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DURHAM, N.H. -- Starting this summer, University of New Hampshire oceanographer Ru Morrison will conduct difficult, cutting-edge research that could help answer a small but critical part of the climate change-global warming puzzle.

Morrison is one of only a handful of scientists around the world doing the measurements required to understand exactly how phytoplankton in coastal waters absorb and re-emit or "fluoresce" sunlight - a realm of investigation that is in its infancy and one that could provide more information about global levels of carbon.

Of his phytoplankton photophysiology research Morrison says, "The fundamental science is not well known because interpreting what you measure is a messy business - it's hard to separate out all the other light induced signals."

Morrison will use "hyperspectral" instruments both under the water and aboard an orbiting satellite. These are instruments that "see" between 100 and 250 bands of light in the electromagnetic spectrum and, therefore, provide much greater detail than a "multispectral" image comprised of a mere 10 bands.

Phytoplankton, microscopic plants that make up the foundation of the marine food chain, and exert a global-scale influence on climate, use carbon dioxide for photosynthesis. The larger the world's phytoplankton population, the more carbon dioxide gets pulled from the atmosphere.

Says Morrison, a research assistant professor in the Ocean Process Analysis Laboratory (OPAL) at UNH's Institute for the Study of Earth, Oceans, and Space, "If you can understand what's going on with fluorescence in natural environments you can better understand what's happening with photosynthesis, which in turn gives you primary productivity, which in turn is vitally important in global carbon budgets."

Morrison was recently awarded a three-year, $360,000 grant from the National Aeronautic and Space Administration (NASA) under its New Investigator Program, which is aimed at encouraging the integration of Earth system science research and education by scientists early in their careers.

To conduct his research, Morrison will use the 76-foot-high, three-legged Air-Sea Interaction

Tower embedded in the seafloor in 50 feet of water three miles off the coast of Martha's Vineyard.
Part of the Martha's Vineyard Coastal Observatory, the tower was built and is operated by the Woods Hole Oceanographic Institute, where Morrison spent four years doing post-doctoral research before joining OPAL last year. The heavily instrumented, high-tech tower, says Morrison, "is at the forefront of ocean observing in coastal waters." Morrison will also employ a satellite named "Hyperion" to over-fly the site and gather hyperspectral data.

In addition to providing data on global carbon, Morrison's research will provide essential information on how ocean ecosystems work.

"It's important we understand the function of coastal ecosystems. At the moment, from space, using optical measurements, you generally just retrieve the bulk measurements for chlorophyll." He says. Morrison's data will provide much greater specificity and, "give us a better understanding of what's going on in terms of primary production in the ocean."

The importance of understanding the whole, interconnected ocean ecosystem was emphasized recently by the release of the U.S. Commission on Ocean Policy's 500-page report. Among other things, the presidential commission urged a new "ecosystem-based" approach to management.