New Technologies and Their Roles in Advancing Biogeochemical Science during the JGOFS Era
(With a Glimpse of Future Technologies)

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A Sea of Change: JGOFS Accomplishments and the Future of Ocean Biogeochemistry
Final Open Science Conference
Washington, DC
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Spatial Variability

Example:
Atlantic Meridional Transect

Chlorophyll
Fast Rep. Rate Fluorometer
Aiken, 2002

Primary Productivity

Optical Plankton Counter
Burkhill & Gallienne 2003

SeaSoar/
UOR
Some Key JGOFS Event Scale Processes

Dickey, 2002
JGOFS Biogeochemical Mooring Study Sites
High Frequency, Long-term Time Series
JGOFS Equatorial Pacific
Passage of Tropical Instability Wave (TIW)

Multi-Variable Moored System

Processes:
+ ENSO – 2 phases
+ Kelvin Waves
+ TIWs
+ Diel

Foley et al., 1998
JGOFS Arabian Sea Mooring Array
Monsoons & Eddies

Honjo et al., Weller et al., Marra, et al. and Dickey et al.
JGOFS
Southern Ocean
12-Mooring Array
Spring Bloom & Fronts

Abbott et al., 2000

Light limitation
Spring bloom
Zoo grazing/
Si limitation
Fe limitation
Roles of Episodic Events?
Eddy and Hurricane Passages at BTM/BATS Site

Dickey et al., 1998a,b, 2001; McNeil et al., 1999, Conte et al., 2003; Zedler et al., 2003
Events at the JGOFS BTM/BATS Site
Effects: pCO₂, PP, Biol. Pump?

Dickey et al., 1998a,b, 2001a; McGillicuddy et al., 1998, McNeil et al., 1999, Bates et al., 2000
Nitrate Injections at JGOFS H-A/HOT Site

Data provided by Hans Jannasch and Ken Johnson; see paper by Letelier et al., 2000
Eddy and Rossby Wave Passages at BTM/BATS and H-A/HOT Sites

Sakamoto et al., 2003
CARIOCA Buoy/Drifter and BTM Time Series

Argo floats also capable of interdiscipl. measurements

Liliane Merlivat/Nick Bates
MITESS Iron Time
Series from BTM

Ed Boyle

TS-SID for $^{14}$C Prim. Prod. Measurements

Craig Taylor

MITESS:
Moored In-situ Trace Element Serial Sampler
- Collects uncontaminated water samples under programmed control
- Deployable on Moorings for >6 months
- Can be used by anyone to collect deep-sea trace metal profiles

Fe Duplicate Samples (BTM, 1998-1999)
Out of 11 pairs of replicate samples, 2 agree within expected error
A Glimpse of Future Technologies
Chemical Plume Mapping with an Undulating Towed Vehicle

Figure provided by Al Hanson
Spectral Elemental Analysis System

In Situ Mass Spectrometer

Bob Byrne, USF
Moored Flow Cytometer (left)
DNA System (below)

Rob Olson et al.

Chris Scholin
Global Map of Existing and Planned Time Series Observatories

Note: Biogeochemical Measurement Sites: 30 planned; ~10 in operation now

Ocean Observing Panel for Climate Global Eulerian Observatories (GEO)/Time Series Science Team
Observatory

Figure provided by John Orcutt

Large Spar Buoys
AUVs and gliders with interdisciplinary sensors
AUVs
Gliders
Summary of JGOFS Advances Enabled Via Technologies

- Measurements of seasonal, interannual, and “long-term” biogeochemical (BGC) and ecosystem variability (HOT/BATS): e.g., carbon, new organisms, …
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- Instrumentation making possible Fe-enrich. studies


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