Commentary to Richard Lampitt:

'Linking Surface Ocean and the Deep Sea'

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JGOFS Open Science Conference
4-8 May 2003

Differences in the biological carbon pump within the same biogeographical province

A case study from the subtropical North Atlantic Gyre

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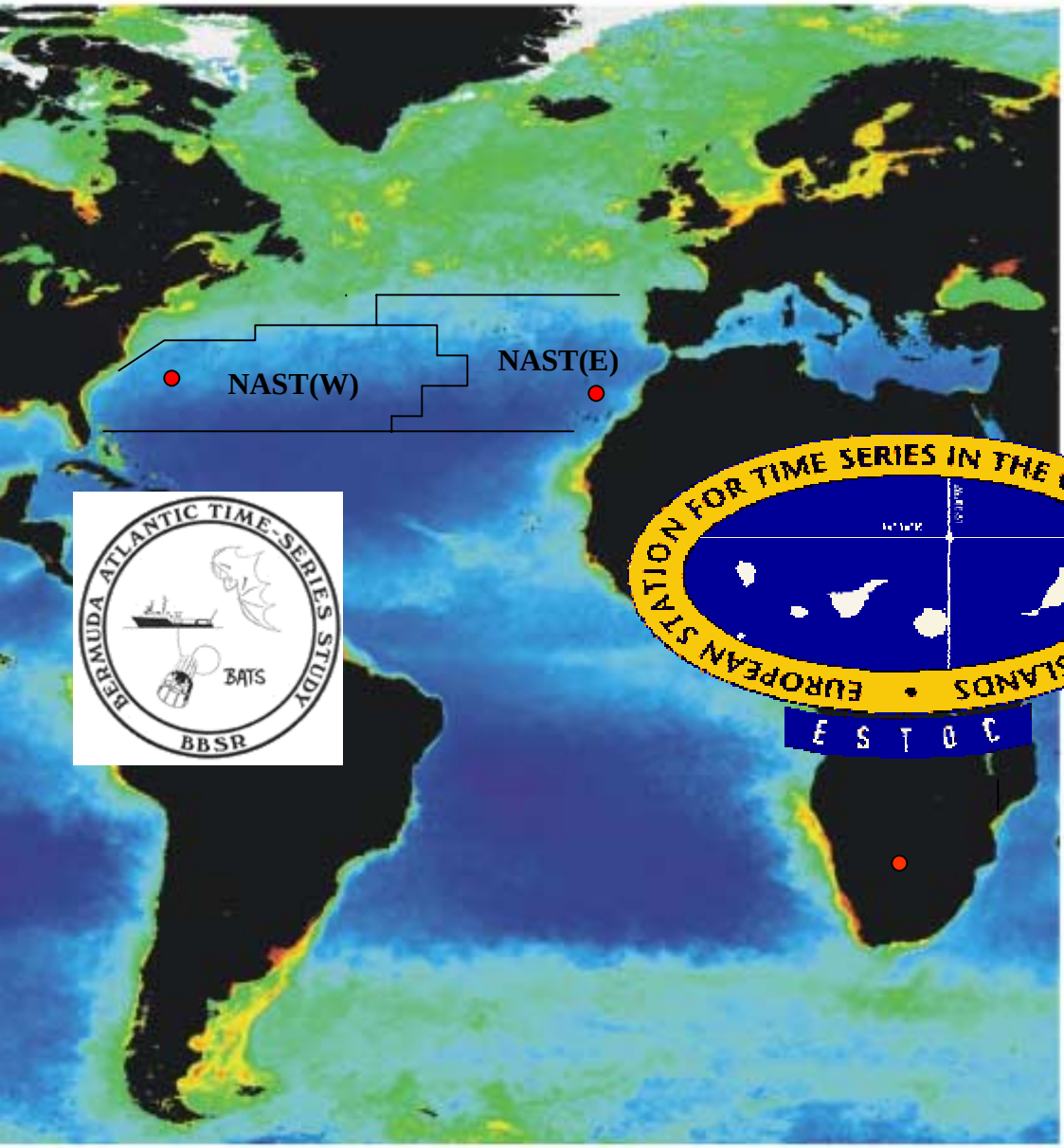


Data sets used for this study have been obtained simultaneously during 1996-1998.

The North Atlantic Subtropical Gyral Province (NAST)

East:

ESTOC

(European Station for Time-Series, Canary Islands)

West:

BATS

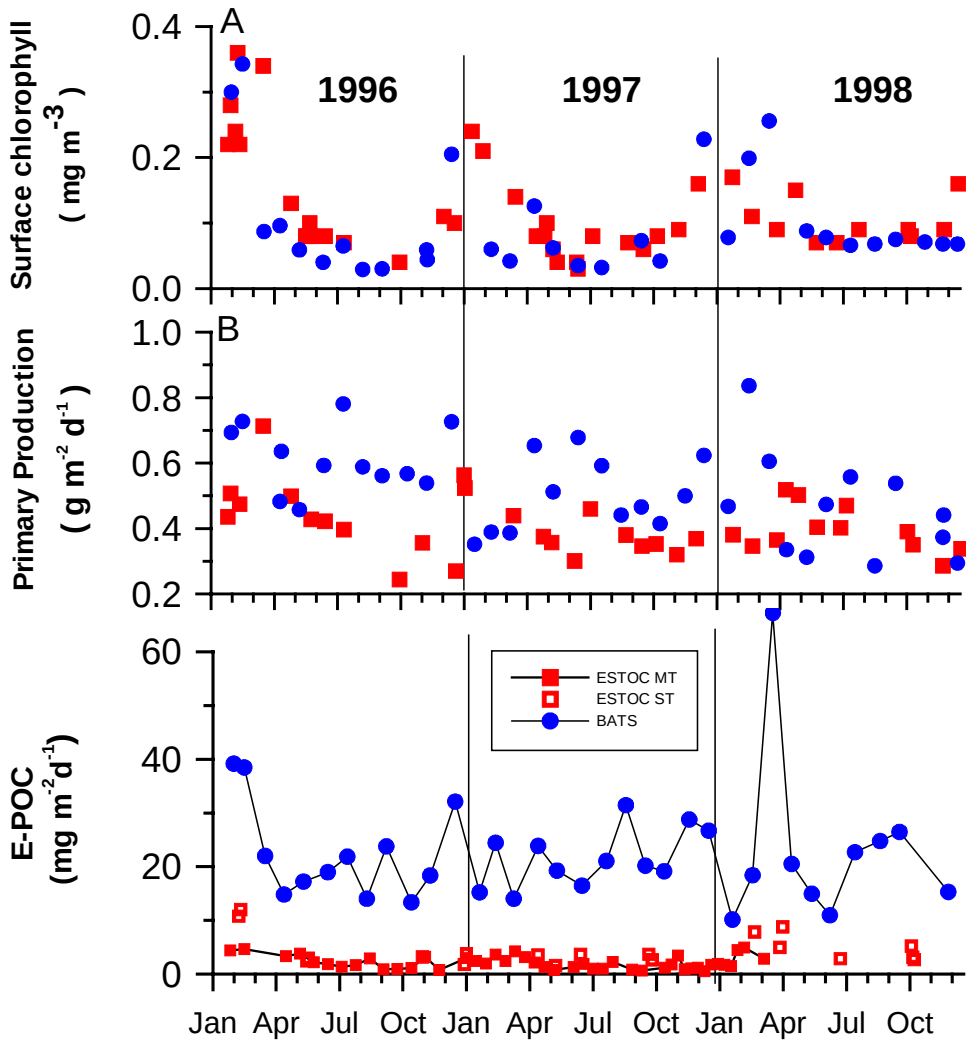
(Bermuda Atlantic Time-Series)

Seasonality of surface chlorophyll, integrated primary production and export production at ESTOC and BATS

Chl a

PP

Epoc



Neuer et al.2002

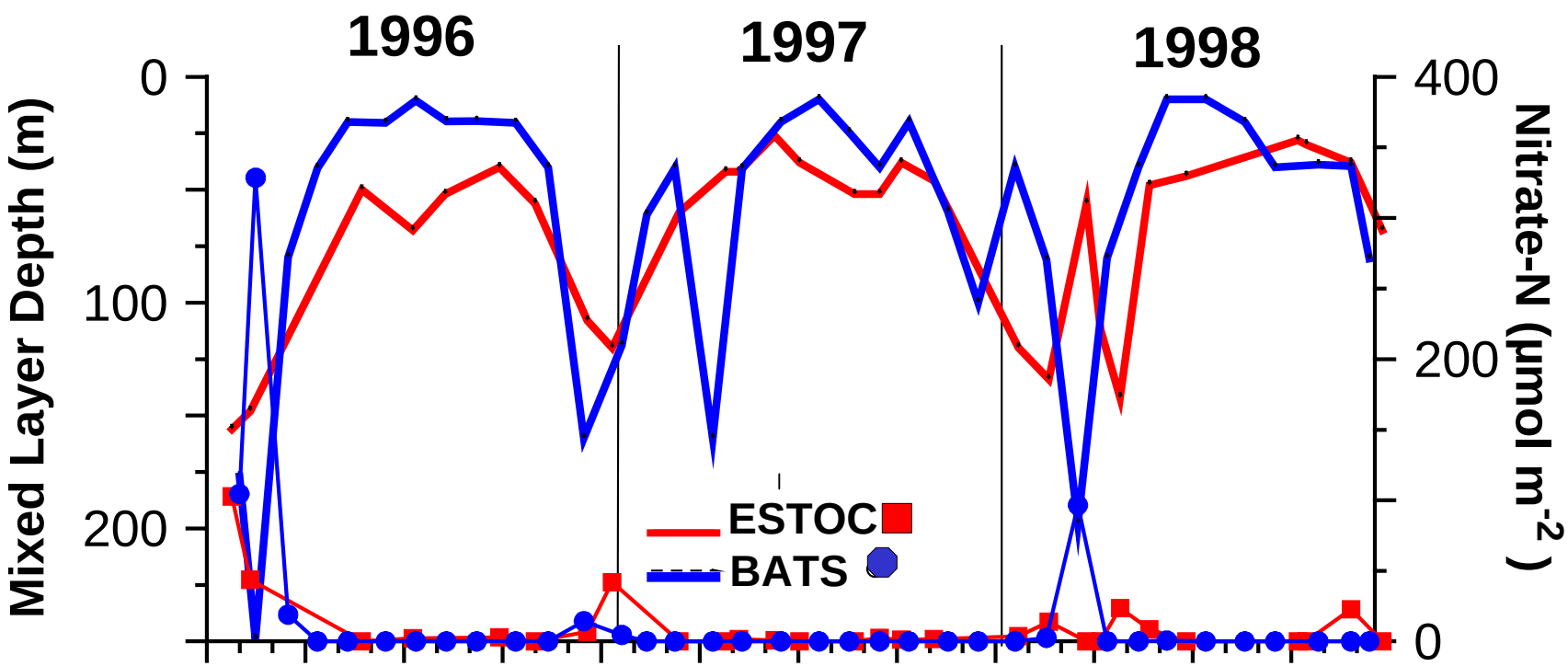
Yearly integrated PP, E_{POC} and ER (E_{Poc} /PP) for ESTOC and BATS

	PP mol C m^{-2} yr^{-1}		E_{POC} mol C m^{-2} yr^{-1}		ER	
	BATS	**ESTOC**	**BATS**	**ESTOC[a]**	**BATS**	**ESTOC[b]**
1996	16.3	11.9	1.4	0.24 / 0.16	0.086	0.017
1997	13.3	12.0	1.3	0.16 / 0.16	0.098	0.013
1998	13.9	11.7	0.7	-- / 0.20	0.050	0.017
AVG	**14.5**	**11.9**	**1.1**	**0.2**	**0.08**	**0.016**

[a]Shallow moored/surface tethered trap. Surface tethered trap value of 1996 and 1997 composite of both years [b] Mean of moored and surface tethered traps.

Neuer et al.2002

Mixed layer depth and Nitrate-N input at ESTOC and BATS



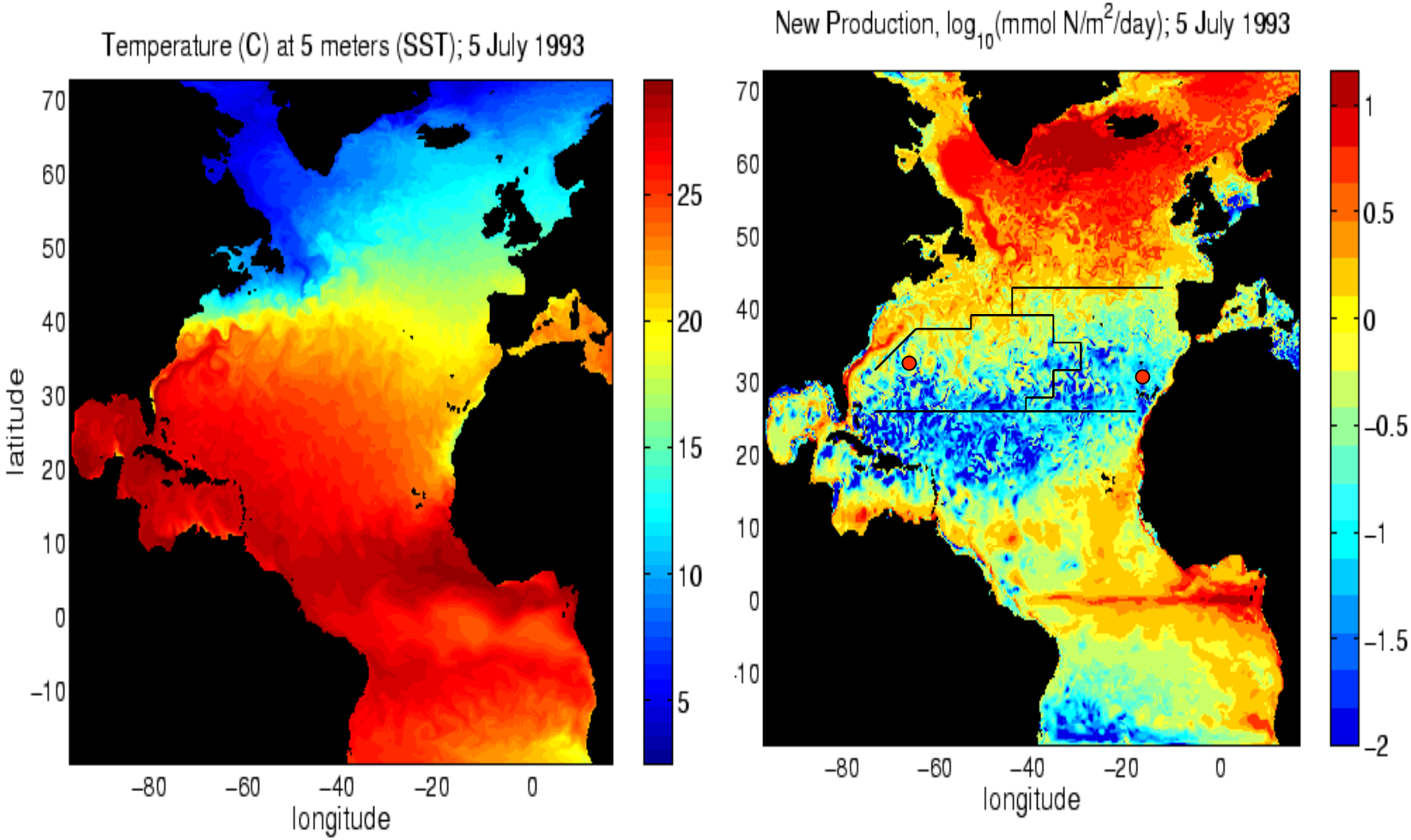
ESTOC: 0.06 - 0.2 mmol N/m2/yr

BATS: 0.01 - 0.5 mmol N/m2/yr

Neuer et al.2002

Nutrient budgets at BATS and ESTOC diagnosed from an eddy-resolving 0.1 degree resolution simulation of the North Atlantic (after McGillicuddy et al. in press)

	BATS	ESTOC
New Production (mol N $m^{-2}yr^{-1}$)	**0.63**	**0.04**
Convection	0.37	0.00
Vertical diffusion	0.10	0.02
Vertical advection	**0.12**	**0.02**
Horizontal advection	0.04	0.00
Horizontal diffusion	0.00	0.00
Vertical velocity (m yr^{-1})	-31	-30



Snapshots of temperature and new production in a 0.1 degree resolution simulation of the North Atlantic

(McGillicuddy et al., GBC, in press)

Conclusions

ESTOC (NAST-E) has comparable surface chlorophyll and primary production than BATS (NAST-W), but new (export) production is significantly lower.

Conclusions

Lower input of new nutrients does not necessarily result in lower PP per se but influences the removal efficiency (export ratio) of biologically produced carbon into the ocean's interior.

Conclusions

Primary production and surface chlorophyll alone are insufficient to constrain the amount of carbon export in the subtropical ocean.

References

Neuer, S., R. Davenport, T. Freudenthal, G. Wefer , O. Llinás, M-J. Rueda, D. K. Steinberg and D. Karl. 2002. Differences in the biological carbon pump at three subtropical ocean sites. *Geophys. Res. Lett.*, 29, 32-1 to 32-4.

McGillicuddy, D.J., Anderson, L.A., Doney, S.C., and M.E. Maltrud. Eddy-driven sources and sinks of nutrients in the upper ocean: results from a 0.1 degree resolution model of the North Atlantic. In press, *Global Biogeochemical Cycles*.