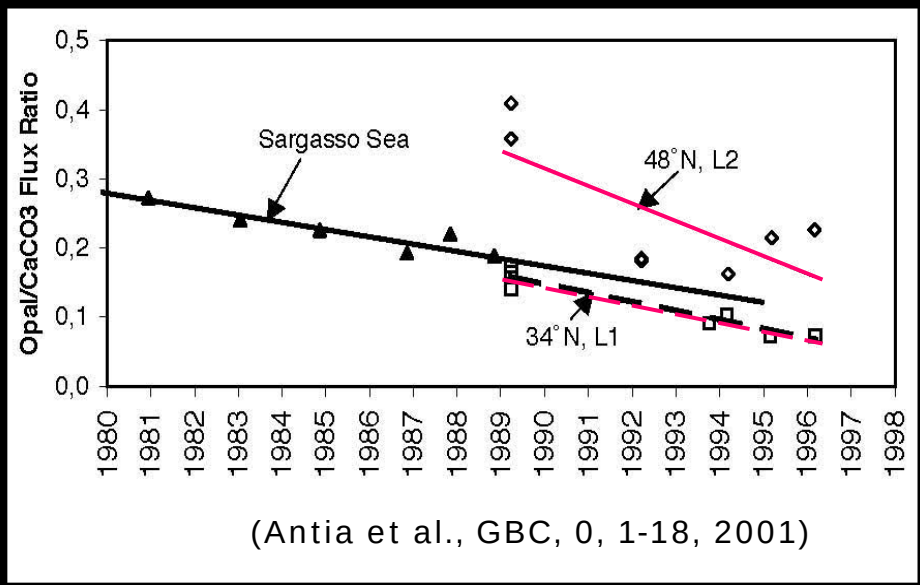
Based on multiple regression analysis, Opal plays an important role in transporting organic carbon to the ocean interior (Good ballast).



Concentration of Opal and the ratio of Opal to $CaCO_3$ tended to decrease with time.



(Deuser et al., DSR I, 42, 1923-1932,1995)

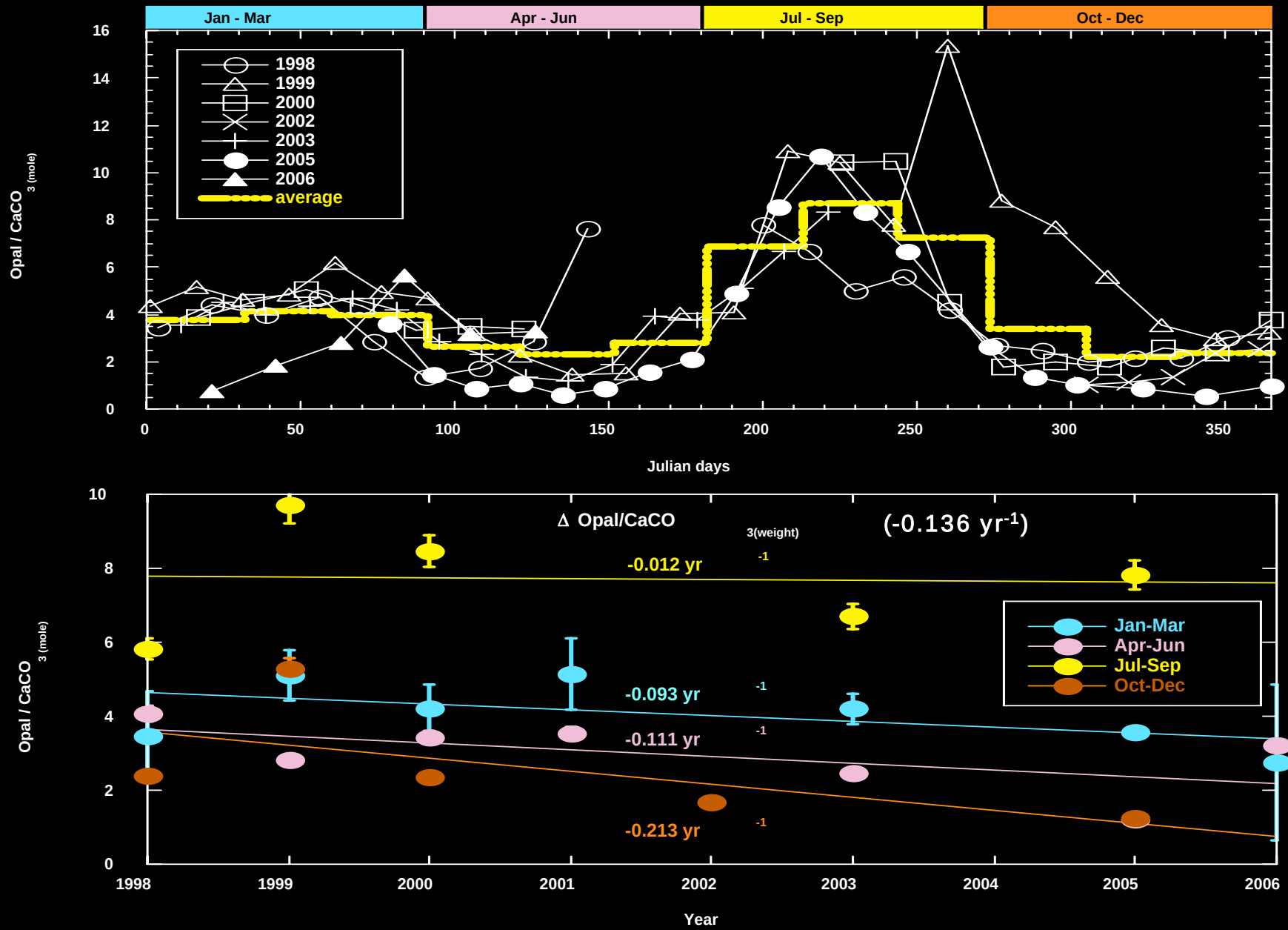


(Antia et al., GBC, 0, 1-18, 2001)

$\Delta Opal/CaCO_{3(weight)}$ (yr^{-1})	
NWN Pac.	- 0.136
BATS	- 0.0105
NABE48N	- 0.026
NABE34N	- 0.015

$\Delta Opal/CaCO_{3(weight)}$ has also observed in the Atlantic ocean and, but,

$\Delta Opal/CaCO_{3(weight)}$ in the NWNP is larger.

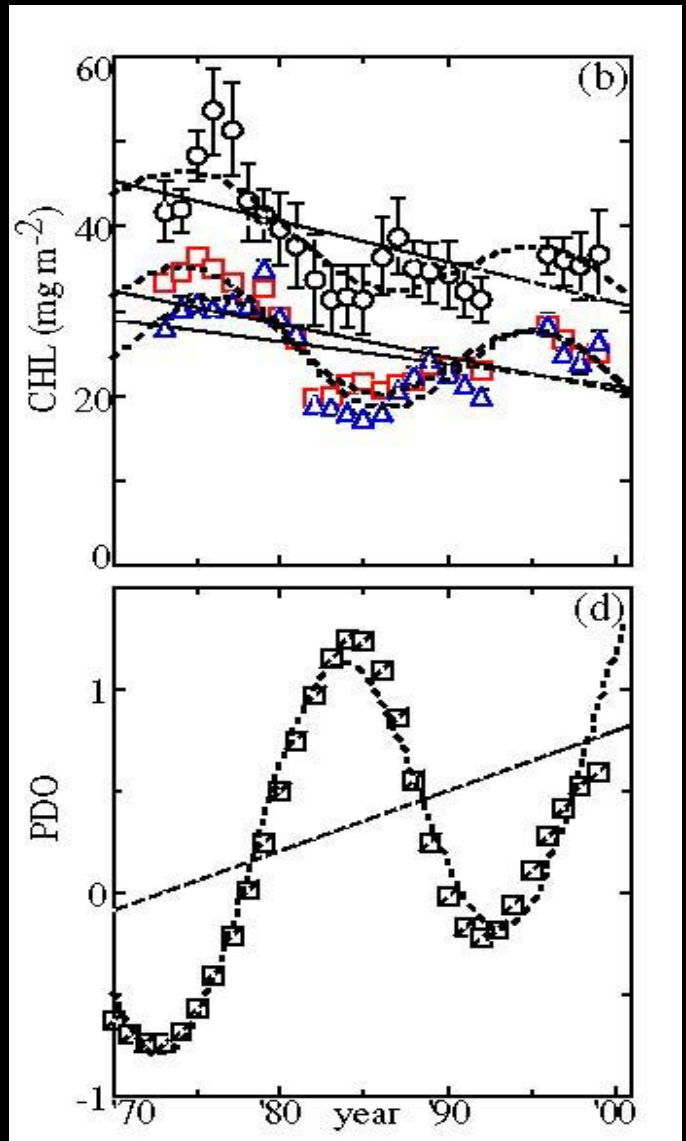


The decrease in the ratio of Opal to $CaCO_3$ flux in autumn tends to be larger followed by that in spring.

Concluding remarks

In the NWNP where has been called as “silica ocean”, contribution of biogenic opal to sinking particle tends to decrease in the last 8 years. This trend corresponds to recent reports (Coccolithophorids bloom in the Bering Sea, Hunt et al., 1999; Increase in smaller phytoplankton, Ishida et al., 2005).

However it is too early to say that the NWNP is changing to “carbonate ocean”. More than bi-decadal time-series observation is strongly requested.



Bi-decadal oscillation
(Y. W. Watanabe et al., JO, 2005)