

Representative Publications

Submitted: (* => available on line at <http://www-ocean.lbl.gov/PDFs>)

- 0) *Lam, P.J., J.K.B. Bishop, High Biomass Low Export Regimes in the Southern Ocean. *Deep-Sea Reserch II* (in review){LBNL# 59452}.

Carbon-iron dynamics of the Southern Ocean were investigated through bulk (C,N,P,Si,Ca) elemental analysis and image analysis of size-fractionated particulate matter samples collected to 1000 m depths during the Southern Ocean Iron Experiment (SOFeX). South of the polar front there were very high concentrations of phytoplankton in the euphotic zone and iron addition increased plankton abundances; however, there was almost no particle export below 200m due to the fact that the zooplankton grazing community (including particle feeders) was strongly focused shallow in the upper water column. We infer that iron added to waters south of the Antarctic Polar Front will not lead to a significant enhancement of carbon export because the zooplankton grazing community is already adapted to feeding on large siliceous phytoplankton. North of the polar front we initially found lower phytoplankton abundances and indications of much stronger carbon transport to depth in absolute terms. One month later, we found that iron addition had stimulated a plankton bloom but also a condition of reduced carbon export. e.g. HBLE conditions. Many points of evidence suggest that the grazing community at 55S was unable to adapt to feeding on large iron-stimulated phytoplankton and was effectively starved. The biomass growth at 55S was thus unstable. Several weeks later, Carbon Explorers did record a sedimentation event (Bishop et al. 2004, Science). The triggering mechanism for this iron-enhanced export at 55S is not understood.

This is the second major publishable result from Lam's Ph.D. thesis. Bishop was primary advisor and Chair of Lam's thesis committee.

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- 1) *Lam, P.J., J.K.B. Bishop, C. C. Henning, M.A. Marcus, G. A. Waychunas, and I.Y. Fung. Wintertime phytoplankton bloom in the Subarctic Pacific supported by Continental Shelf Iron. *Global Biogeochem. Cycles*. 20, GB1006, doi:10.1029/2005GB002557. [LBNL# 55467].

[Just published] An unexpected iron-stimulated wintertime phytoplankton bloom assemblage was discovered in high nutrient low chlorophyll waters of the subarctic North Pacific in Feb 1996. Analysis of size-fractionated particulate matter samples collected using the Multiple Unit Large Volume in-situ Filtration System (MULVFS) by Inductively-Coupled Plasma Mass Spectrometric analysis and synchrotron XRAY microanalyses, coupled with ocean GCM model tracer simulations led us to conclusively trace the origin of the iron to the continental margin nearly 1000 km away.

Lam's work has identified a here-to-fore underestimated delivery pathway for iron to reach the open ocean.

- 2) *Bishop, J.K.B., T.J. Wood, R.E Davis, J.T. Sherman. (2004) Robotic Observations of Enhanced Carbon Biomass and Carbon Export at 55S During SOFeX - Science, 304, 417-420.; [LBNL# 53136]

[Cited 12 times]. Carbon Explorers capture the first high frequency record of biomass growth and enhanced sedimentation following a purposeful iron enrichment experiment in the Southern Ocean. First use of Carbon Explorers in Southern Ocean waters. The Explorers recorded a remarkable and unexpected phytoplankton and sedimentation enhancement due to added iron in low-silicate - high-nitrate waters north of the Antarctic Polar Front. Clearly demonstrates the future for the methodology for both following natural and human perturbed ocean carbon cycle processes.

- 3) *Bishop, J.K.B. R.E. Davis and J.T. Sherman (2002) Robotic Observations of Dust Storm Enhancement of Carbon Biomass in the North Pacific. Science 298, 817-821. [LBNL #50120].

[Cited 37 times]. LBNL's first two Carbon Explorers capture a novel high frequency record of biomass variability in the subarctic N Pacific following the 2001 Gobi Desert Dust event. The effects of dust are shown stimulate phytoplankton growth but are short lived.

- 13) *Bishop, J.K.B. (1999) Transmissometer Measurement of POC. Deep-Sea Research I. 46(2) 353-369. [LBNL# 43996]

[Cited 37 times/27 since 2001]. Retrospective analysis of systematically collected transmissometer/MULVFS data sets since 1982 leads to proposal that beam attenuation coefficient can be used as an empirical (but robust) measure of Particulate Organic Carbon concentrations in the ocean. The method underlays Carbon Explorer program.

Selected First Author Publications with staying power

- 46) *Bishop, J.K.B., J.M. Edmond, D.R. Ketten, M.P. Bacon and W.B. Silker (1977) The chemistry, biology, and vertical flux of particulate matter from the upper 400 m of the equatorial Atlantic Ocean. Deep-Sea Research 24, 511-548.

[Cited 289 times, 37 since 2001]. First science results from Large Volume in-situ Filtration.

- 29) *Bishop, J.K.B. (1988) The barite-opal-organic carbon association in oceanic particulate matter. Nature 332, 341-343.

[Cited 235 times/96 since 2001/46 since 2004]. Solved a 30 year mystery on Barium cycle in ocean. Interpretations and findings still hold up. Illustrates the science gained from combined micron scale SEM XRF and bulk chemical analysis of MULVFS samples.

- 25) Bishop, J.K.B. and W.B. Rossow. (1991) Spatial and temporal variability of global surface solar irradiance. J. Geophys. Res., 96 (C9), 16,839-16,858 {PDF not available}.

[Cited 166 times, 71 since 2001]. Remote sensing of solar irradiance over the ocean. Data set used by Mitchell et al. (24) - cited 127 times (57 times since 2001).

- 14) Bishop, J.K.B., W.B. Rossow and E.G. Dutton (1997) Surface Solar Irradiance from ISCCP 1983-1991. J. Geophys. Res. (Atmospheres), 102, 6883-6910. {PDF not available}

[Cited 47 times, 30 since 2001]. Remote sensing of solar irradiance over land and ocean. 8 year times series. Effects of aerosols.

- 36) Bishop, J.K.B. (1986) The correction and suspended mass calibration of Sea Tech transmissometer data. Deep-Sea Research 33, 121-134.

[Cited 59 times, 11 since 2001]. Work with transmissometers led to Carbon Explorer.

- 31) *Bishop, J.K.B., J.C. Stepien, and P.H. Wiebe (1987) Particulate matter distributions, chemistry and flux in the Panama Basin: response to environmental forcing. Progress in Oceanography 17, 1-59.

[Cited 45 times/ 11 since 2001]. Science of animal - particle interactions. First clear demonstration of biologically mediated carbonate dissolution in chemically supersaturated water column. Importance of Zooplankton in determining the carbon remineralization profile. The zooplankton control of carbon flux is central to the story of Phoebe Lam's 2nd thesis publication.

Some significant non-first author cited papers.

- 15) McLaughlin, F.A., Carmack, E.C., Macdonald, R.W. and Bishop, J.K.B. (1996), Physical and Geochemical Properties across the Atlantic/Pacific water mass front in the southern Canadian Basin. J. Geophys. Res. 101 (C1) 1183-1197.

[Cited 94 times/ 55 since 2001] M.Sc Thesis student at University of Victoria (Bishop Supervisor). Use of CFC tracer seawater analysis to document Arctic Ocean circulation changes and Arctic Ocean warming.

- 16) Jeandel, C., Bishop, J.K.B. and Zindler, A.N. (1995). Exchange of Neodymium and its isotopes between seawater, small and large particles in the Sargasso Sea. Geochimica. et Cosmochimica Acta. 59, 535-547.

[Cited 52 times/ 27 since 2001] Nd analysis of MULVFS samples shows isotopic disequilibrium in surface waters reflecting dust input but progressive equilibration with water column Nd with increasing depth.

- 37) Be, A.W.H., J.K.B. Bishop, M. Sverdlove and W. Gardner (1985) Standing stock, vertical distribution and flux of planktonic foraminifera in the Panama Basin. *Marine Micropaleontology* 9, 307-333.

[Cited 55 times, 15 since 2001]. Comprehensive look at the depth distributions and sedimentation behavior of planktonic Foraminifera. These CaCO₃ organisms form an important part of the sedimentary record. The Carbon Flux Explorer (under development with DOE support) will capture Foraminifera sedimentation.