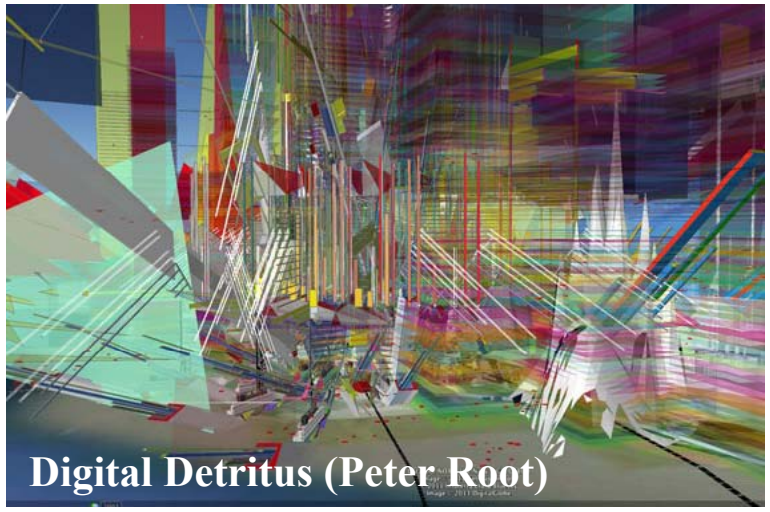
QED
SCOPE 2020 • Pitch #4 • *Part II*

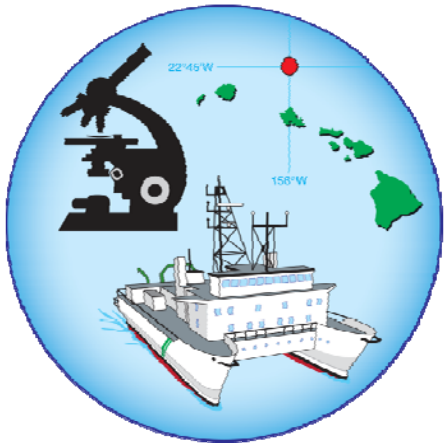
***Mission*: Quest for an Explanation of Detritus • QED**

***Goal*: Quantitative Ecology of Detritus • QED**

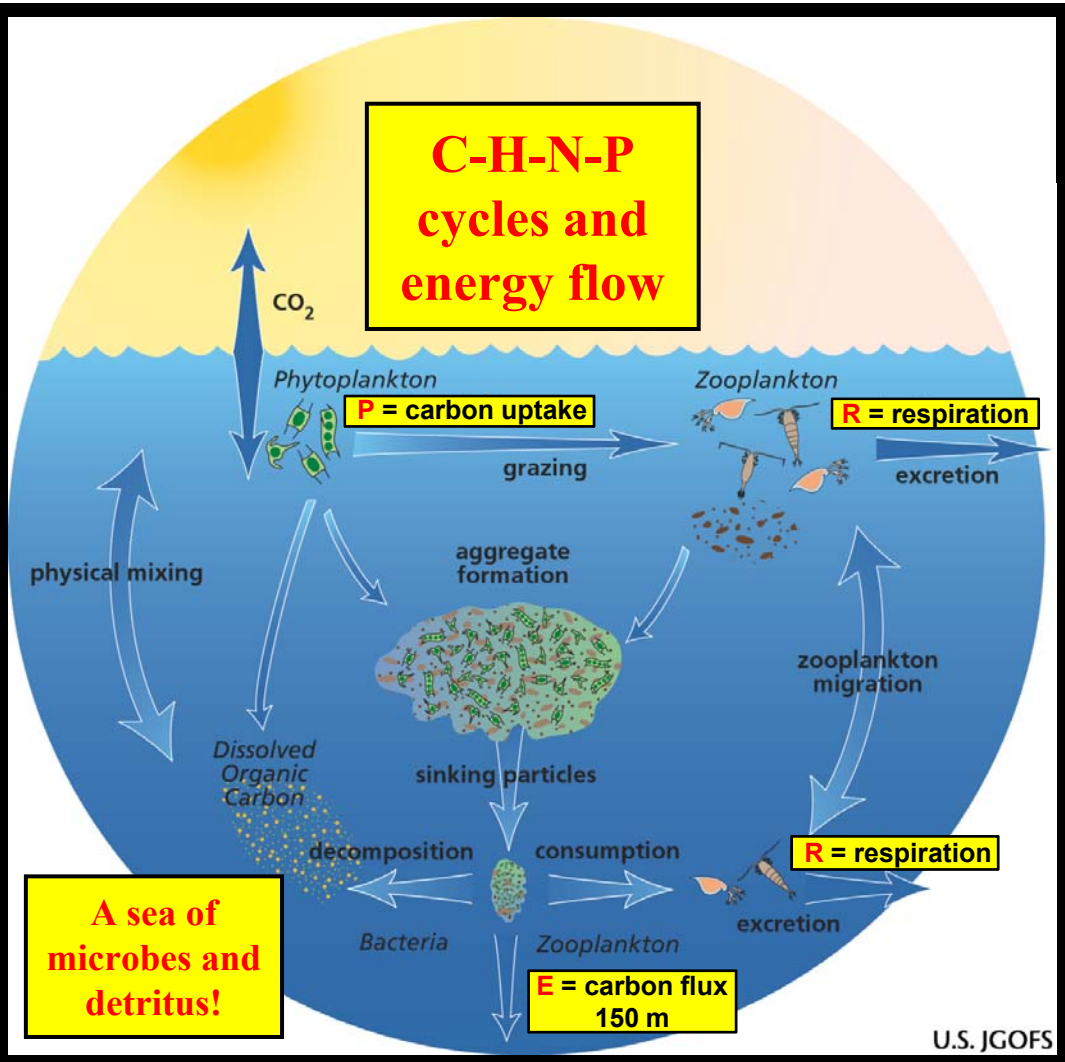
***Hashtag*: #SCOPEQED**



Digital Detritus (Peter Root)



quod erat demonstrandum



Biological Carbon and Energy Pump

Input: Sunlight, nutrients and CO_2

Output: O_2 and organic matter/ energy export to mesopelagic zone

P-R = NCP≈E

EGU General Assembly 7 – 12 April 2019, Vienna, Austria

Microbial life, growth, death – and what is left in soil

Session SSS4.11/BG2.64

Yakov Kuzyakov – ykuzyakov@yandex.com
Matthias Kästner – matthias.kaestner@ufz.de
Evgenia Blagodatskaya – janeblag@mail.ru

This session welcomes experimental and modeling studies to microbial life, growth, propagation, communication, functioning, adaptations, metabolism, death, and necromass stabilisation in soil

Sounds like a terrestrial SCOPE!

Microorganisms in soil are well adapted to fluctuations of environmental conditions but are challenged by unfavorable stressors as predators, food shortage, and extreme events. The chance to thrive from organic C from roots, decomposing litter or SOM is low in the topsoil and strongly decreases with depth leaving microbes for starvation and dormancy. Simultaneously, the chance to meet antagonists – viruses and predators – strongly increases in microbial hotspots. Substrate utilization by microorganisms in soil, their growth and death result in necromass production and its stabilization should be quantified.

Submit abstracts at:

https://egu2019.eu/abstracts_and_programme/how_to_submit_an_abstract.html

Important Deadlines:

Travel support applications –
01 December 2018, 13 00 CET

Abstract submission –
10 January 2019, 13 00 CET

Common processes in soils and in seas…

A Way Forward…

- **Develop a specific set of *testable hypotheses***
- **Design robust observational/experimental *procedures and field sampling* capabilities**
- **Activate a *well-trained navy* of collaborative microbial oceanographers**
- **Promote *access to the sea***

Excerpt from Karl pitch (11/14/18)

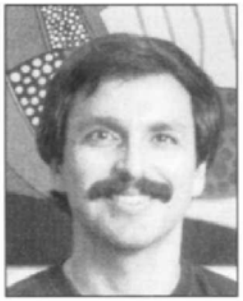
Déjà Vu, All Over Again!

1991 • HOT

In the near future, we will establish the capability of making continuous measurements of sea-surface meteorology, upper ocean physics, dissolved gas concentrations, ocean optics, and particle flux from bottom-moored platforms. We also anticipate enlisting the unique capabilities of an instrumented, autonomous underwater vehicle to help resolve spatial and temporal variability in physical and biogeochemical processes. Finally, the deployment of a semipermanent (3- to 6-month duration) staffed research platform at Station ALOHA, which could be serviced by helicopter or high-speed surface craft, would greatly improve our ability to document and interpret variability in biogeochemical rate processes that are not amenable to remote sensing.

Environmental Science & Technology 25

… but which 6 months?



David M. Karl is chairman of the Biological Oceanography Research Division and professor of oceanography, School of Ocean and Earth Science and Technology, at the University of Hawaii in Honolulu.



Christopher D. Winn is assistant research oceanographer, School of Ocean and Earth Science and Technology, University of Hawaii.

2012 • C-MORE

PNAS PNAS PNAS

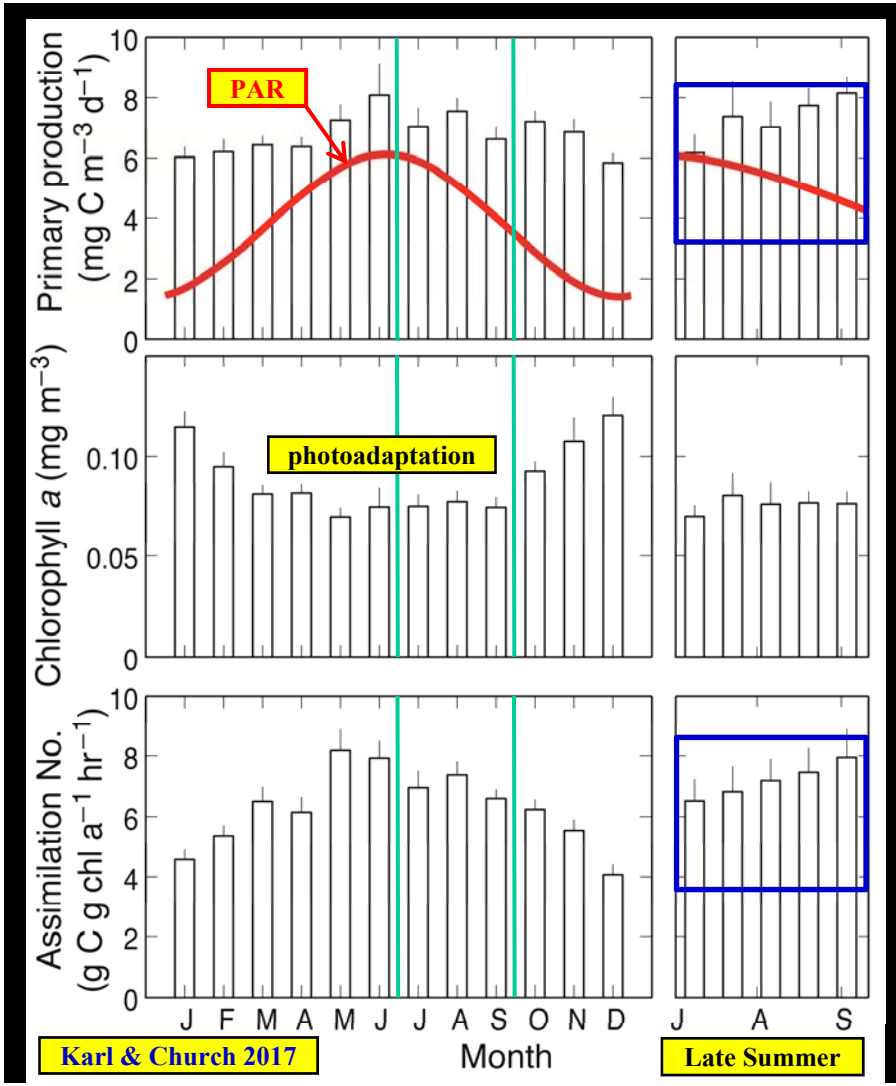
Time Series and C-MORE

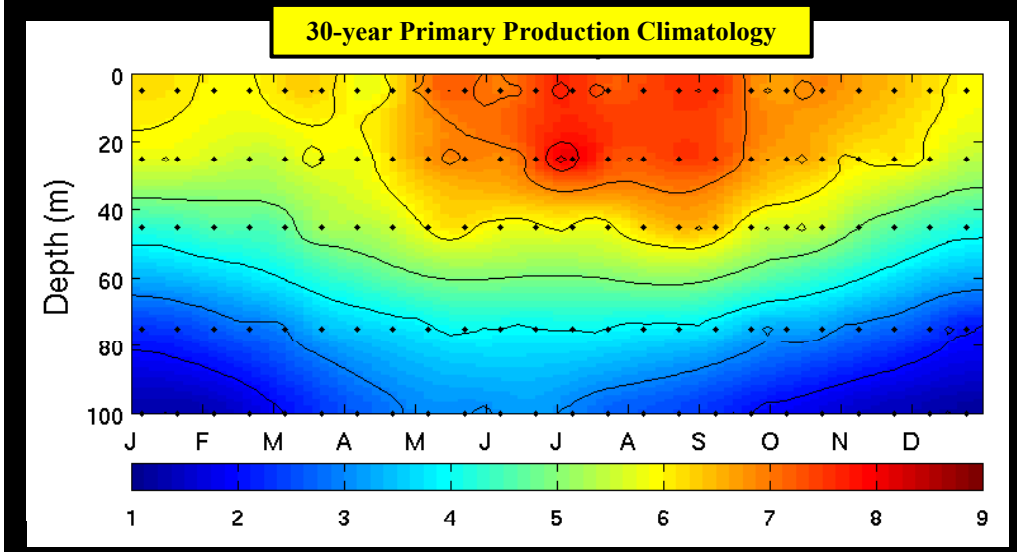
Today, Karl has taken on an even bigger venture as director of C-MORE, a partnership between the University of Hawaii and collaborators at five US mainland institutions.

Karl describes C-MORE as a "super-HOT program." It is based at the HOT Station ALOHA and complements the HOT program with more variables, including genomics measurements. The goal will be to "understand the dynamics of life in the sea, from the genome to the biome": how the ocean and marine life respond to habitat changes, both natural and human-made. The *pièce de résistance* will be the 6-month manned occupation of Station ALOHA using an 80-ft ex-military ship that Karl plans to reconfigure as a remote laboratory. "It's going to be a one-of-a-kind dataset, a gold mine for knowledge creation and dissemination," says Karl. A new research facility, C-MORE Hale, has recently been constructed on the University of Hawaii campus to support the research mission.

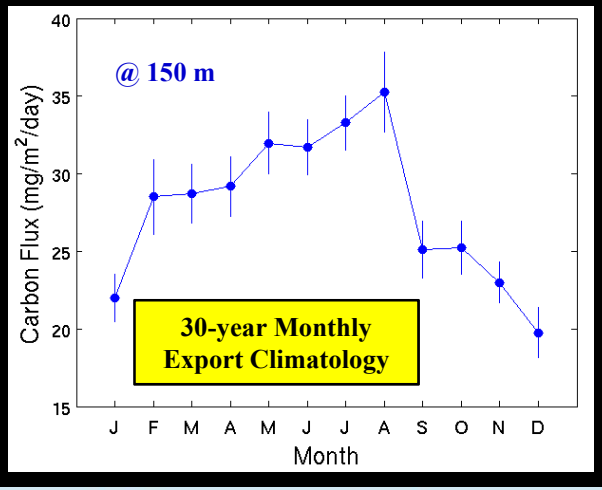
Although Karl is not going on as many research expeditions as he used to, he has logged more than 1,000 days at sea in his career and is adamant that he has not retired, just shifted responsibilities. "I would like to think of my role, especially in the last 5 years, as being a science facilitator and opportunity broker. For my entire scientific career, I have been the beneficiary; it is time to give back," states Karl.

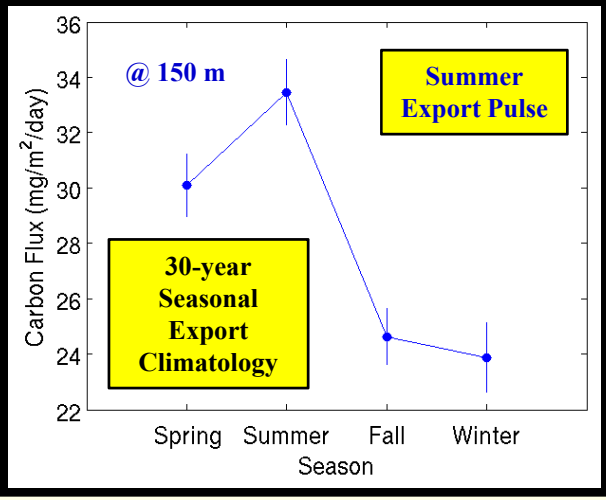
Bijal P. Trivedi, *Freelance Science Writer*

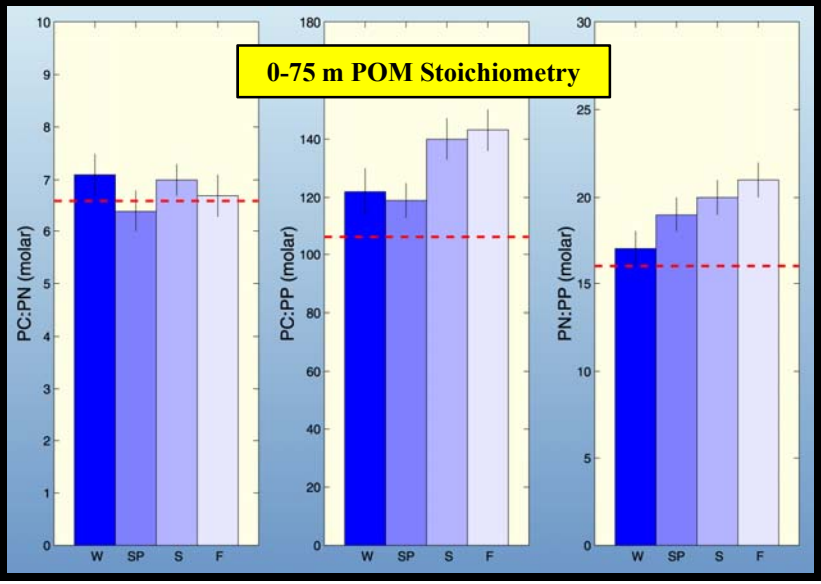




- **In the NPSG, light is life…** ***but there is more to it than that!***
- **Hypothesis:** ***late summer production is supported by*** N_2 ***fixation***

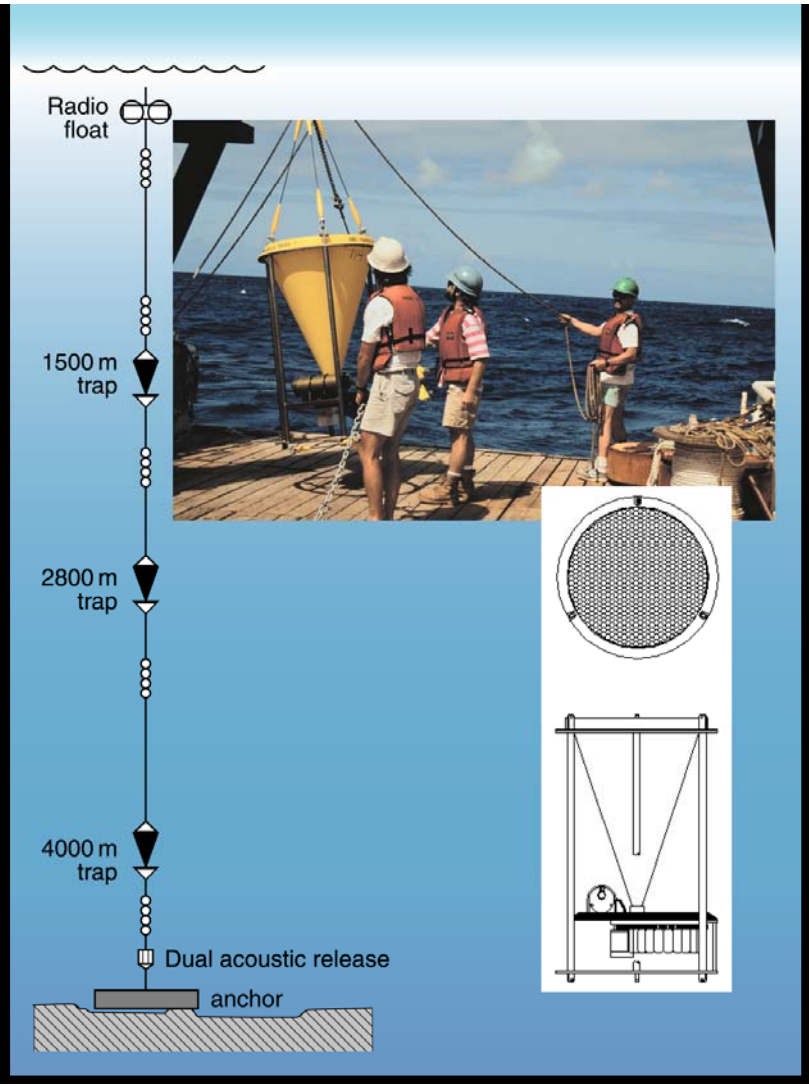


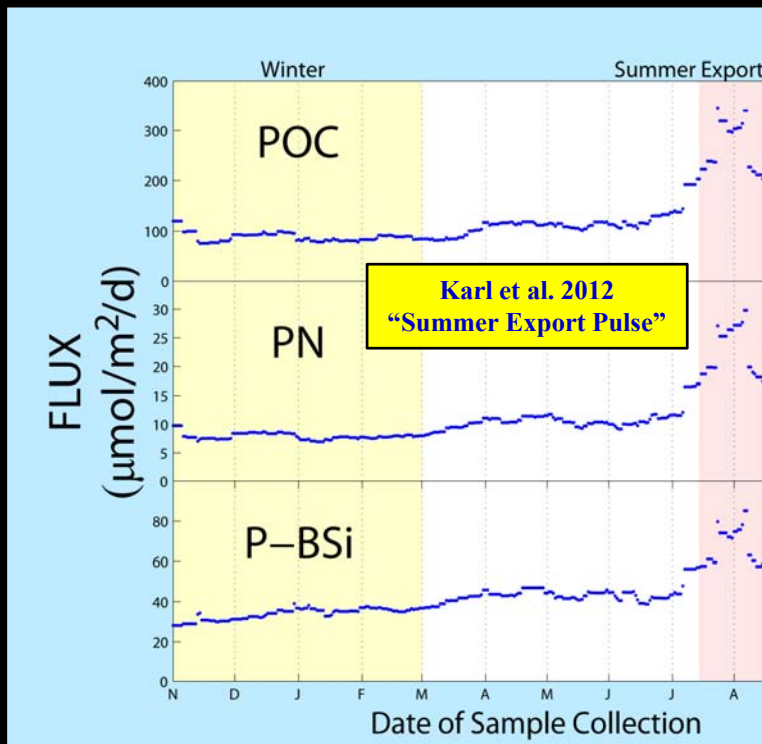


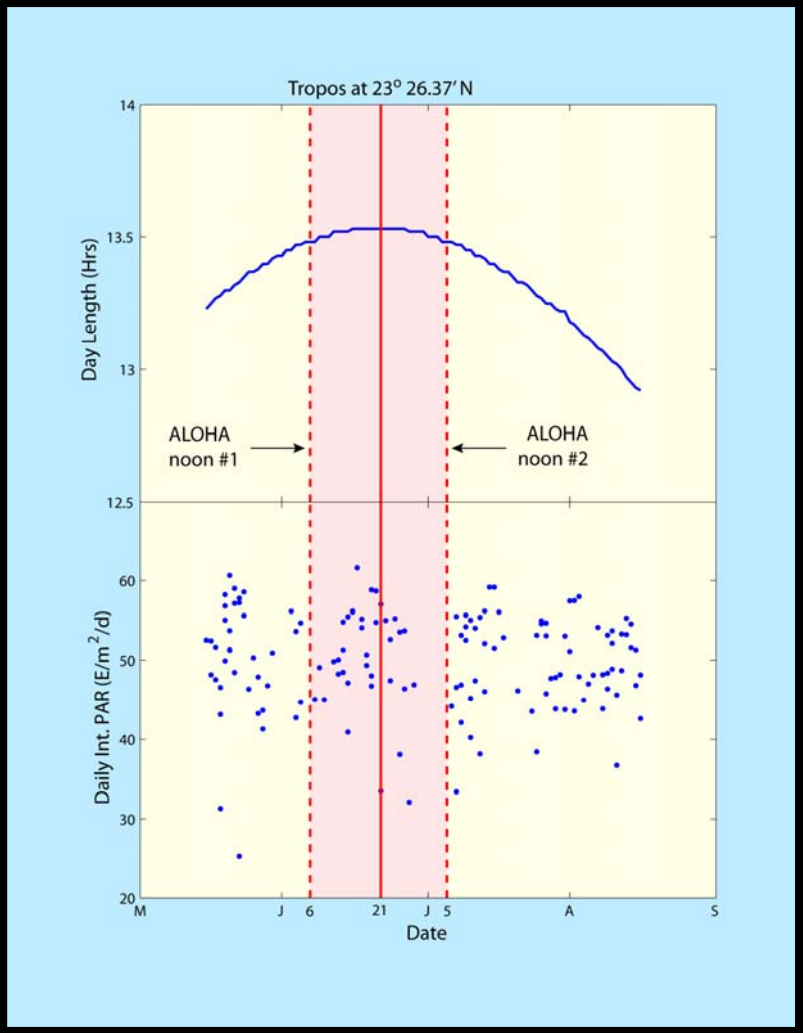


- **Winter-spring-summer build-up, then *CRASH!***
- **Return to *REDFIELD* each winter**
- **All fingers point to N_2 *FIXATION***

ALOHA
Bottom-Moored Deep Traps







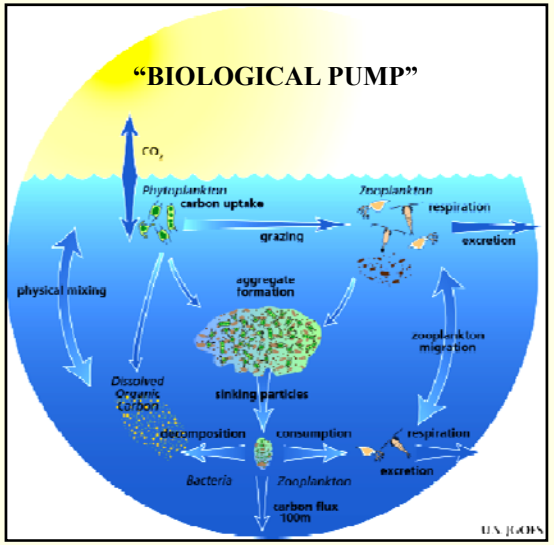
ALOHA Daylength Hypothesis

- For a 1-month period (6 June – 5 July) ALOHA DL is essentially constant (13.52-13.53 hr)
- Following 2nd "ALOHA noon", solar angle, PAR and DL all decrease with DL loss of 10-15 min/wk until minimum of 10.44 hr on 21 Dec

Conceptual Summer Export Pulse Timeline

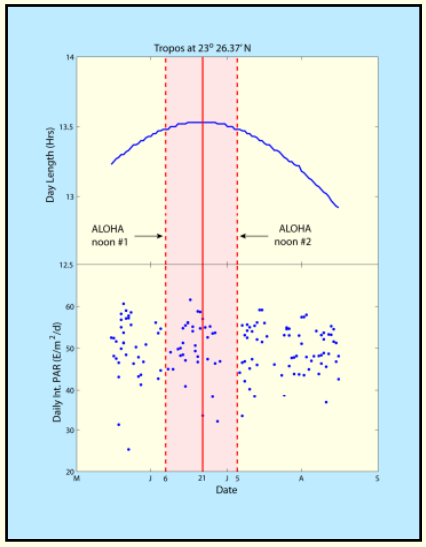
Spring/ Early Summer

- Increasing PAR and DL
- Growth of diatoms – some with endosymbionts



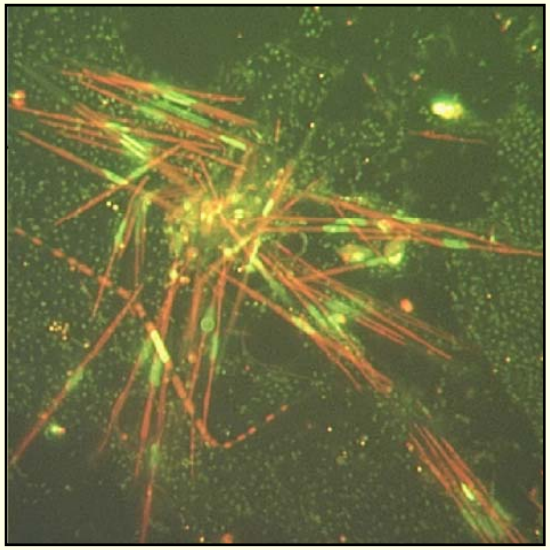
Second "ALOHA Noon"

- Maximum PAR and DL
- Summer stratification
- Enhanced N_2 fixation / P stress



Photoperiod-based Export

- Subtle change in DL triggers aggregation
- Summer export pulse of fresh POM
- Reset the Redfield clock



A Way Forward…
to be continued

- **Develop a specific set of *testable hypotheses***
- **Design robust observational/experimental *procedures and field sampling* capabilities**
- **Activate a *well-trained navy* of collaborative microbial oceanographers**
- **Promote *access to the sea***