Putting Plankton in Perspective, from Sea to Sky (w/ Video)

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Mike Behrenfeld, a phytoplankton ecologist and physiologist at Oregon State University, studies the floating ocean plants in the lab and out in their natural environment. His broad view contributed to a new theory about the timing and cause of the annual phytoplankton bloom in the North Atlantic. Credit: Oregon State University

(PhysOrg.com) -- From the time he was 21 and working toward his Ph.D., Mike Behrenfeld has been observing phytoplankton -- floating ocean plants that have a global impact. Observing these tiny plants under a microscope, Behrenfeld discovered early on that how you set up an experiment matters.

Researchers had previously observed that "fat and happy" plankton in a sterile laboratory dish suffer considerably when exposed to ultraviolet radiation. But perform the same experiment while simulating the

abundance of real-world stresses that phytoplankton face every day in the ocean, and the impact of ultraviolet radiation is much smaller, Behrenfeld found.

Now a phytoplankton ecologist and physiologist at Oregon State University, Behrenfeld studies phytoplankton in the lab but also makes a point of regularly going out to sea to stay grounded in the "real world."

He also employs a big-picture tool: the view from space.

Behrenfeld's introduction to satellite data came during his tenure at Brookhaven National Laboratory, where he learned how space-based instruments can measure ocean color and detect phytoplankton's green pigment.

"That's when I began thinking in earnest about the global aspects of phytoplankton ecology," Behrenfeld said. "I was able to combine physiological knowledge of processes at the cellular level that I learned from the lab with the big picture of looking at global systems from space."

Now, with more than ten years of ocean color data from NASA's Sea-viewing Wide Field-of-view Sensor (SeaWiFS) instrument, Behrenfeld has developed a new theory about the timing and cause of the North Atlantic Bloom. This annual bloom of phytoplankton spans the entire ocean at northern latitudes, and responsible for feeding marine birds and mammals, as well as soaking up carbon dioxide from the atmosphere.

Behrenfeld found that the classic understanding of the bloom -- that warm spring temperatures and abundant sunlight drive its onset -- may be mistaken. Instead, satellite data show that the bloom begins in winter, when phytoplankton habitat extends deeper below the ocean surface. Phytoplankton are diluted over a larger habitat volume, decreasing their

chance of encountering a predator, allowing the population to grow, and initiating a bloom. Only later, in spring, do favorable growth conditions at the surface contribute to the bloom.

"With space-based tools, we can go back and look at these old paradigms in a new way," Behrenfeld said. "The satellite measurements were the absolute central piece of the work, but their interpretation required background knowledge from the laboratory and field techniques."

Behrenfeld encourages the next generation of young scientists -- whether they are focused on satellite data, computer models, laboratory experiments or optics -- to take a diversified approach to scientific inquiry and to get out into the real world as much as possible.

"Getting away from the computer and simply thinking about things for awhile opens up new questions you want to ask," he said, "and feeds our scientific curiosity about how organisms and natural ecosystems work."

Provided by JPL/NASA (news : web)