

NOSAMS: Post-Doctoral Research



Constraining Sources & Fates of Organic Molecules in the Oceans

Dr. Steven R. Beaupre received his Ph.D. from the department of Earth System Science at the University of California, Irvine. As a WHOI postdoctoral investigator, Steve is using radiocarbon to constrain age spectra in complex natural matrices of marine dissolved and particulate organic carbon by 1) improving methods to separate populations of carbon-containing molecules based on thermal stability, 2) developing an interface between sample extraction methods and NOSAMS microwave plasma gas ion source, and 3) modeling the global distribution of radiocarbon in the marine organic and inorganic carbon reservoirs. These efforts in obtaining novel observations and interpretations are fundamental to constraining the origin, persistence, and fate of organic molecules in the sea, and hence their significance within the global carbon cycle.

Radiocarbon Analysis of Ultra-Small Samples and Polar Biomarkers



Dr. Sunita Shah did her Ph.D. work at Harvard University. As a postdoctoral scholar advised by Ann McNichol (NOSAMS) and Ben Van Mooy (MC&G), Suni is working towards developing methods to make compound-specific radiocarbon measurements of intact polar lipids to quantify the effect that sedimentary archaeal communities have on TEX86-based paleo-sea surface temperature reconstructions. To accommodate the expected small sample sizes, she is also exploring the use of an elemental analyzer to combust lipid samples with the goal of reducing the process blank associated with closed-tube combustion and testing reduced-volume graphitization reactors which will allow the measurement of samples containing <5 micrograms of carbon.

Development of Interfaces for CFAMS



Dr. Cameron McIntyre received his Ph.D. from Macquarie University, Sydney, Australia. As a postdoctoral investigator, he designed and constructed a novel gas chromatograph-combustion system for the continuous-flow ^{14}C -Accelerator Mass Spectrometry system (CFAMS). The complete GC-AMS system has been successfully operated and the first continuous-flow compound specific radiocarbon measurements recorded. This technological breakthrough will permit the rapid analysis of compounds for radiocarbon. It also paves the way for other analytical instruments to be coupled to the continuous-flow AMS system. Cameron's interests include instrument and method development and their application to geochemical research.

Radiocarbon Dating Holocene Sea Levels



Dr. Andrea Hawkes did her Ph.D. work at the University of Pennsylvania. As a postdoctoral scholar advised by Associate Scientist Jeff Donnelly and USGS scientist Jeff Williams, Andrea dated basal peat samples from Bermuda in order to produce a high quality Bermuda sea-level record that will be used to better understand North American deglacial history. She is also developing a high resolution hurricane record for the Atlantic coast. The laminated sediments may allow for seasonal/yearly-hurricane resolution. Hawkes and colleagues want to look back over the past 10,000 years in the geologic record to get a detailed understanding of the full range of possible hurricane scenarios. This record spans times when the climate was different than today. It offers potentially important clues to how climate affects the intensity and frequency of hurricanes and what that may mean for hurricane forecasts as Earth's climate changes

in the future.

Continental Erosion: Radiocarbon Dating of Individual Organic Molecules from River Sediments



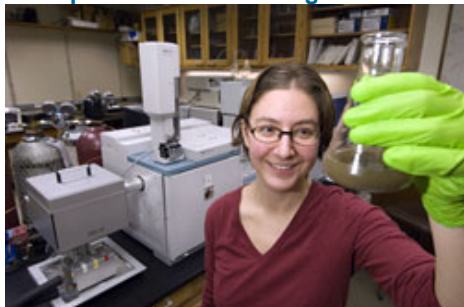
Dr. Valier Galy, received his Ph.D. at CRPG-CNRS, Institut National Polytechnique de Lorraine. As a postdoctoral scholar advised by Tim Eglinton and Bernhard Peucker-Ehrenbrink, Valier worked on coupling radiocarbon measurements of bulk organic matter and molecular biomarkers with inorganic isotope tracers to study the source, transport and fate of organic carbon in the Ganges-Brahmaputra river basin. He developed a record of the spatial and temporal variability of the sediment load in this complex river system as well as characterizing petrogenic and organic carbon phases in these sediments. Radiocarbon dates indicate that 30 to 50% of the carbon initially present in the Himalayan rocks is conserved during the erosion cycle. (10/4/07-10/10/09) He has gone on to join the scientific staff at WHOI.

Continuous Flow AMS



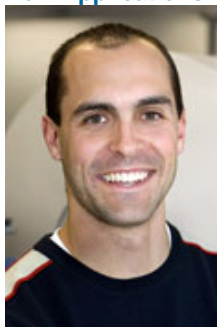
Dr. Ernst Galutschek received his Ph.D. from the University of Technology Vienna, Vienna, Austria. He worked as a Postdoctoral Investigator with Dr. Mark Roberts on the construction and initial characterization of the second-generation gas ion source. The gas ion source, in conjunction with an AMS system, allows for the monitoring of ^{14}C in a continuous flowing CO_2 gas stream. Ernst worked to further develop a key component of the new system, the gas-accepting microwave-plasma ion source first built at Atomic Energy of Canada Limited, Chalk River, Ontario, Canada. (7/11/07-11/10/09)

Transport of Terrestrial Organic Carbon



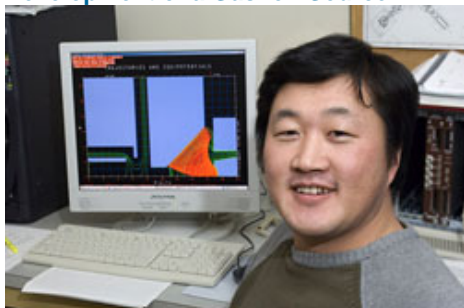
Dr. Angela Dickens, a Postdoctoral Scholar who received her PhD from the Department of Chemistry, University of Washington, Seattle, Washington, is working to understand how different forms of organic carbon (OC) move through and are transformed within the environment. Her postdoctoral research focused on using radiocarbon measurements to constrain the timescales over which terrestrial vascular plant-derived OC is transported via river systems to the oceans. These terrestrial "residence times" are likely to vary depending on the properties of the watershed (e.g. size, relief, and climate) and, in particular, on the importance of storage of OC within the watershed (e.g. in soils or floodplains). An understanding of these residence times is fundamental to our comprehension of the dynamics of carbon cycling, however, our current understanding of these timescales remains extremely limited.

New Applications for Continuous-Flow AMS



Dr. Brad Rosenheim, a Postdoctoral Investigator who received his Ph.D. from the Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, Florida, helped with the development of the Continuous-flow Accelerator Mass Spectrometer for Carbon-14 measurement with Dr. Mark Roberts. This instrument, the first of its kind, will accept coupling to various peripheral instruments including GC, LC, automated carbonate preparation, and laser ablation. His specific interest is in adapting the system for rapid analysis of carbonates to scan for the radiocarbon bomb curve and provide a first order age model. This type of advance will enable easy and rapid assessment of the age models of deep sea corals, zooxanthellate corals, sclerosponges and mollusks.

Development of a Gas-Ion Source



Dr. Baoxi Han, a Postdoctoral Investigator who received his Ph.D. from the Institute of Heavy Ion Physics, Peking University, Beijing, China, worked with Dr. Mark Roberts on the development of the Continuous-flow Accelerator Mass Spectrometry (CFAMS) system. Specifically, his efforts focused on ion optical modeling and design of the CFAMS beam line. In addition, Baoxi worked on development of the data acquisition system and was involved in the research and development of the microwave ion source for the CFAMS system.

Other Postdoctoral Staff

Gesine Mollenhauer, Postdoc Scholar - 11/2002 - 5/2004, from University of Bremen, worked with Tim Eglinton and John Hayes on "molecular sedimentology"

Albert Benthien, Postdoc Investigator - 1/2003 - 1/2005, from University of Bremen, worked with Bob Schneider constructing the first interface to the prototype gas ion source, a programmed-temperature combustion system.

Pascale Poussart, Postdoc Scholar - 9/2004 - 3/2006 from Harvard worked with Konrad Hughen and Timothy Eglinton radiocarbon dating terrestrial biomarkers in laminated ocean sediments.

Sang-Wook Kim - 11/1999 - 6/2002, a plasma engineer trained at the University of Chicago and the University of Michigan, worked with Bob Schneider developing the microwave plasma ion source for continuous flow AMS.

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