The Role of Trace Gas Flux Networks in the Biogeoosciences

Vacat networks of meteorological sensors ring the globe, providing continuous measurements of an array of atmospheric state variables, such as carbon dioxide concentrations, water vapor, and methane. Yet to understand how and why these atmospheric state variables vary in time and space, biogeo- scientists need to know where, when, and at what rate important compounds are flowing between the land and the atmosphere. Tracking trace gas fluxes provides information on plant or microbial metabolism and climate-ecosystem interactions.

The existence of trace gas flux networks is a relatively new phenomenon, dating back to research in 1984. The first gas flux measure- measurement networks were regional in scope and were designed to track pollutant gases such as sulfur dioxide, ozone, nitric acid, and nitrogen dioxide. Atmospheric observa- observations and model simulations were used to infer the deposition rates of these hazard- hazardous chemicals. Only recently, FLUXNET, which remains active today, currently includes more than 400 tower sites, dispersed across most of the world’s cli- climatic zones and biomes, with sites in North and South America, Europe, Africa, Asia, Australia. More recently, several atmospher- atmospheric sensors have been included, extending networks dedicated to urban areas (Urban Fluxnet), carbon dioxide, and methane. A key attribute of the eddy covariance technique is that it must be able to measure fluxes in situ with minimal disturbance to the environ- environment, at a spatial scale of hundreds of meters, and on time scales spanning hours, days, and years.

For the eddy covariance technique to work, gas sensors must be able to respond to rapid fluctuations in atmospheric conditions. Old- olders are too slow, such as nitric acid and mercury vapor, one can rely on the relaxed eddy accumulation method to calculate flux densities to measure their fluxes. Researchers have developed methods to measure fluxes over as little as a tenth of a second, and thus, one can rely on the relaxed eddy accumulation method to calculate flux densities to measure their fluxes.

Individual flux towers provide information on how trace gas fluxes vary with season; how rain induces large pulses in ecosystem respiration; and how the net ecosystem-atmosphere carbon exchange varies with the time since the last disturbance. Researchers have developed methods to produce new information on feedbacks between carbon- carbon and water fluxes and meteorological and soil conditions using tracer flux methods. Researchers have developed methods to produce new information on feedbacks between carbon- carbon and water fluxes and meteorological and soil conditions using tracer flux methods.

Attributes of Effective Networks

An effective flux network possesses a number of key attributes. Data are best when they are standards and protocols for instru- instruments, data quality, and calibra- calibration; data gaps are minimized if redundant or replacement sensors are available.

Data are converted into information and knowledge when there is a shared and inte- integrated database [Aapane et al., 2010, Papale et al., 2012] with which researchers can merge flux measurements with a cohort of atmospheric, meteorological, and soil variables. A centralized database can harmo- harmonize data processing, produce value-added products such as daily or annual sums or averages, establish version control and shar- sharing policies, and archive data. Databases can be queried to pull data for specific- specific times, locations, or variables.

Ultimately, flux studies are centered on measuring surface-atmosphere carbon dioxide exchange and how these studies have produced new information on how the length of the growing season modulates animal photosynthesis, how peak photosynthesis climatizes with temperature increases; how light use efficiency increases with the fraction of diffuse, rather than direct, sunlight; how photosynthetic capacity varies with season; how rain induces large pulses in ecosystem respiration; and how the net ecosystem-atmosphere carbon exchange varies with the time since the last disturbance. Researchers have developed methods to produce new information on feedbacks between carbon- carbon and water fluxes and meteorological and soil conditions using tracer flux methods. Researchers have developed methods to produce new information on feedbacks between carbon- carbon and water fluxes and meteorological and soil conditions using tracer flux methods.
communities, scientists are finding flux net- works to be a critical tool in efforts to pro- duce information on trace gas fluxes that are occurring everywhere, all of the time. Biophysical, biogeographic, and ecological- al methods that diagnose and forecast the state of the land’s trace gas budgets depend on data from a network of “supersites” that measure a broad suite of site characteristics to identify or quantity important biophysical processes and develop parameterizations for mechanistic algorithms.

Other types of models need a dense net- work of less intensive flux measurement sites that are sampling representative climate and ecological spaces. These models digest remote sensing, and climate data to produce maps of trace gas fluxes at regional, contin- ental, and global scales using neural net- works, regression trees, or genetic algorithms [Jung, 2011]. Improvements in empirical machine learning models will require addi- tions of such measurements to the instrument set to be installed in clusters at sites that experience different types of ecosystem disturbances or that include underrepresented climate and ecological spaces such as the tropics and tundra, where spatial gaps in current flux measure- ment networks remain the greatest. At present, data generated by flux measure- ment networks are being used to test and improve the land and climate flux algo- rithms used by climate models [Baldocchi, 2011]. They may also be used in the next generation of data assimilation models, which improves system statistics and helps to under- stand climate and weather models [Williamson et al., 2009]. In addition, flux networks have the potential to supply data that will be used to validate maps of sources and sinks that are being generated by the global net- work of trace gas concentration monitors and which will be generated from improving the next generation of satellite-based carbon dioxide observations.

Satellite observations, through programs such as the National Ecolo- gical Observatory Network or the Inte- grated Carbon Observation System, has the potential to detect long-term and grad- ual changes that are occurring due to the background of faster physiologi- cal changes as well as carbon dioxide concen- trations and air temperature continue to rise. Finally, there is potential to use information emerging from flux networks to better quan- tify carbon sources and sinks for carbon market valuation, to inform land use pol- icy, and to provide information on pollutant deposition for addressing the efficacy of pol- lution control policies.

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**References**


Coral Reefs

Reef Flats Likely Will Not Keep Up With Sea Level Rise

Reply to Comment on “Rising Sea Level May Cause Decline of Fringing Coral Reefs”

We thank Dr. Fenner for continuing the important discussion about the potential impact of sea level rise on fringing coral reefs (Fenner 2012). He notes that all reefs will be affected by sea level rise, i.e., “the Molokai situation is not unusual.” We agree that increased turbidity on reefs by increased wave energy is a problem that could be universal, but the potential for it to be epidemic is unclear. Fenner also notes that there are examples of fringing reefs around high islands where sediment stress is likely to be exacerbated by sea level rise.

The heart of his comment, however, is about the accurate rate of reef flattening. Fenner strongly disagrees with Fenner’s assertion that “many reef flats may keep up with sea level rise until bleaching kills most corals in a decade or two.”

References


References


Experts in observations and modeling of atmospheric waves from the Earth and planetary atmospheric science communities came together at a November 2011 workshop held at the European Space Agency’s (ESA) European Space Research and Technology Centre (ESTRACK) site in the Netherlands to discuss the nature of waves observed in Venus’s atmosphere and their comparison to those on Earth and Mars.

ESA’s Venus Express (VEE) satellite and ground-based observers find atmospheric waves at many scales. Migrating solar tides and other planetary-scale waves are observed in cloud-tracking wind vectors and temperature fields. Mesoscale gravity waves (GWs) can also be seen at a variety of levels from the cloud base up to the thermosphere, evident in imagery and in vertical profiles of temperature, density, and aerosol abundance. This workshop focused particularly on GWs, as their role in the atmospheric circulation is still poorly understood.

A review of the atmospheric waves and their classification was followed by presentations about observations of GWs on Earth, particularly using thermal infrared limb sounding and radio occultation. The Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) has meanwhile obtained over 1000000 observations of atmospheric waves year to date, providing a rich data set for the characterization of GWs. Similarly, limb observations in the thermal infrared yield two-dimensional (latitude-altitude) plots of temperature, from which vertical GW momentum flux can be calculated.

Mars has been the subject of an intense campaign of spacecraft exploration in the past 2 decades, including ESA’s Mars Express (MEX) satellite. GWs are observed in MEX observations at a range of altitudes, from surface pressure maps and cloud path turn-ups to the wave trains observed in the thermosphere. Meso-scale circulation models of the Martian atmosphere are well developed, allowing assimilation and reconstruction of observed atmospheric GW behavior.

Unfortunately, the spatial and temporal coverage and resolution of Venus observations is sparse; thus, Venus researchers cannot use all of the techniques used for analysis of Earth data. VEX obtained only a few hundred radio occultations in its 5-year mission to date, and because of its highly elliptical orbit, it has acquired only a relatively small number of thermal infrared limb observations with geometry suitable for GW detection. Despite the difficulties of analyzing such a sparse data set, achievable objectives for VEX GW data analysis were set. First, more work is needed on characterizing the wavelengths and spatial distribution of GWs in Venus data. Furthermore, there should be a renewed drive to search for correlations between wave occurrence and underlying topography. Although cloud-liquid turbulence and shear are likely to be a more important source of GW generation than topography, quantifying topographical GW generation would help scientists understand surface atmospheric boundary condition for the atmospheric circulation.

The workshop, sponsored by ESA’s Research and Scientific Support Department faculty, was attended by some 30 participants from nine countries, with an additional 20 scientists participating remotely via video link. Presentations from the workshop can be viewed at http://www.nasa.esa.int/index.php?project=VENUS/EXPRESSION &page=atm wav es_intro. Many of the detailed results from VEX are reported in a special issue of Eos, published 1 February 2012.

Colin F. Wilson, Atmospheric Oceanic and Planetary Physics, Department of Physics, University of Oxford, Oxford, UK; E-mail: vcolin@iop.org, and Albert P. Fougstedt, ESA, Noordwijk, Netherlands

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**MEETINGS**

**Characterizing Atmospheric Waves on Venus, Earth, and Mars**

**Atmospheric Waves Workshop: Noordwijk, Netherlands, 9–10 November 2011**

**Strategies to Deliver Information on Regional Climate Changes to Communities**

**Regional Climate Services Workshop 2011: Victoria, British Columbia, Canada, 21–23 November 2011**

**Longitude and Hemispheric Dependence of Space Weather**

Addis Ababa, Ethiopia 12–16 November 2012

**ABSTRACT DEADLINE: 12 July 2012, 23:59 Eastern Time**

This international conference expands the focus on longitude and hemispheric dependence of space weather by emphasizing its response to major solar events and by examining the Earth system response.

For complete meeting details, including information regarding abstract submission, housing, conveners, and more, visit www.agu.org/SpaceWeather.Chapman.
Keir Receives 2011 Jason Morgan Early Career Award

Derek Keir received the 2011 Jason Morgan Early Career Award at the 2011 AGU Fall Meeting, held 5–9 December in San Francisco, Calif. The award is for significant early-career contributions in tectonophysics.

Citation

The AGU Tectonophysics section is pleased to present the third Jason Morgan Early Career Award to Derek Keir for discovery resulting from his innovative and tireless efforts to elucidate the role of magma intrusion in large-scale strain accommodation prior to and during continental rupture, a stage of the Wilson Cycle that is very poorly understood. Keir is a consummate tectonophysicist; he uses state-of-the-art techniques to study in detail a first-order tectonic problem: that of how continents break up as the Wilson Cycle is initiated. To address this problem, one has to go to the only place on Earth where the process is ongoing at this moment: the northern Africa and the Arabian Peninsula. These are physically and logistically difficult places in which to do fieldwork, but the work of many collaborators must be coordinated to collect the necessary high-quality seismic, structural, and other field geophysical data. These studies are in their infancy.

William Kaula gave unstintingly of his talents and energies to AGU’s publications. He served as Editor of Reviews of Geophysics and Journal of Geophysical Research-Solid Earth, led the development of a number of policies and practices during his service on the Publications Committee, was a mentor to junior scientists serving as associate editors and editors, and was always present for high standards for AGU journals. Past recipients of the award are George Horsbrugh, Karl Turekian, William Hinze, Marcia Neugebauer, and Alexander Drexler.

—REBECCA MAER ANSON Direct Journals, AGU; E-mail: rmaer@agu.org

Opening Date: 12 June
Abstract Submissions Deadline: 8 August, 23:59 EDT

For details on submission policies and guidelines, including membership requirements, visit fallmeeting.agu.org. AGU galvanizes a community of Earth and space scientists that collaboratively advances and communicates science and its power to ensure a sustainable future.

Call for Nominations for 2012 William Kaula Award

The William Kaula Award recognizes the outstanding service of a member of AGU to the scientific community through extraordinary dedication and exceptional efforts on behalf of AGU’s publications program. Individuals may be recognized for contributions such as outstanding reviewing, editorial service beyond expectations, or innovative leadership.

In even-numbered years the Publications Committee selects a recipient, who is recognized at the Editors’ Evening at the Fall Meeting and in Eos. The Publications Committee is asking the community to help identify those who are deserving of this award. If you would like to nominate someone, please send an e-mail to editors@agu.org no later than 15 August 2012. Please outline as clearly as possible why this particular individual is a worthy recipient of the award.

William Kaula gave unstintingly of his talents and energies to AGU’s publications. He served as Editor of Reviews of Geophysics and Journal of Geophysical Research-Solid Earth, led the development of a number of policies and practices during his service on the Publications Committee, was a mentor to junior scientists serving as associate editors and editors, and was always present for high standards for AGU journals.

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—REBECCA MAER ANSON Direct Journals, AGU; E-mail: rmaer@agu.org

Response

I am sincerely grateful to the Tectonophysics section of AGU for considering me as a recipient of this prestigious award. These days, early-career scientists face an ever-increasing challenge navigating their way toward independent careers. The international science community is large and complex, and the standards are high. It is therefore very important for the community to continue supporting young scientists through opportunities in funding and resources, sound mentoring, and encouragement to contribute back to the community. I have been fortunate to have had all these ingredients in my career to date.

First, I am grateful to my Ph.D. advisor, Cindy Ebinger. Her enthusiasm, generosity, and unwavering determination in Earth science for the benefit of humanity...

—HAAN W. GREEN University of California, Riverside

ETHIOPIA

Ethiopia: Graham Stuart, Tim Wright, Sylvie Lacov, and Azalay Abebi, who continue to provide valuable monitoring and scientific collaboration. I have built a fledgling career on a core of seismic experiments in Ethiopia and Yemen. I am therefore indebted to Alex Birdbourne and colleagues at SESUK for the fabulous opportunities facilitated, as well as to collaborators at Addis Ababa University and the Yemen Seismological Observatory Center. In the United States the platforms provided to young scientists by AGU and the Geo-Dynamic Processes at Rifting and Subducting Margins (GeoPRISMS) program contribute to, and integrate with, the broader community and have also been exceptionally important.

Young scientists are the future, and I have already worked with and learned from a suite of young and exceptionally talented seismologists, geophysicists, geochronologists, and volcanologists. I look forward to a future of collaborative, multidisciplinary, high-quality, fun, and ethical science from my new base at the National Oceanography Centre, Southampton.

—DEREK KEIR National Oceanography Centre, Southampton University, Southampton, Southampton, UK

AGU Chapman Conference on Hydrogeomorphic Feedbacks and Sea Level Rise in Tidal Freshwater River Ecosystems

Reston, Virginia, USA 13-16 November 2012

ABSTRACT DEADLINE: 12 July 2012 (23:59 EDT)

Tidal freshwater rivers link watersheds with estuaries and affect the flux of carbon, nutrients, sediment, and freshwater from land to the ocean. However, climate change is continually altering tidal river ecosystems as tides advance inland and watershed inputs change. This Chapman Conference will generate synthesis of feedbacks between geomorphic, biogeochemical and ecological processes in tidal rivers to better predict ecosystem changes in response to climate change.

For complete meeting details, including information regarding abstract submission, housing, conveners, and more, visit www.agu.org/TidalRivers

MOUNTAIN BELL TOWNS

Mountain Bell towns bludgeoned California's Suitors: Mesta Chorus in Search of AGU Blugophere

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POSITIONS AVAILABLE
Biogeoosciences

University of Waterloo
Department of Earth and Environmental Sciences

The ecohydrology group at the University of Waterloo focuses on water-related environmental issues. (http://ecohydrology.uwaterloo.ca) It is funded through the Canada Excellence Research Chair program (www.cerc.gc.ca), and includes a diverse team of geologists, biogeochemists, soil scientists, hydrologists, environmental engineers and microorganisms.

The University of Waterloo (UW) is located in Waterloo, Ontario, approximately 100 km west of Toronto, and consistently ranks as the most innovative university in Canada.

The University of Waterloo values candidates who have experience working in settings with students with diverse backgrounds, abilities, and beliefs. Preference will be given to candidates with demonstrated skills and experience in (environmental) chemistry, hydro(geo)engineering and microbiology. The University of Waterloo is an equal opportunites employer, and persons with disabilities are encouraged to apply.

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The ecohydrology group at the University of Waterloo invites applications for a Postdoctoral Fellow.

Ecohydrology

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The University of Waterloo is an equal opportunity employer and persons with disabilities are encouraged to apply.
Seeking world-class PhD students, post-doctoral researchers and technical engineers in the field of volcanic and magmatic systems

The CleVerC (Clermont-Ferrand Centre for Volcano Research) consortium involves six laboratories of Blaise Pascal University in Clermont-Ferrand, France (Laboratories of Volcanology, Magmas et Volcans, Paris (Physics, Physical Meteorology, Social and Cognitive Psychology, Mathematics, Computer Science), the Observatoire de Physique du Globe at Clermont-Ferrand, and the French Geodetic Center (BRGM). The consortium, which is led by the Laboratoire Magmas et Volcans (director P. Schiavo; scientific coordinator T. Druitt), has received funding for a ten-year Collaborative research programme from the French government Laboratory of Excellence initiative. The programme will address fundamental questions in the field of magma generation, volcano dynamics, volcanic hazards and volcanic risk.

We are seeking candidates for ten projects, to start in October of 2012. The projects are at post-doctoral (PDoc) and doctoral (PhD) levels. Postdoctoral projects are divided into those with that are strongly research-oriented (PDocRes), and those with important components of technical development (PDocTech).

Details of the projects, post profiles, salaries, contact addresses, application procedures and deadlines may be found at the following site: http://www.observatoire-geoclimat.fr/francais/CleVerC_positions.pdf. In the event of additional enquiries or problems, please contact Sochanea Swain (Sochanea.Swain@univ-bpclermont.fr).

- **Physical development of magmatic inclusions in crystals, P. Schiavo (LMV).**
- **PDocRes.**
- **Influence of mantle processes on volcanic behaviour O. Sillimanov (LMV).**
- **PDocTech.**

- **Magnetics and mobility of explosive eruptions, J.-L. Le Petigou (LMV), PDocRes.**
- **Physical vulnerability of urban buildings and infrastructures to lateral and pyroclastic flow impacts, J.-C. Thouret (LMV) & A. Wagner (BRGM) PDocRes.**
- **Development of a volcano-dedicated INAR data processing toolbox, J.L. Frigeri (LMV) PDocTech.**
- **Development of a portable instrument platform for volcano monitoring by muon tomography, P. Labaye (LMV-PDoc) and C. Cardogna (LMV) PDocTech.**
- **High pressure and high temperature experiments for the determination of thermodynamical, physical, and kinetic constraints for the processes of magma genesis, evolution, and eruption, K. Koga (LMV) PDocTech.**
- **Developing a platform for numerical modelling of volcanic eruptions, P. Labaye (LMV) PDocTech.**
- **Development of techniques of analysis and inversion of data from muon tomography – a new technique that uses cosmic rays to probe volcanic edifices C. Cardogna (PDoc) and P. Labaye (LMV) PhD.**
- **Modelling of danae, two-phase volcanic flows K. Keleoun, O. Roche (LMV) & A. Chupin (LMV), PhD.**

LMV: Laboratoire Magmas et Volcans; LPC: Laboratory of Particle Physics; LM Laboratory of Mathematics; BRGM: French Geodetic Survey.

Classified cont. from page 222

Knowledge of and experience in using modern IT tools for managing and communicating information

Demonstrated experience in managing or coordinating the proposal preparation processes

Effective written and oral communication skills as evidenced by publications, websites, and presentations.

Prefered Qualifications:

- An advanced degree in a computer science, geophysical science, or environmental science discipline.

- Experience in proposal preparation is highly desirable.

- Professional qualification in project management is preferred.

More information or to apply for this position, please contact Julianna Presley at presleyj@ornl.gov

**Postdoctoral Research Associate.**

The Department of Civil and Environmental Engineering at the University of Connecticut seeks a postdoctoral researcher to join an interdisciplinary team working on understanding ecosystem interactions at various time scales. Successful candidates should have a Ph.D. by time of appointment, and have interest and expertise in one or any combination of the following areas: (1) modeling the terrestrial ecosystem and biogeochemical cycles, (2) land-use modeling and prediction, or (3) regional climate modeling. Experience with the NCAR community models or the KTP regional climate model is desirable but not required. The initial appointment will be for one year, with tenure based on performance. Further information is available at http://www.engr.uconn.edu/apply or by email to gwang@engr.uconn.edu. Applicants should upload an application letter, CV, and contact information of three referees via Husky Hire (http://www.jobs.uconn.edu). The position will remain open until fills available at

December 1, 2012.

The University of Connecticut is an EEO/AA employer.

**ASSOCIATE PROFESSOR/PROFESSOR IN GEOCHEMISTRY**

**School of Geography, Environment & Earth Sciences**

We seek outstanding candidates with expertise in Trace Element and Isotope Geochemistry who will lead our existing plasma-source Geochemistry Facility and programme. The successful candidate will be expected to enhance the School’s wide-ranging and innovative research programme in Geochemistry, including working with and enhancing our existing strengths in georesources and volcanology. The successful candidate will develop new or maintain existing research relationships with the Wellington-based Crown Research Institutes, as well as with other universities.

The successful candidate must have a proven track record of leading a significant and successful research programme and will undertaken internationally recognized research in the Geochemistry of igneous, geothermal, surficial or (salts-) environmental processes, early Earth, or Solar System processes. Candidates with a strong background in more than one of these fields, and with hands-on experience in plasma source isotopes and trace element analysis, are preferred.

The School has a world-class Geochemistry facility including an ultra-clean laboratory and three plasma-source mass spectrometers, as well as a new inductively coupled plasma mass spectrometer and a new state-of-the-art ICP-MS instrument. The successful candidate will have opportunity to develop and adapt the research programme to their own interests.

The successful candidate will be a member of the School’s Earth Sciences programme, the members of which work closely with researchers in Antarctic Research Centre and the Geography programmes (including joint supervision of graduate students).

Applications close 30 June 2012

Reference A107-19Q

**RESEARCH FELLOW IN GEOCHEMISTRY**

**(2 year fixed-term)**

**School of Geography, Environment & Earth Sciences**

We seek outstanding candidates to join our diverse and dynamic Geochemistry, Volcanology & Petrology group within the Earth Sciences programme, to undertake internationally recognized research in geochemistry in an area complementary to existing staff expertise and interests. The appointment is for a fixed term of two years.

The successful candidate will share responsibility for the day-to-day operations of the School’s Geochemistry Facility, including ensuring that the multi-collector and single-collector plasma source mass spectrometers and other equipment are well maintained and operating to the highest specification. They will also assist in the training of graduate students and other users in use of the Geochemistry facilities, and be expected to play an active, collaborative role in projects leading to publications.

The School has a world-class Geochemistry facility including an ultra-clean laboratory and three plasma-source mass spectrometers, as well as a new high-resolution ICP-MS instrument, new rock preparation and mineral separation facilities, and stainless steel furnace facilities. A detailed list of the equipment in the school’s Geochemistry Facility and of Geochemistry research currently being undertaken within the group is available on request.

Members of the Earth Sciences programme work closely with researchers in Antarctic Research Centre and Geography programmes (including joint supervision of graduate students).

Applications close 30 June 2012

Reference A106-19Q

Victoria University of Wellington is an EEO employer and actively seeks to meet its obligations under the Treaty of Waitangi.

For more information and to apply online visit http://vacancies.vuw.ac.nz

VICTORIA UNIVERSITY OF WELLINGTON

Victoria university delivers internationally acclaimed results in teaching and research, as well as programmes of national significance and international quality.

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- Bachelor’s degree preferably in computer science, environmental science, or a geophysical science discipline.
- At least seven years’ experience in managing projects and programs.
- Demonstrated expertise in managing the financial aspects of a multi-disciplinary scientific enterprise.
- Knowledge of and experience in using modern IT tools for managing and communicating information.
- Demonstrated experience in managing or coordinating the proposal preparation processes.
- Effective written and oral communication skills as evidenced by publications, websites, and presentations.
- Preferred Qualifications:
  - Advanced degree in a computer science, geophysical science, or environmental science discipline.
  - Experience in proposal preparation is highly desirable.
  - Professional qualification in project management is preferred.

More information or to apply for this position, please contact Julianna Presley at presleyj@ornl.gov.
student noted that the magnitude of each gas release is driven by a drop in the lake’s water level or a change in the lake bed. Researchers argue that the nanograins are negatively charged ones by a factor of more than negatively charged grains outnumber positively charged ones by a factor of more than 1 electron charge. In addition, Hill et al. measured the charge-to-mass ratio of each grain and found that the most likely charge per grain is 1 electron charge. In addition, the authors noted that the number of each kind of gas release is large enough to turn some lakes into net sources of atmospheric carbon dioxide and that the past decade have shown that ebullition—the propagation of bubbles up to the surface—in an important methane transport mechanism in lakes. Uncertainty remains, however, around figuring out the drivers behind, or the magnitude and frequency, of bubble-mediated methane emissions. In a 6-month investigation of Upper Mystic Lake, in Massachusetts, Veizer and Hemond sought to answer these questions using a system of high-resolution gas bubble traps. The authors placed floating bubble traps below the water’s surface at several locations around the lake, measuring captured gas volumes every 10 minutes. They also record the lake water level, atmospheric pressure, and wind speed. The authors found that bubbling episodes tend to last from hours to days and that they took place at different locations around the lake simultaneously. Making up such bubble episodes, however, were a number of shorter-duration bursts lasting minutes to hours. For example, at one site the authors noted that 60% of the methane gas was released during just 3% of the time. Using a mathematical technique based on wavelet analysis, which is useful for interpreting observations that cross a range of frequencies and durations, the authors looked for links between bubbling events and environmental parameters. The authors found that the main trigger for a bubbling event is the drop in the lake water level or a change in the lake bed. The authors noted that the number of each kind of gas release is large enough to turn some lakes into net sources of atmospheric carbon dioxide and that the past decade have shown that ebullition—the propagation of bubbles up to the surface—in an important methane transport mechanism in lakes. Uncertainty remains, however, around figuring out the drivers behind, or the magnitude and frequency, of bubble-mediated methane emissions. In a 6-month investigation of Upper Mystic Lake, in Massachusetts, Veizer and Hemond sought to answer these questions using a system of high-resolution gas bubble traps. 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