SOLAS - Links to JGOFS Biogeochemistry

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surface ocean solas lower atmosphere study

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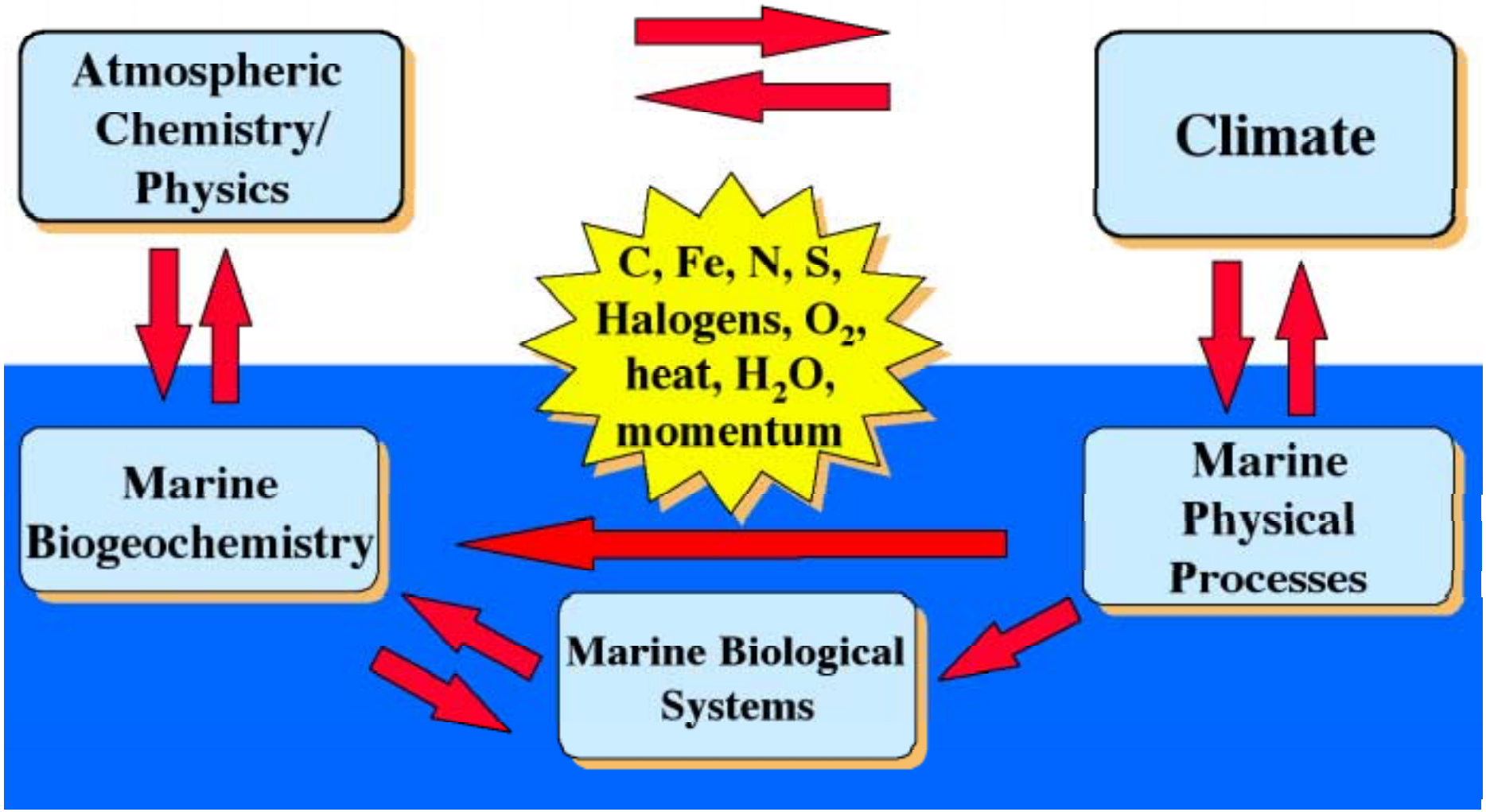
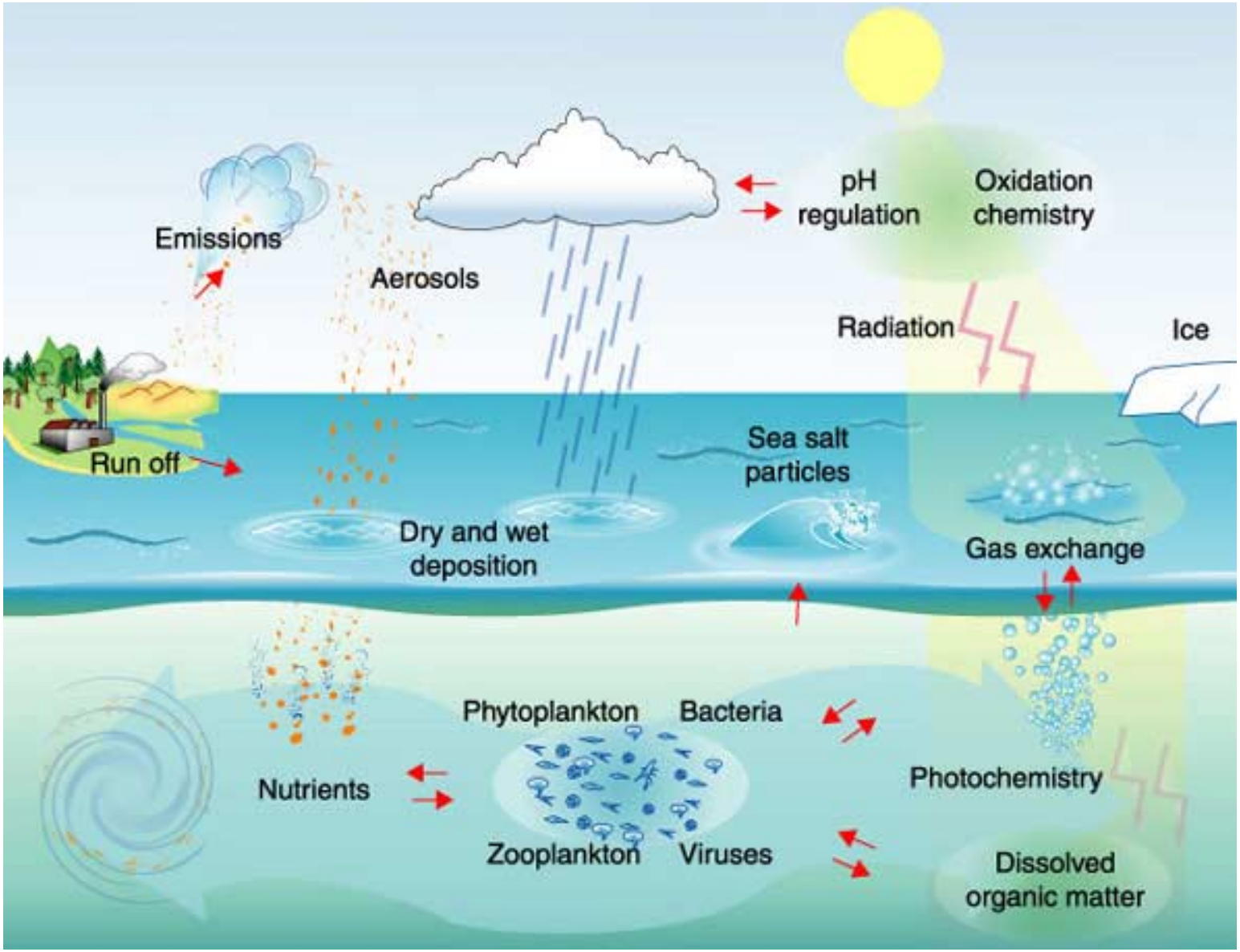
The Scope of SOLAS



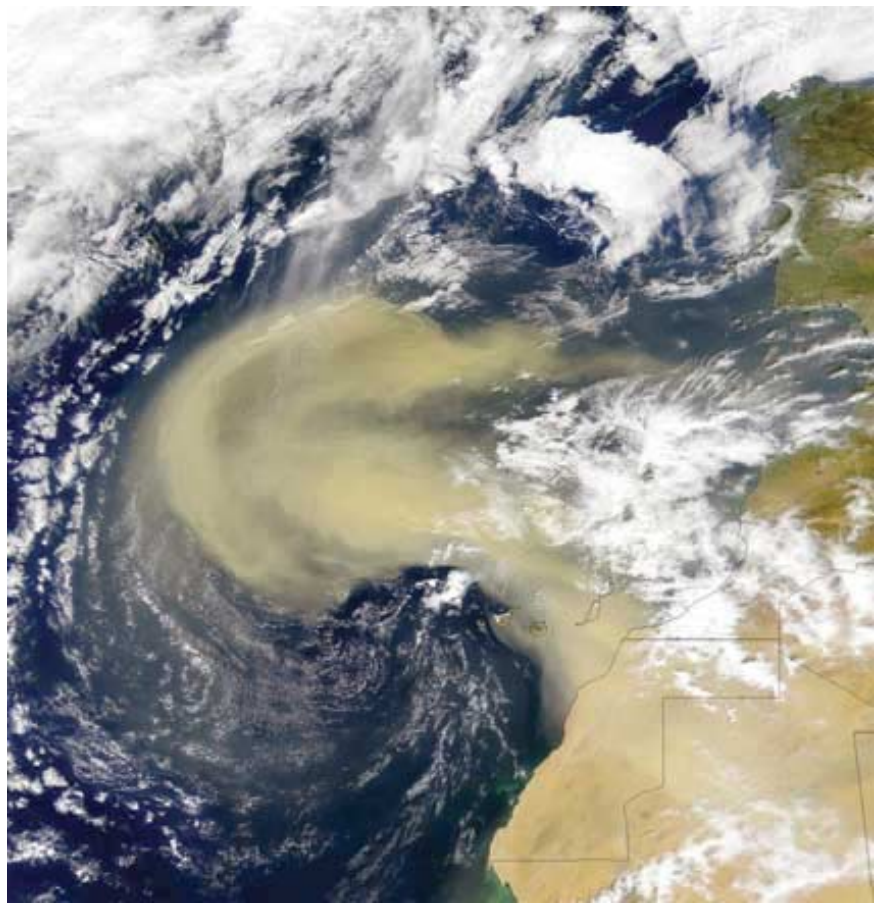
W Broadgate

The Domain of SOLAS



SOLAS: The Foci

- FOCUS 1: Biogeochemical interactions and feedbacks between ocean and atmosphere
- FOCUS 2:Exchange processes at the air-sea interface and the role of transport and transformation in the atmospheric and ocean boundary layers
- FOCUS 3: Air-sea flux of CO_2 and other long-lived radiatively-active gases



SeaWiFS

CACGP

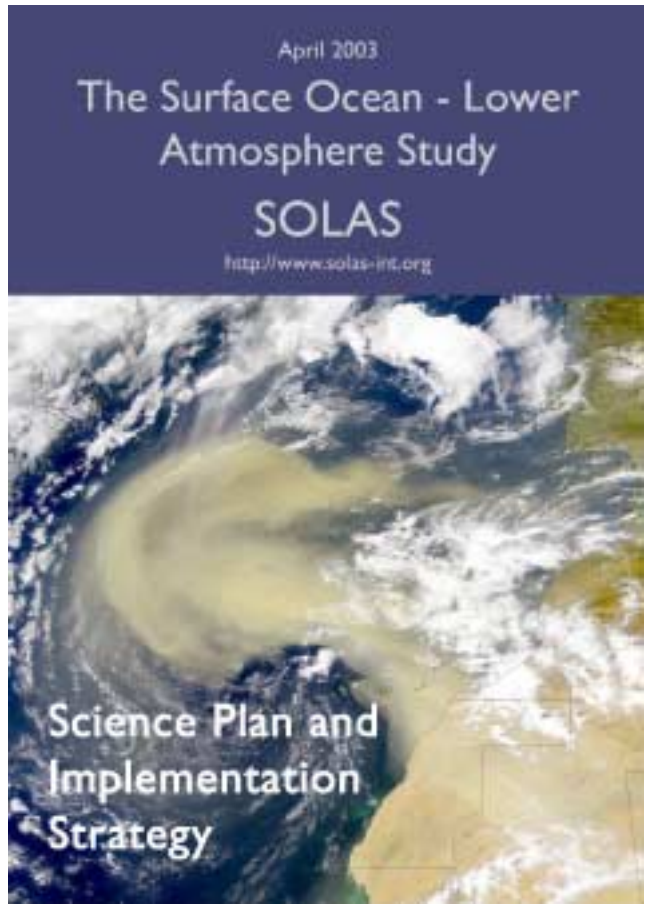
International Council for Science
Scientific Committee on Oceanic Research

WCRP Climate

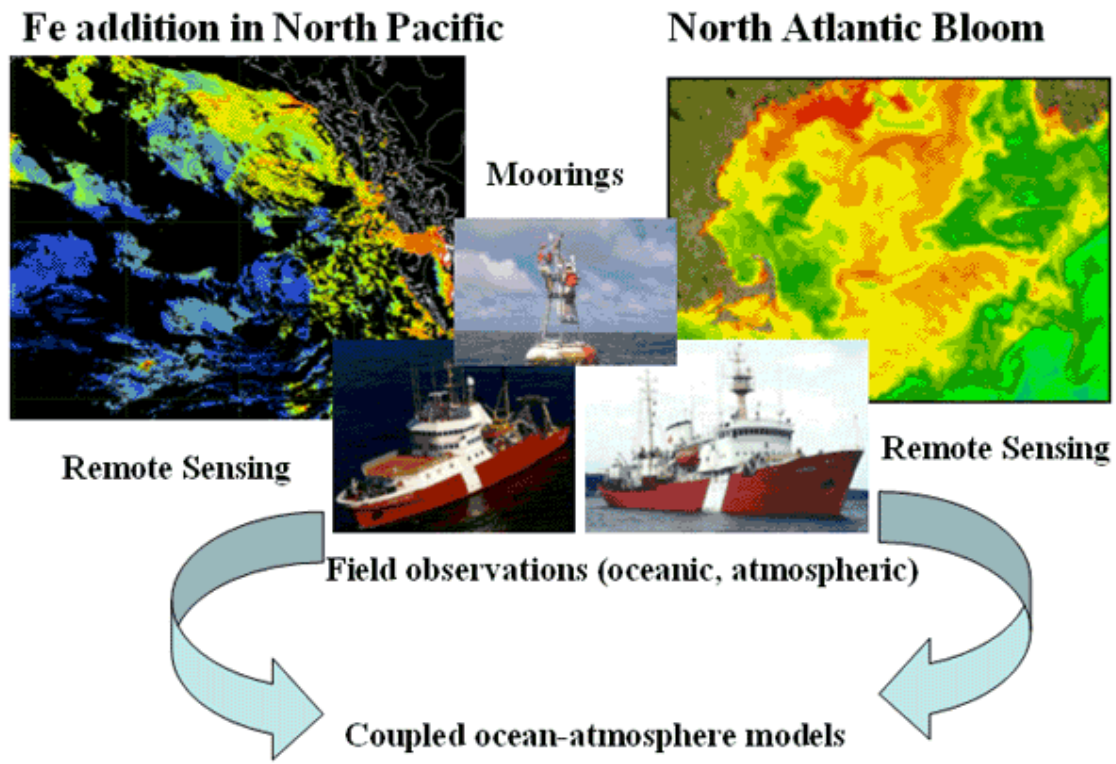
GLOBAL CHANGE IGBP

Science Plan and Implementation Strategy

- Available online at: www.solas-int.org
  - National Reports
  - SSC Members
  - Join email list
  - Submit your research for endorsement
- Brochure available

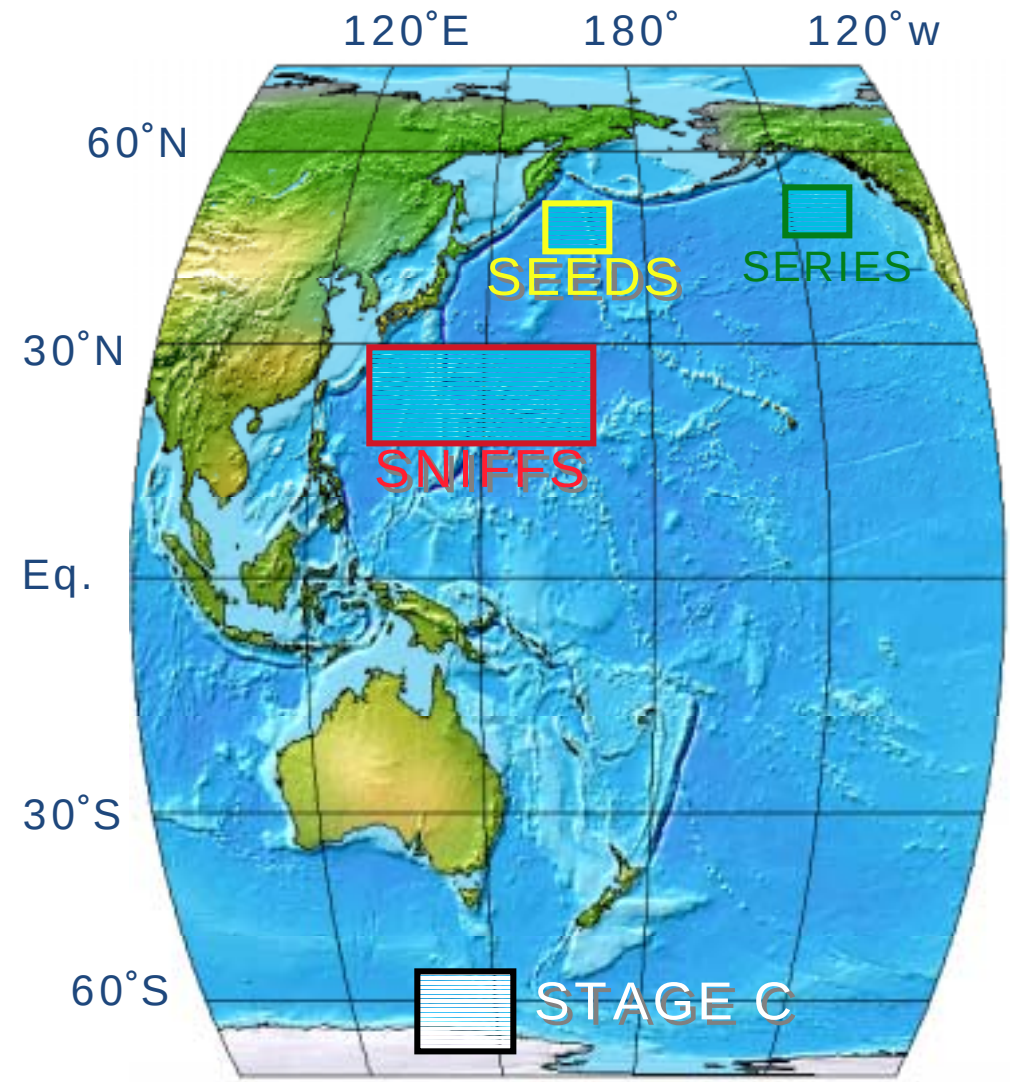


Examples of National Programmes: Canada - $9M, 5 years



http://csolas.dal.ca

Examples of National Activities: Japan



SEED~S:Subarctic Ocean Enrichment and Ecosystem Dynamics Study

SNIFFS:Subtropical Nitrogen Fixation Flux Study

STAGE:STudies on the Antarctic ocean and Global Environment by JARE

SERIES:Canadian SOLAS

uematsu@ori.u-tokyo.ac.jp

Examples of National Activities: Germany

Meteor 55: Oct-Nov 02
W-E Equatorial Atlantic

Research Areas:

Trace gases (ocean): N_2O, DMS, halocarbons, oxygenated organics, CO_2
IfM-Kiel, MPI-Mainz, UEA (UK)

Trace gases (atmos): all of the above + BrO + addl. Halocarbons
IfM-Kiel, Uni-Heidelberg, NCAR (USA), MPI-Mainz

Trace metals (ocean): ***IfM-Kiel***
(atmos.): ***UEA (UK)***

Nitrogen cycle: stable isotopes, DOC, molecular biology
IfM-Kiel, IOW-Warnemuende Univ. Essex (UK)

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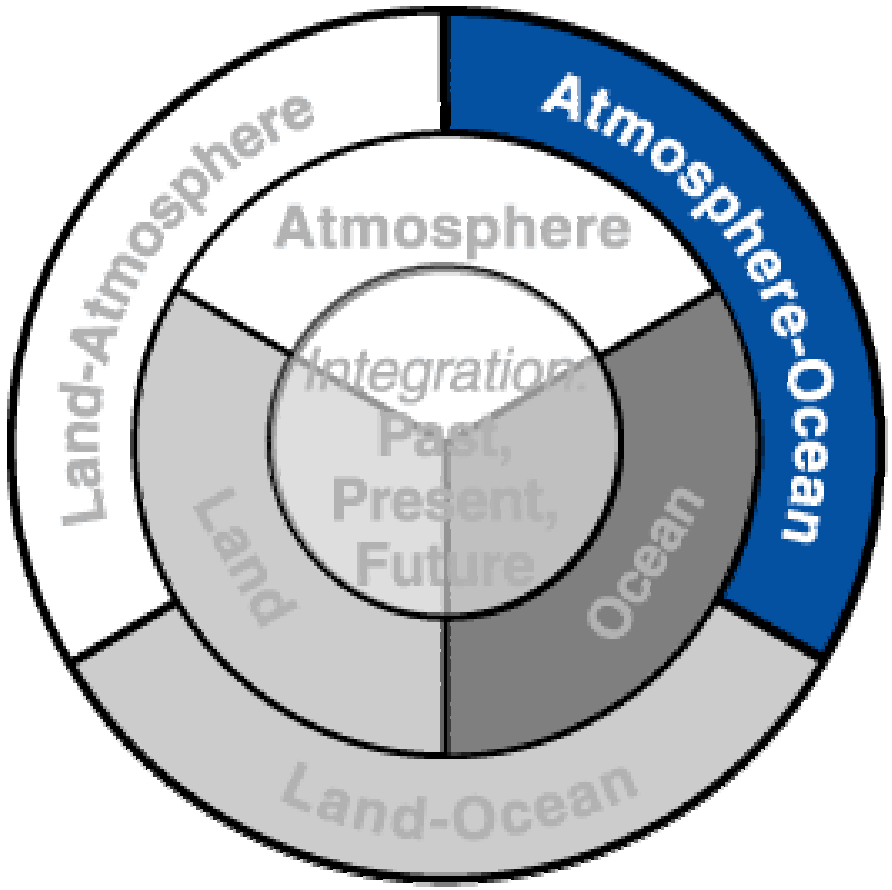
Examples of National Programmes: UK and USA

- UK: April 3rd 03 NERC announces 5-year £11M programme, UKSOLAS

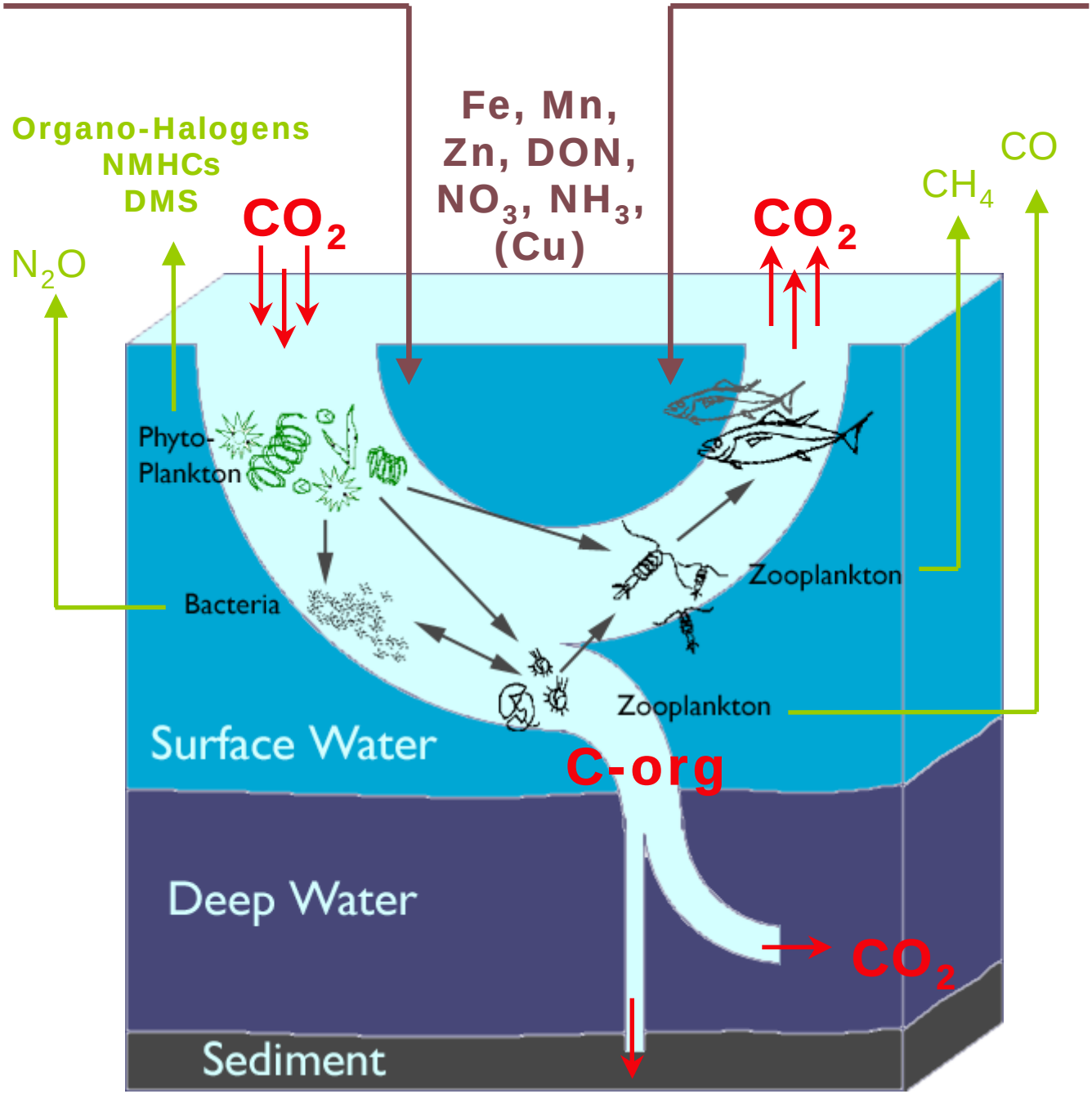
- USA: No programme yet, but large number of SOLAS-related projects

SOLAS in IGBP II

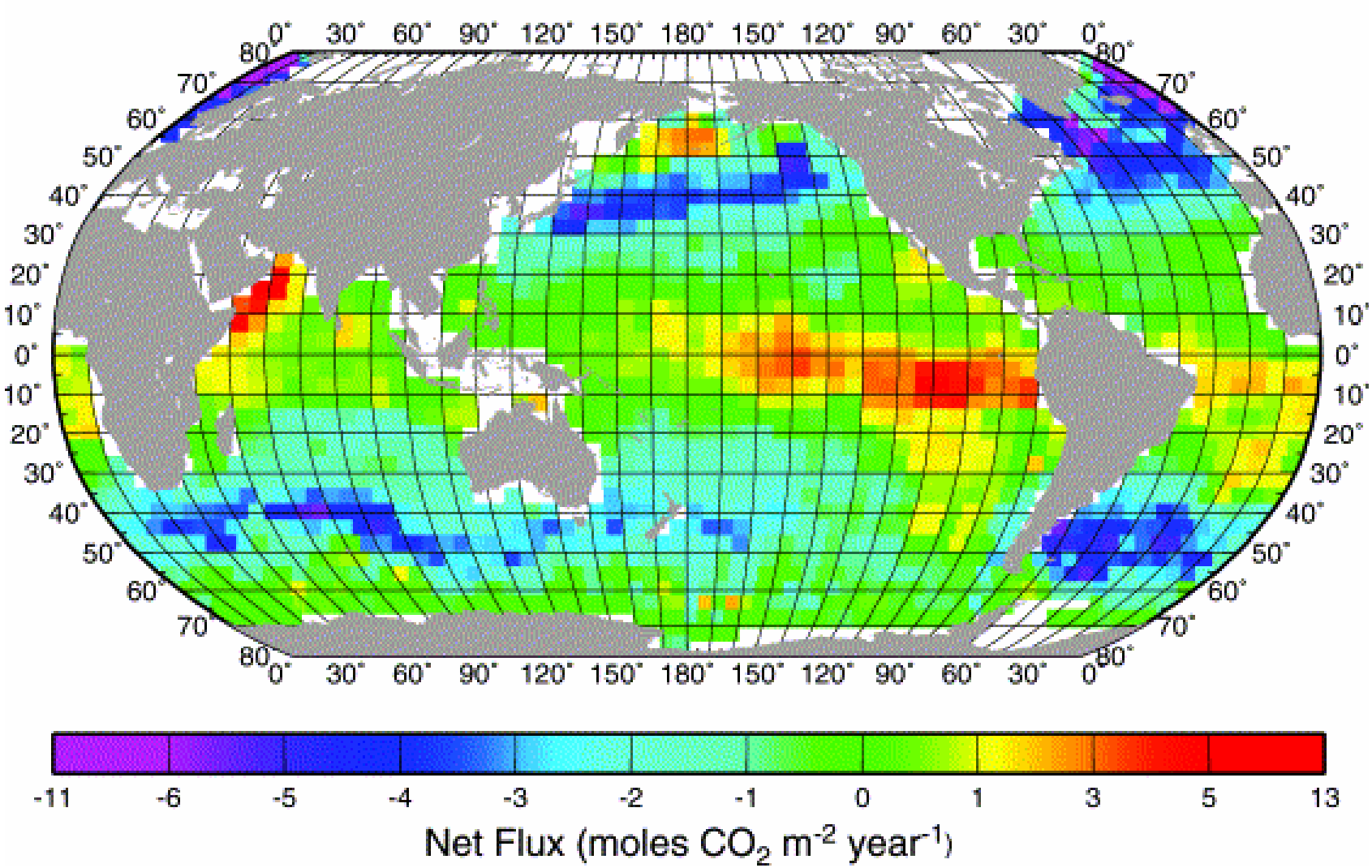


SOLAS Science Meetings

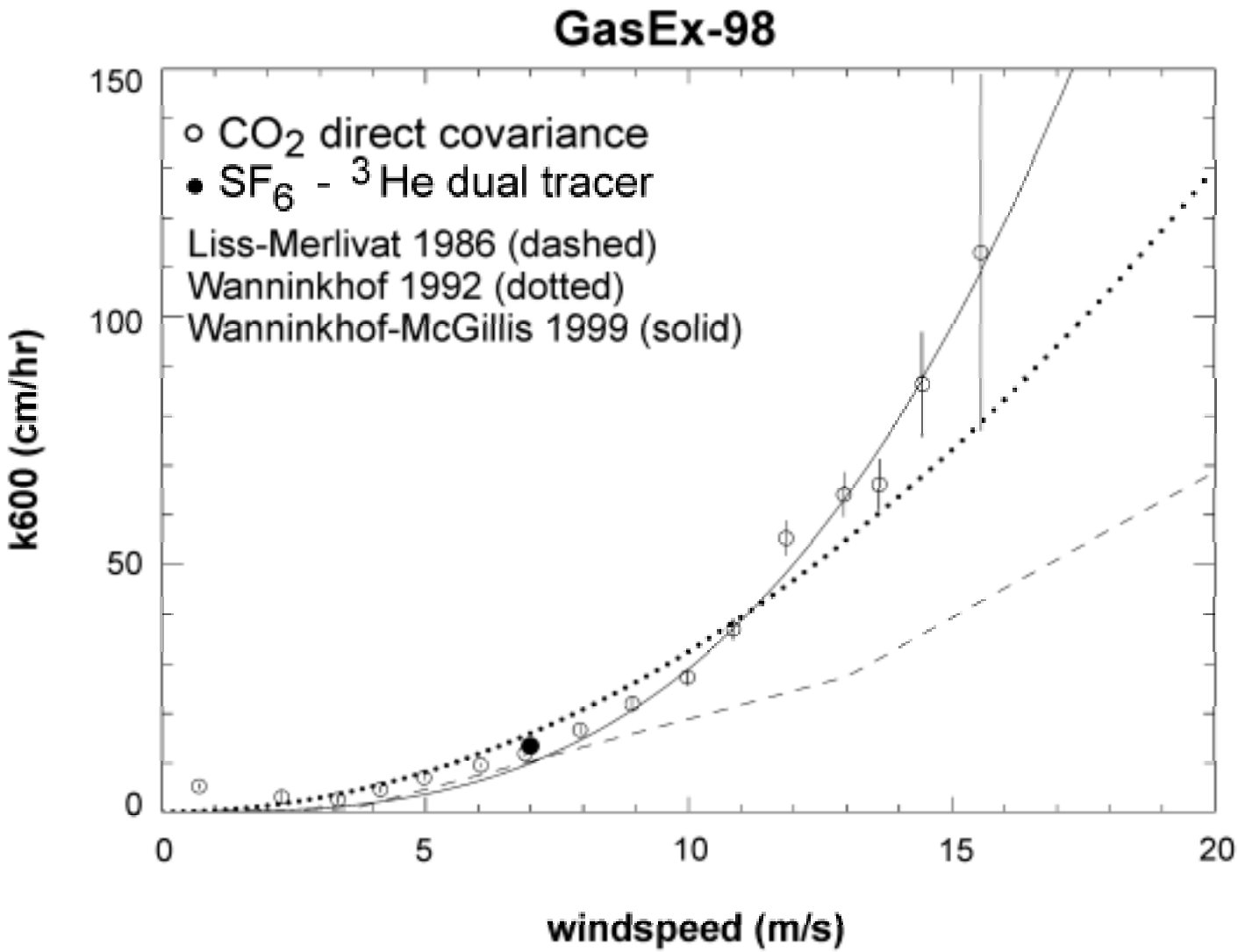
- EGS/AGU Nice
  - 7 - 11 April 2003, Nice, France
- IUGG Sapporo
  - 1 - 9 July 2003, Sapporo, Japan
- Summer School
  - 30 June - 11 July 2003, Corsica, France
- SOLAS Science 2004
  - 11 - 14 Oct 2004, Halifax, Canada


Organo-Halogens
NMHCs
DMS
N_2O
CO_2
Fe, Mn,
Zn, DON,
NO_3, NH_3,
(Cu)
CO_2
CH_4
CO
Phyto-
Plankton
Bacteria
Zooplankton
Zooplankton
Surface Water
C-org
Deep Water
CO_2
Sediment

Global climatology of the annual net air-sea CO_2 flux based on interpolation of air-sea pCO_2 differences referenced to the year 1995. (Takahashi et al., 2002)

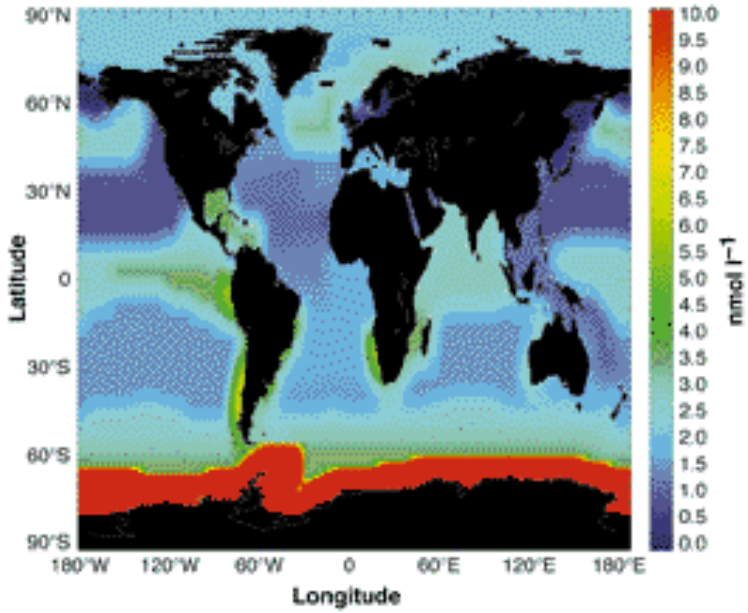


Transfer velocity (k) determined by eddy correlation (direct covariance) in GasEx-98 and one k measurement obtained using the SF_6 - ^3He dual tracer pair, all plotted against windspeed. Also plotted are some widely-used parameterisations of k versus windspeed . (McGillis *et al.*, 2001)

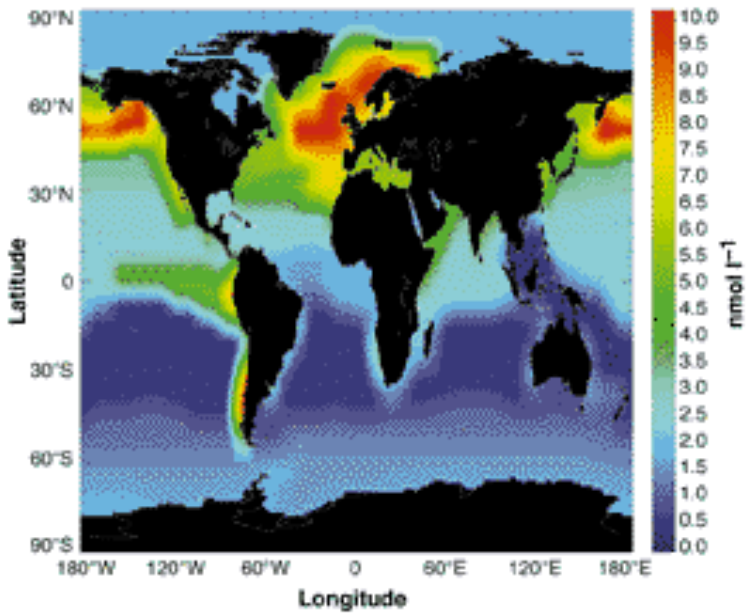


Global DMS distribution Jan and July. (Kettle *et al*. 1999)

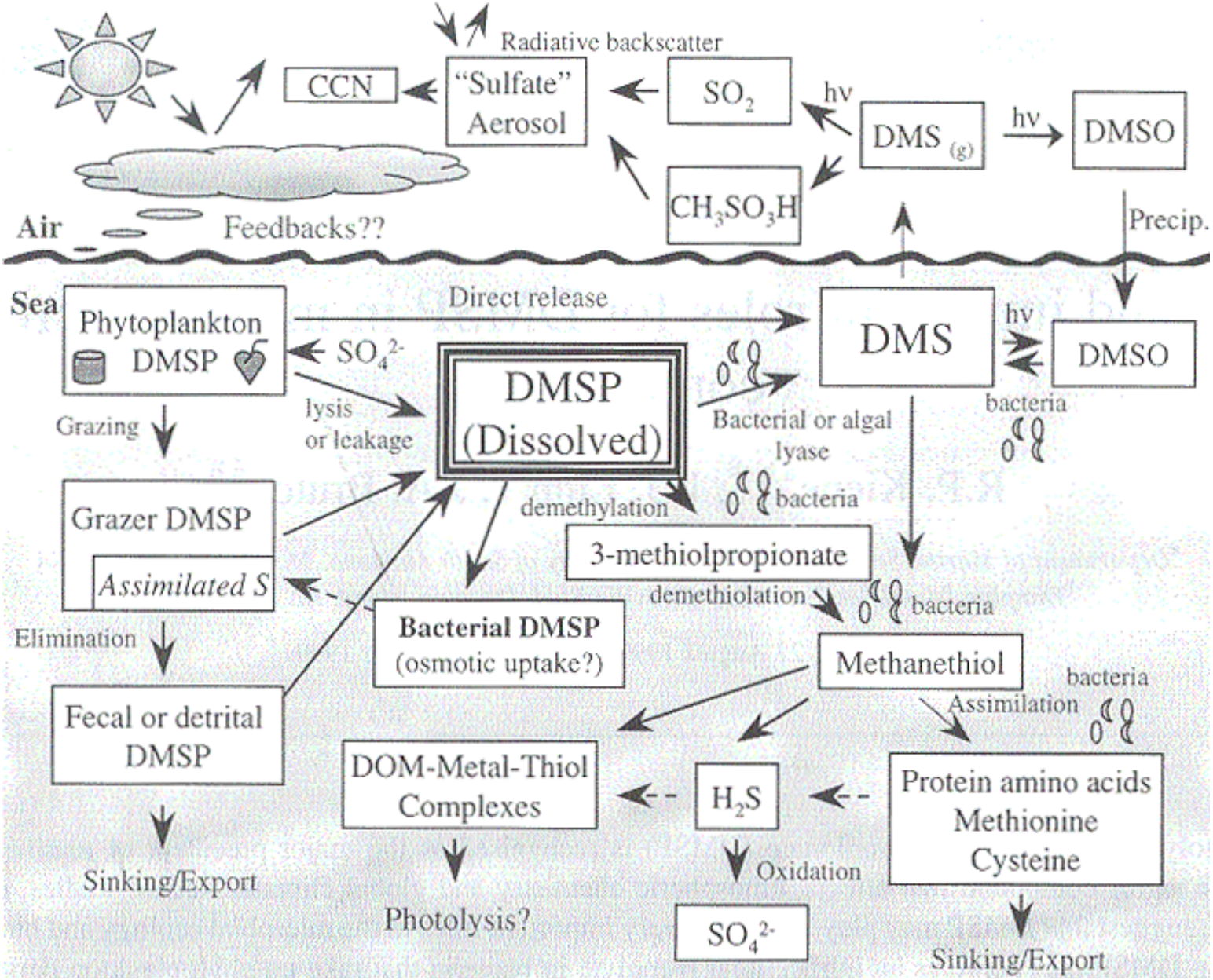
JAN



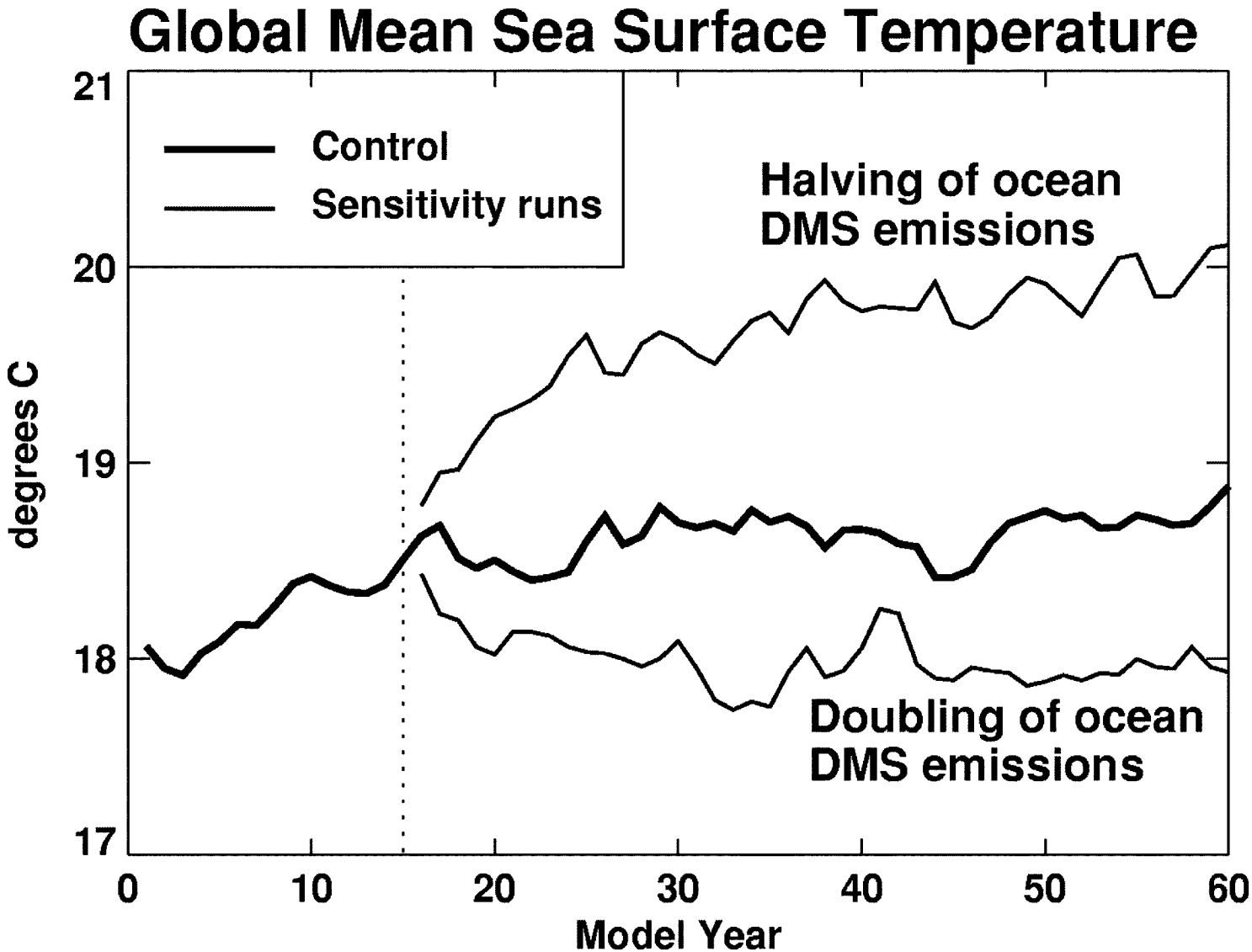
JULY



A conceptual model illustrating the biogeochemical cycle of DMS and DMSP (Kiene et al. 2000)



The global mean sea surface temperature as simulated in the Hadley Centre atmosphere/ocean coupled model (HadCM3). The simulation includes a representation of the effect of ocean DMS emissions on cloud properties. Sensitivity experiments show a strong climate response to changes in ocean DMS emissions (MeTO, 2001)



A simple schematic illustrating the cycling of iodine between the ocean and the atmosphere. A simplified version of the chemical pathway from volatile organo-iodine compounds to aerosol production is shown (Chuck and Liss, 2003)

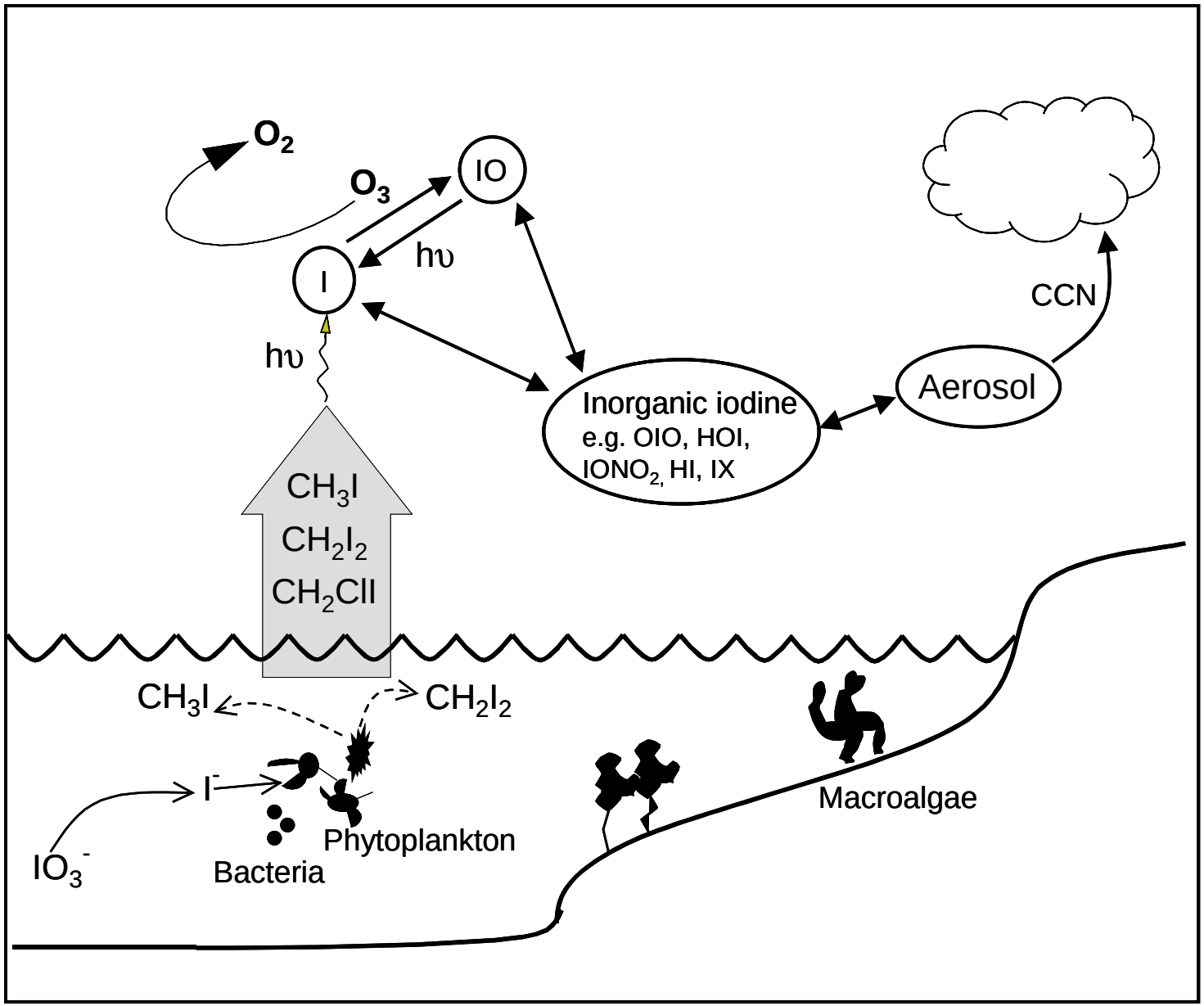
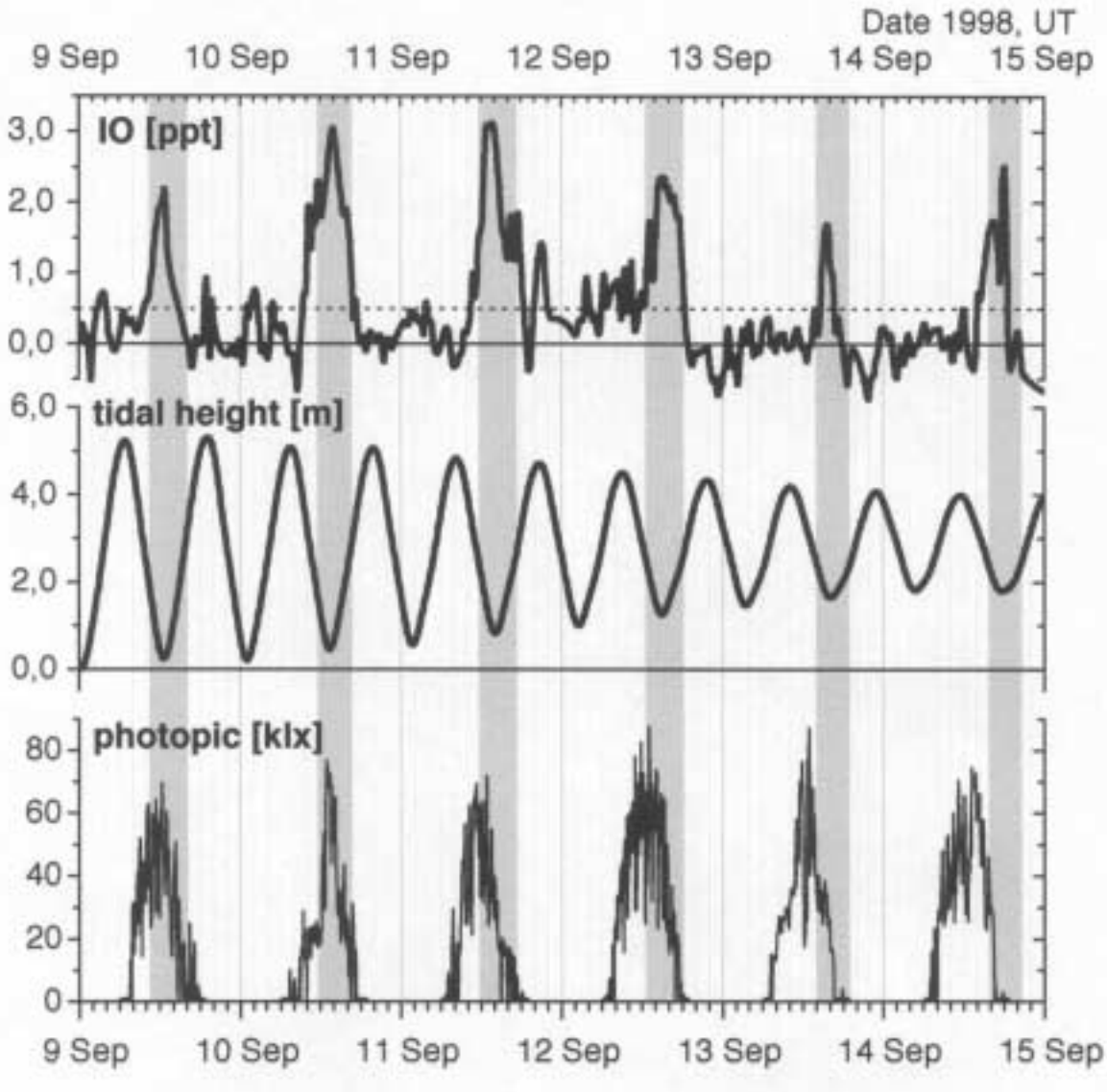
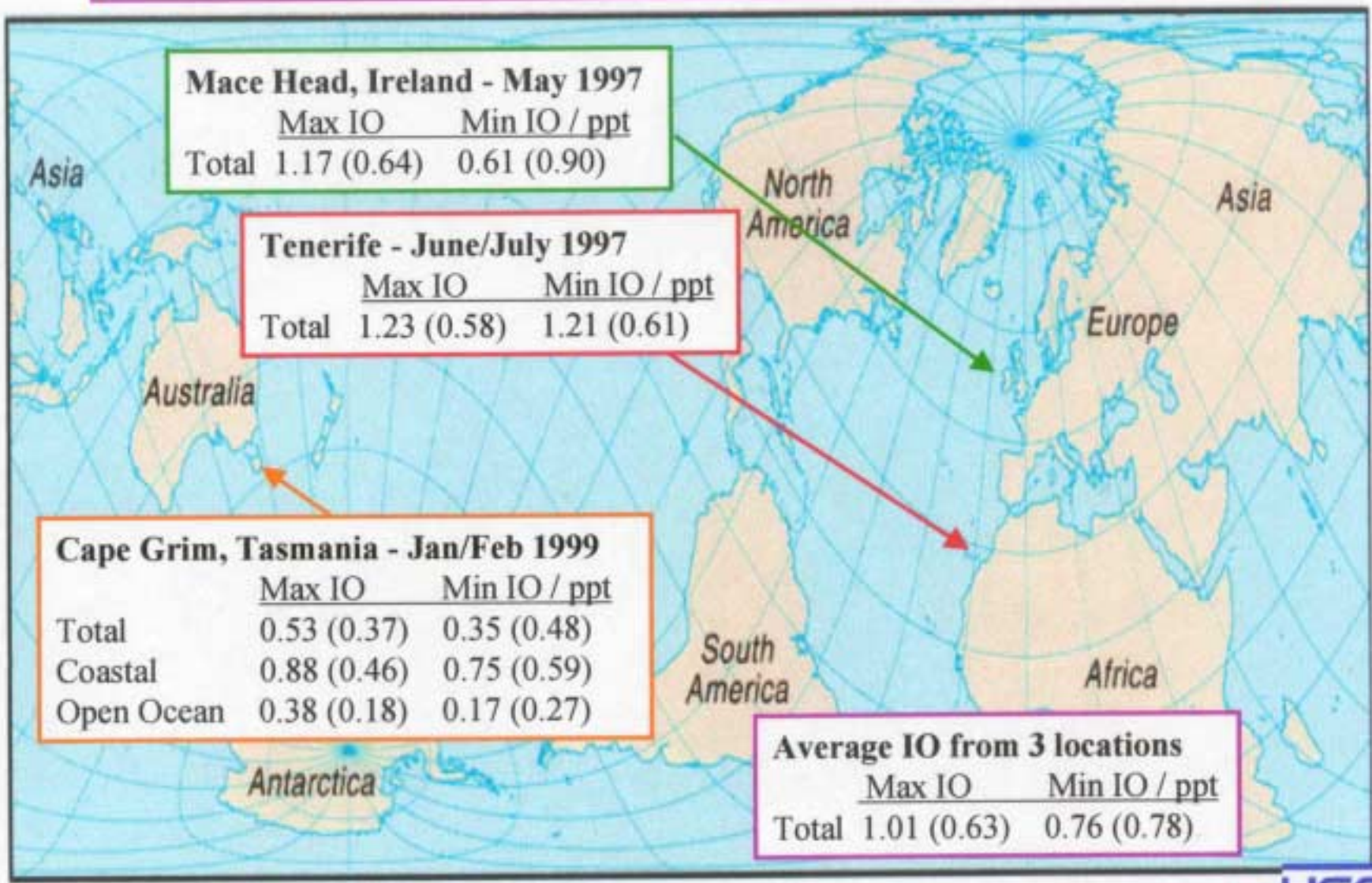


Figure 1. IO, tidal height and solar radiation during 9-15 September, 1998. The dotted line on the IO graph represents the average detection limit. The grey areas mark the low tide periods.



Carpenter et al, 2001

Summary of Average IO Concentrations



Mace Head, Ireland - May 1997

	Max IO	Min IO / ppt
Total	1.17 (0.64)	0.61 (0.90)

Tenerife - June/July 1997

	Max IO	Min IO / ppt
Total	1.23 (0.58)	1.21 (0.61)

Cape Grim, Tasmania - Jan/Feb 1999

	Max IO	Min IO / ppt
Total	0.53 (0.37)	0.35 (0.48)
Coastal	0.88 (0.46)	0.75 (0.59)
Open Ocean	0.38 (0.18)	0.17 (0.27)

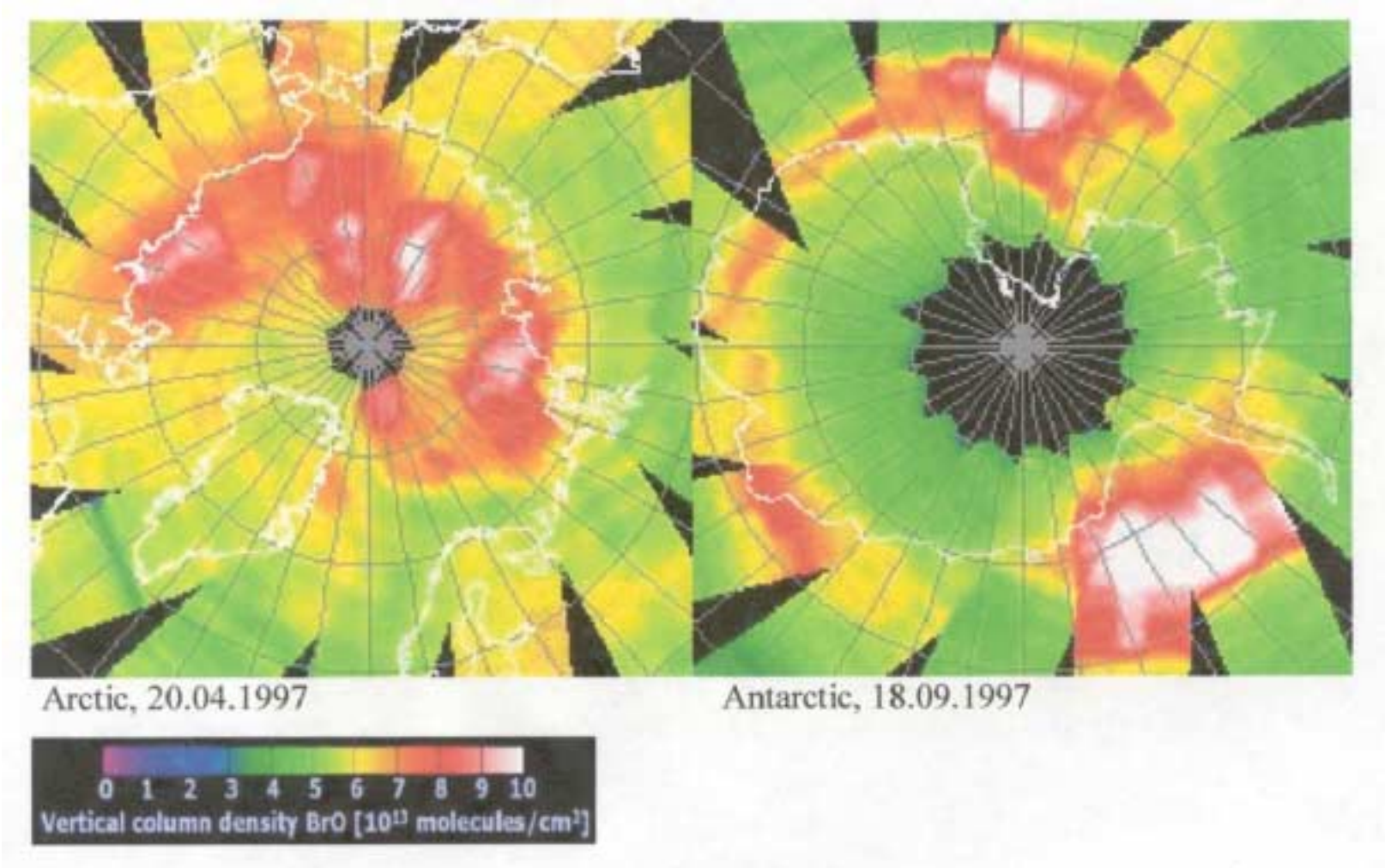
Average IO from 3 locations

	Max IO	Min IO / ppt
Total	1.01 (0.63)	0.76 (0.78)

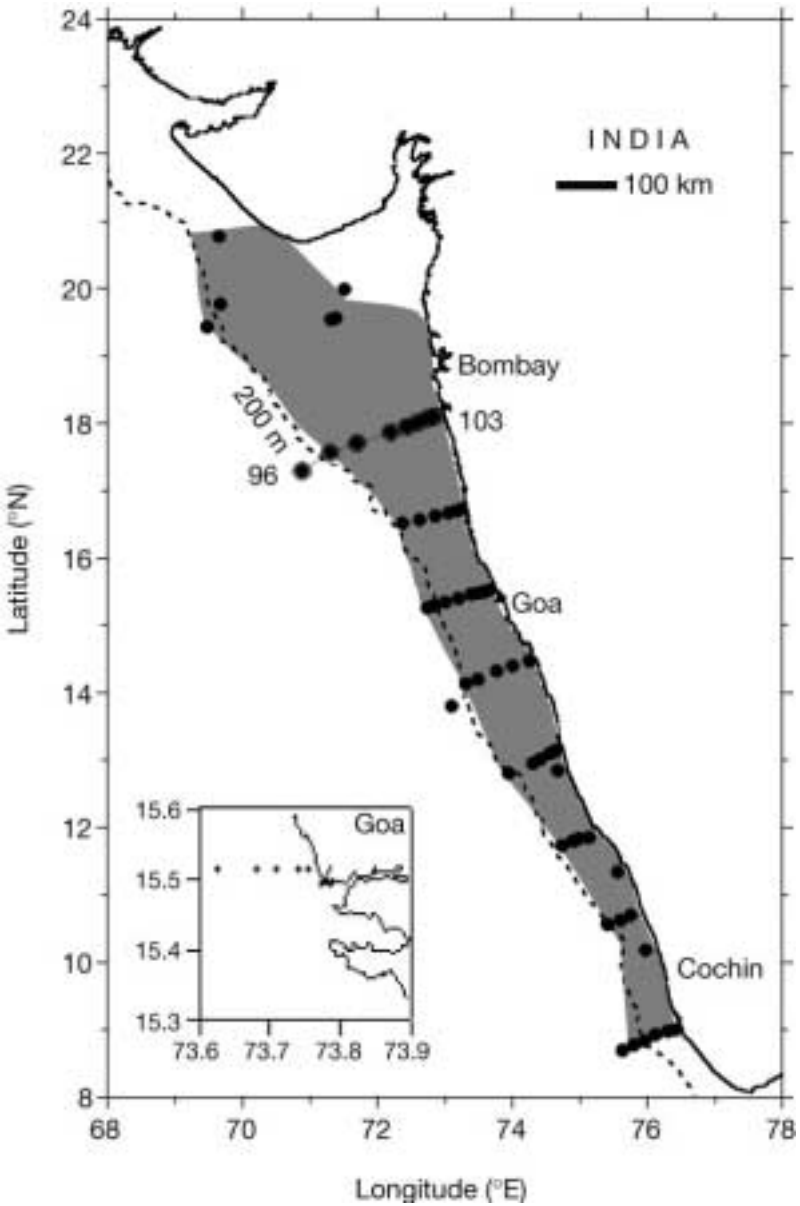
UEA NORWICH

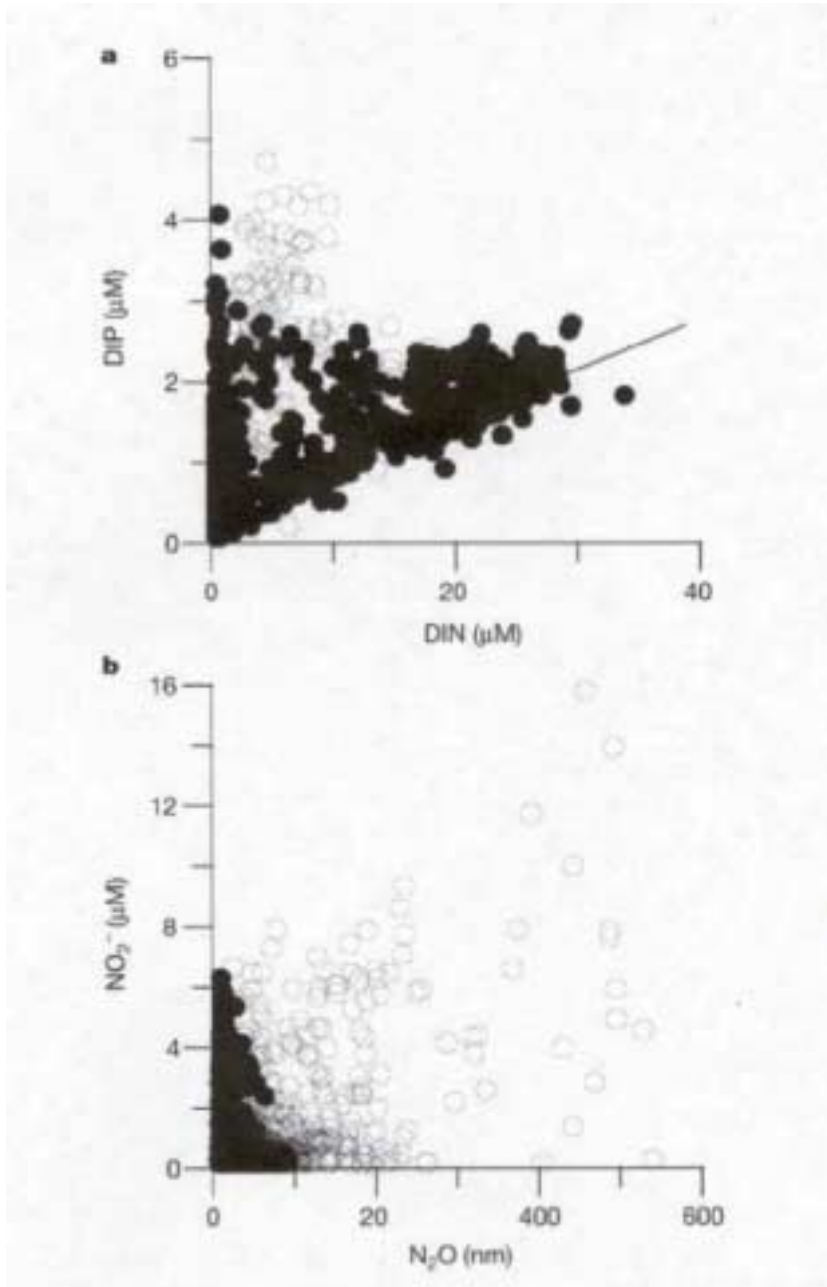
B. Allan

Satellite (Global Ozone Monitoring Experiment, GOME, on the ERS-2 satellite) observations of tropospheric BrO "clouds" in the Arctic and Antarctic. Total BrO column densities in the centre of the clouds exceed 1014 BrO molecules cm-3. The clouds are associated with total loss of boundary layer ozone, occur only in springtime, and have a typical lifetime of one to a few days. (Wagner et al., 2001) Copyright 2001 American Geophysical Union.

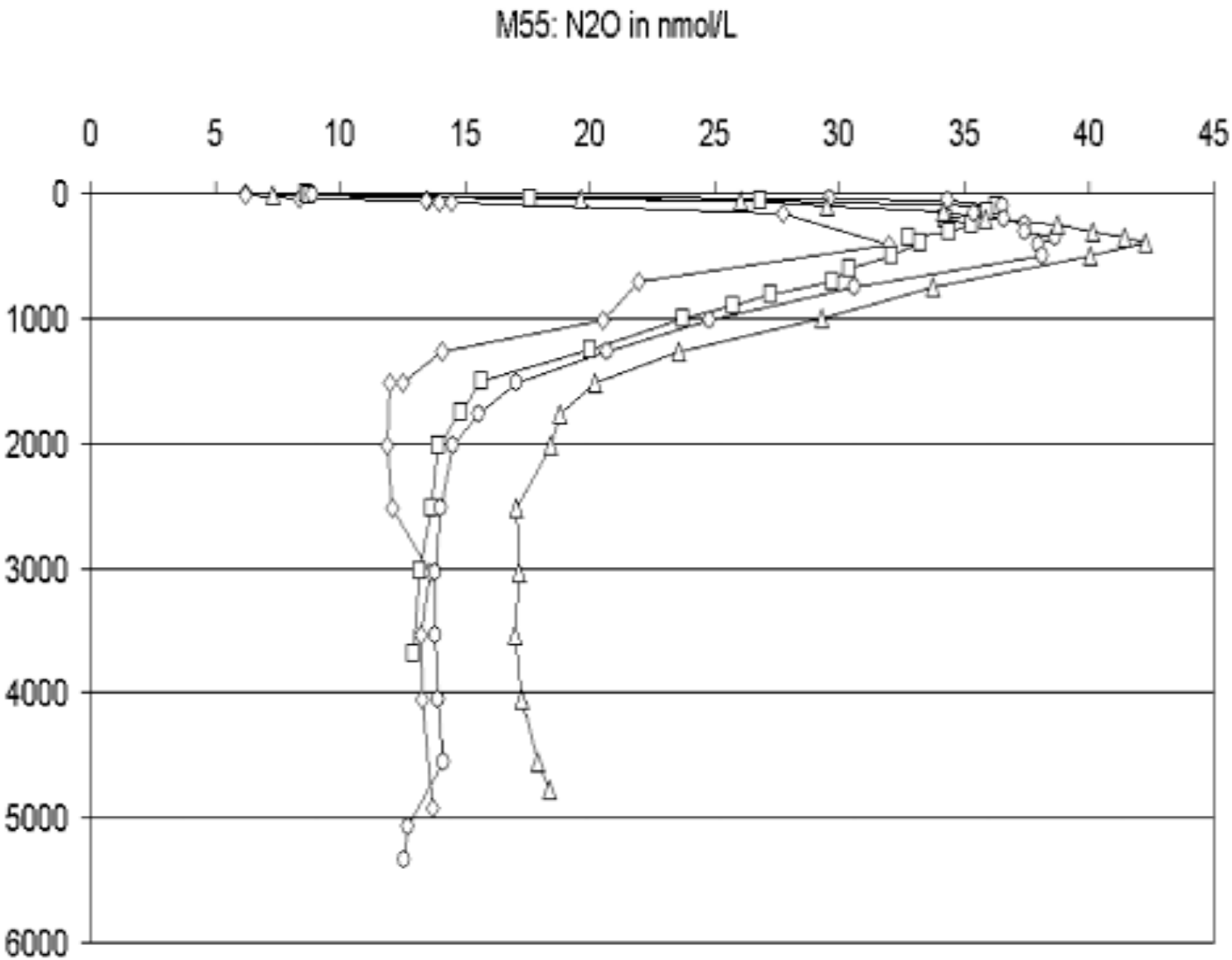


N_2O formation across the west Indian shelf (Naqvi et al., 2000)





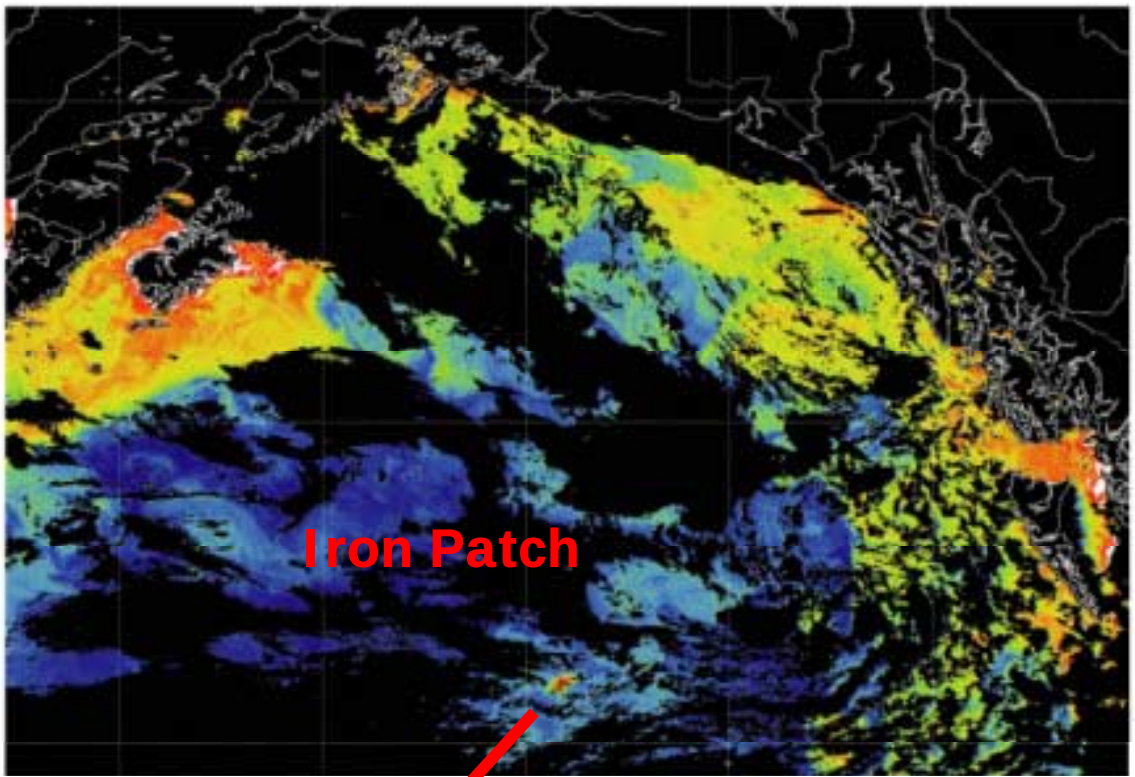
N_2O in the water column at various sites in the equatorial Atlantic (Walter, Bange and Wallace, 2003)



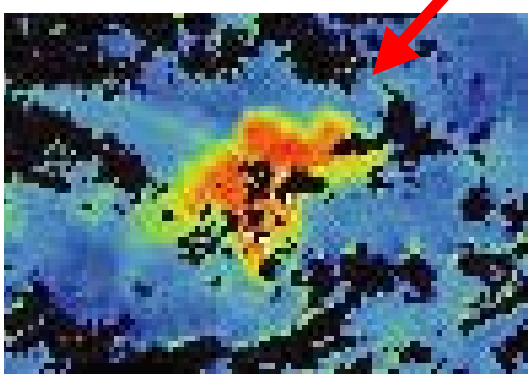
Fe addition to the ocean

S. Turner

SeaWiFS chlorophyll image (NASA real-time data) for July 29, 2002 showing the SERIES patch.

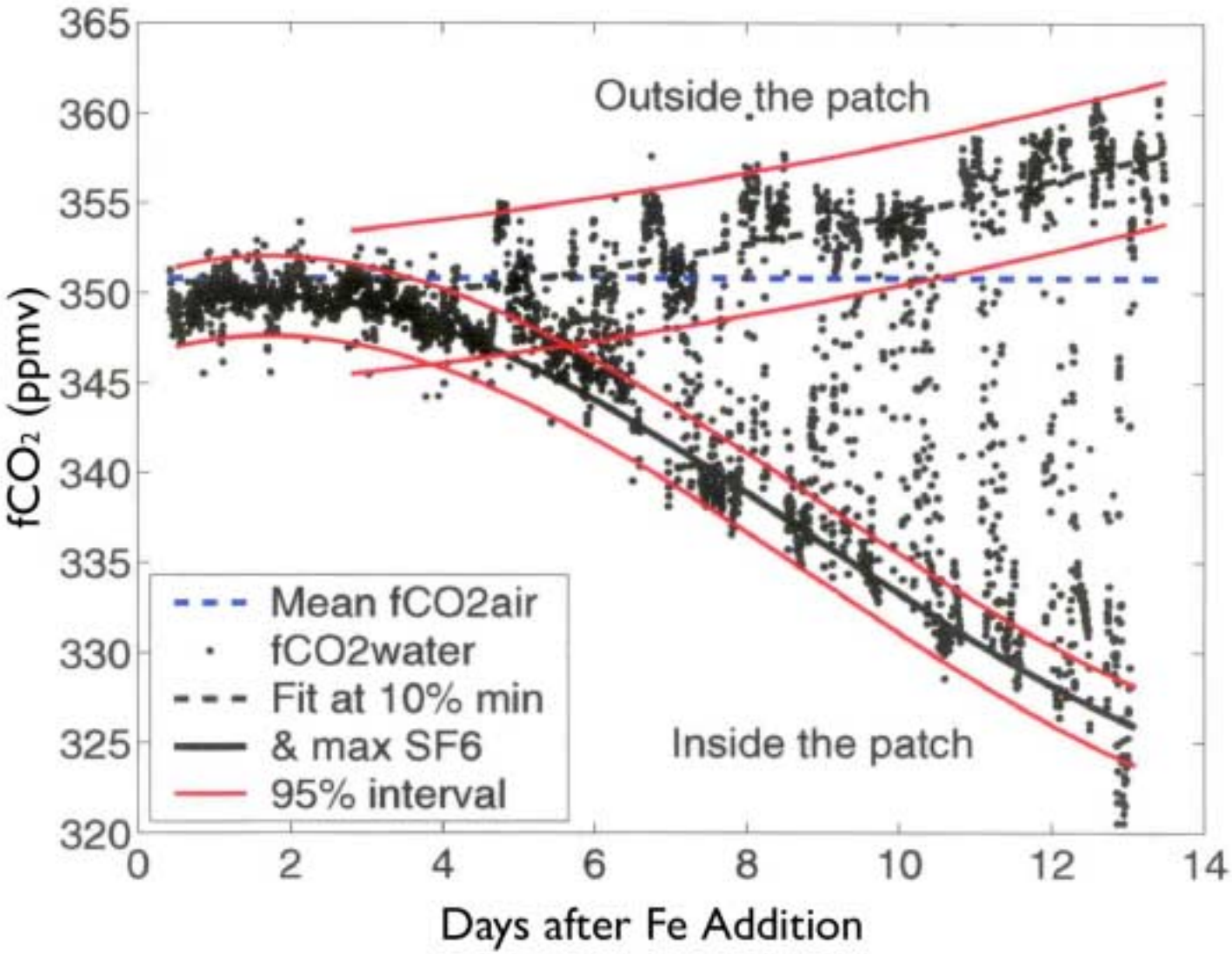


Courtesy of Jim Gover

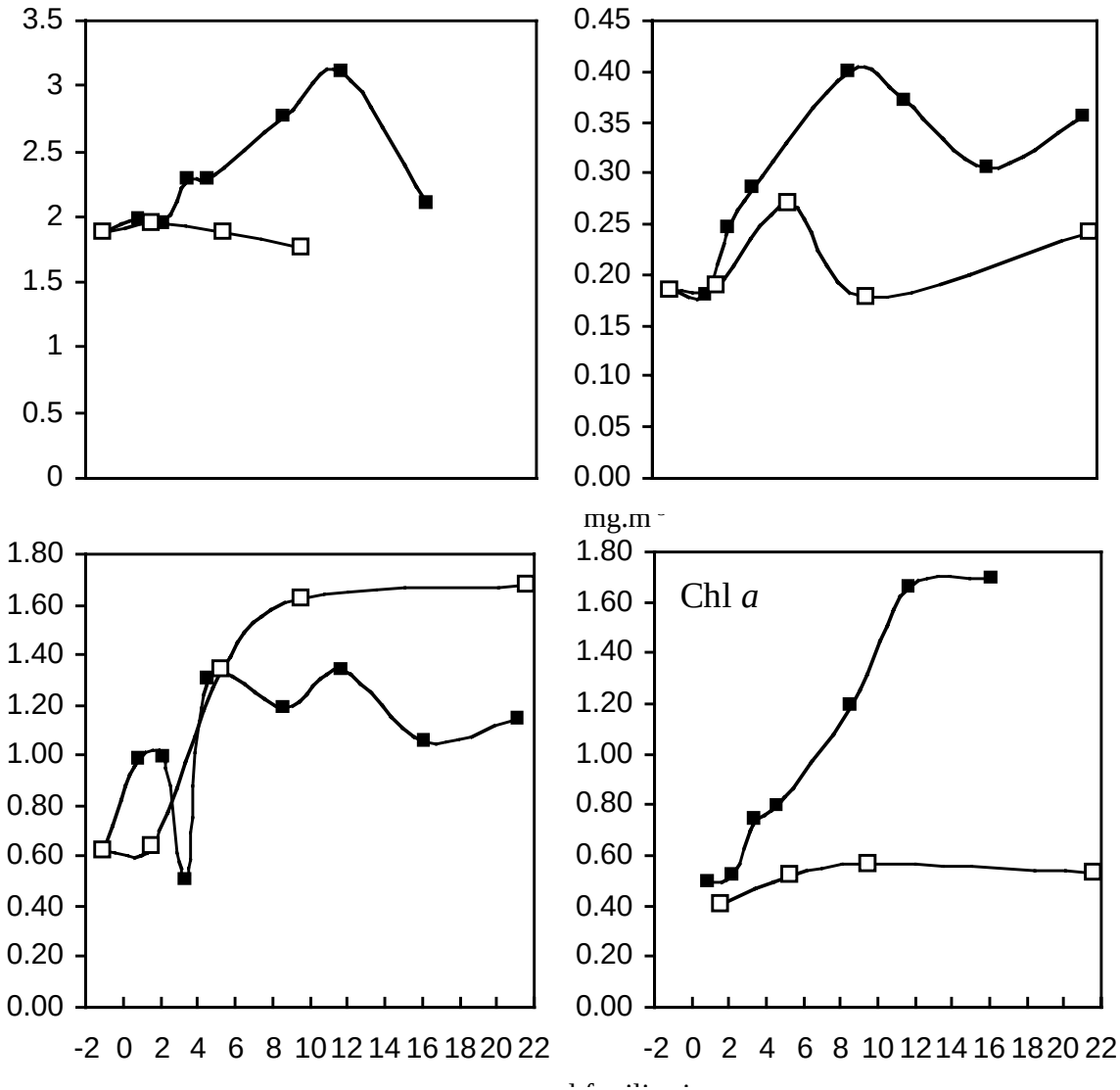


Enlargement of the patch. On July 29 a 700 km^2 area shows surface chl greater that 1 mg m^{-3}. Patch position and shape agreed well with ship transects.

Surface water carbon dioxide fugacity (f CO_2) during SOIREE (Watson *et al.*, 2000)



Surface concentrations (5m) of DMS (nmol l^{-1}), methyl iodide (CH_3I) (ng l^{-1}), bromoform ($CHBr_3$) (ng l^{-1}) and chlorophyll *a* (mg m^{-3}) during the EisenEx experiment highlight the varying responses to the iron addition. Measurements taken from within the fertilised patch are shown as filled squares, measurements from outside the patch are shown as open squares. DMS and CH_3I concentrations increased within the fertilised patch over the 21 days of the experiment, whilst $CHBr_3$ showed a greater increase in concentration outside of the patch. Chlorophyll *a* concentrations increased approximately 3-fold during the experiment (Chuck and Liss, 2003)



Changes in various ice core and marine sediment parameters between the Holocene and the end of the last ice age. a) delta^{18}O (a temperature proxy), Fe and MSA (an atmospheric oxidation product of DMS) from Antarctic ice cores. b) CO_2 from the Vostok ice core; TOC (total organic carbon), alkenones and dinosterol (proxies for surface ocean productivity) in a sediment core from the eastern tropical Pacific Ocean . (Turner *et al.*, 1996)