August 2007 Newsletter of the AGU Near-Surface Focus Group

1. 2007 Fall AGU Meeting: Near Surface, Hydrogeophysics and NS cosponsored sessions

2. 2007 Joint Assembly NS Outstanding Student Paper Awards

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1. 2007 Fall AGU Meeting, San Francisco 10-14 December
(http://www.agu.org/meetings/fm07/)

ABSTRACT SUBMISSION DEADLINE: September 6 2359 UT.

Sessions Sponsored by Near Surface Geophysics:

NS01 Near Surface Geophysics General Contributions
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=632>

NS02 Exploration of the Cryosphere Using Near-Surface Geophysical Techniques: Synergism in the International Polar Year
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=245>

NS03 Induced Polarization (IP), Self-Potential (SP), and Seismic-Electric Coupling for Near Surface Applications
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=353>

NS04 Development and Applications of Airborne Methods
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=368>

NS05 Fault Imaging and Seismic Hazard Assessment
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=472>

NS06 Near-Surface Geophysics and Natural Hazards
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=576>

NS07 Biogeophysics
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=229>

NS08 Improved Estimation and Prediction in Earth Science Through Integration of Multiple Datasets and Model Types
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=687>

Hydrogeophysics Sessions:

H04 Information Infrastructure, Soft Computing and Knowledge Discovery Methods for Monitoring, Modeling and Data Management in Hydrology
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=49>

H41 Cold Regions Hydrogeophysics
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=58>

H42 Hydrogeophysics: Linking Geophysical and Hydrological Data
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=374>

H43 Watershed Characterization and Modeling
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=464>

Sessions Cosponsored by Near Surface Geophysics

B05 Biogeochemistry in Polar Environments
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=81>

B06 Mercury Biogeochemistry in Wetlands
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=92>

B16 Geomicrobiology and Environmental Biogeochemistry of Iron and Manganese
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=223>

B27 Frontiers in Biomineralization Research: Processes, Geochemical Signatures and Responses to Global Change
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=394>

GC10 Understanding the Earth with Unmanned Aircraft Systems
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=180>

GC24 Environmental Monitoring: Luxury or Necessity?
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=685>

GP04 New Studies in Electromagnetic Induction
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=302>

GP11 Geomagnetic Field Studies at all Scales Using Satellite,

Observatory, Marine, and Aeromagnetic Data
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=610>

H11 Detection and Analysis of Coherent Flow Structures in Geophysical Flows
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=32>

H23 Advancing Hydrologic Predictability in a Changing Environment through Interdisciplinary Synthesis
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=702>

MR09 Diffusion, Defects and Transport Properties in Geomaterials
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=574>

NG08 Active Monitoring in Solid Earth Geophysics
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=460>

S14 Advances in Signal Processing Methods for Seismology
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=14>

S19 Multiple Wave Scattering Across Length Scales in the Earth
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=515>

V07 Magma Fracture in Lava Domes and Conduits
<http://www.agu.org/meetings/fm07/?content=search&show=detail&sessid=101>

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2. 2007 Joint Assembly AGU Near-Surface Geophysics Focus Group Outstanding Student Paper Awards

Aaron Regberg, Pennsylvania State University, University Park PA, USA

TITLE: Electrical Signatures Associated with Abiotic and In Vitro Dissimilatory Iron Reduction.

ABSTRACT: Several researchers have described anomalous electrical signatures associated with bacterial activity in anoxic zones in aquifers containing organic contaminants. It is thought that these signals can be attributed to (bio)geochemical changes caused by the oxidation of organic contaminants and the reduction of associated species like iron oxides. We report laboratory observations of changes in electrical conductivity (EC) that can be attributed to specific (bio)geochemical reactions involving reductive dissolution of iron oxides enzymatically and onenzymatically. Abiotic reduction of

ferrihydrite by ascorbic acid in batch experiments causes a cumulative 20-40% increase in measured conductivity, (EC increases by ~300 ?S/cm). This change can be attributed to a decrease in conductivity (? EC) from increasing proton activity (? pH = 3.25 --> 5.07, ? EC = -200 ?S/cm) and an increase in dissolved Fe(II) (? [Fe] = 2.2 - 3.3 mM, ? EC = 400-700 ?S/cm). Conductivity is presumably unaffected by Fe(II) sorbed to the ferrihydrite. Rates calculated from this method are comparable to literature rates for similar experiments. In a similar //in vitro// system, total membrane fractions from //Shewanella oneidensis// MR-1 were used to reduce ferrihydrite in the presence of formate and HEPES buffer. A 10-15% increase in conductivity was observed in the batch experiment (? EC = ~280 ?S/cm). This ? EC is attributed to an increase in the concentration of de-protonated HEPES as well as carbonate ion as formate is oxidized. Fe(II) released in this system is quickly sorbed onto the ferrihydrite surface and is not thought to change conductivity.

Despite the sorption of iron in these in vitro experiments, conductivity changes measurably and documents the rate of the reaction. Accessory changes like buffer de- protonation play an important role in interpreting the electrical signals caused by dissimilatory iron reduction. In order to accurately interpret field data it is necessary to anticipate these changes and attempt to monitor them chemically. Through this work we hope to link chemical changes caused by bacterial activity in the lab to electrical anomalies measured in the field. By quantifying the changes in conductivity, we will investigate rates and distributions of bacterial activity at the field scale.

Peter Schillig, The University of Kansas, Lawrence KS, USA

TITLE: Using Groundwater Point Velocity Probes and Ground Penetrating Radar to Investigate Microbially Mediated Changes in Flow Properties of a Contaminated Aquifer.

ABSTRACT: In the practice of aquifer remediation, groundwater velocity is an essential parameter for determining contaminant fate and transport, and calculating residence times for passive treatment technologies such as reactive barriers. The point velocity probe (PVP), was recently developed to directly measure centimeter-scale groundwater velocities. The PVP velocity estimates are based on a mini tracer-test completed around the circumference of a small cylinder emplaced in the aquifer. Over the past decade, experience with natural attenuation studies has documented spatial and temporal changes in the transport properties of porous materials associated with biological processes. The development of the PVP instrument raises the possibility of measuring velocity changes associated with biological activity in porous media. The PVP functions without a well and therefore requires no calibration.

Also, velocity calculations are independent of Darcy?s Law, thus eliminating the need for hydraulic gradients that can usually only be measured over scales much larger than those of local microbial effects.

Field and laboratory studies confirm the PVP consistently and accurately measures groundwater velocity in porous media. An array of multilevel PVPs instrumented throughout a flow gate in the Borden aquifer coupled with borehole radar tomographic methods were consistent in identifying changes in spatial heterogeneities apparently associated with the evolution of a petroleum hydrocarbon plume. The hydrocarbons were released into the aquifer and then subject to stimulated biodegradation using oxygen release compound (ORC) in wells up-gradient of the PVP array. Observed temporal changes in the heterogeneous properties of the Borden aquifer were attributed to enhanced biological activity with changing groundwater velocities corresponding spatially to areas of ORC application and greatest plume attenuation. To compliment PVP and radar field observations, a large-scale laboratory experiment is underway investigating both biological growth and activity as mechanisms for flow and dielectric property variations in the contaminated aquifer material.

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3. EEGS June issue of FastTIMES available online

The June issue of FastTIMES is currently available for free download from the Environmental and Engineering Geophysical Society website (www.eegs.org <http://www.eegs.org/>). There are items that may be of interest to NS members, including calls for nominations for the Frischknecht and new Early Career awards, and a request for input into the SAGEEP 2008 technical program. It's best to download the document to a computer and then view it with Adobe Reader rather than viewing it within the browser window.

The deadline for material for the September issue is August 29, so if you have anything you wish to contribute, please send the submissions to Jeff Paine, (jeff.paine@beg.utexas.edu <mailto:jeff.paine@beg.utexas.edu>) President, EEGS.

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4. Biogeophysics Career Research Scientist Position at Lawrence Berkeley National Laboratory

The Earth Science Division conducts basic and applied research focused

on hydrological, geological, and biogeochemical properties and processes that are important to environmental remediation, climate change and carbon sequestration, fossil fuel production, and renewable energy. The incumbent will conduct basic and applied geophysical and geomicrobiolgical research geared primarily toward environmental remediation and renewable energy.

Duties: Conduct laboratory, field, and/or theoretical investigations to explore the potential of geophysical methods for providing information about biogeochemical properties and processes, with a particular emphasis on electrochemical phenomena. Provide integrated support for a wide variety of projects including: field site development, data acquisition and interpretation, and assimilation of microbiological, geochemical, and geophysical datasets. Present research at scientific conferences and publish research results in peer-reviewed journals. Develop proposals and provide mentorship as needed to develop a leading biogeophysics team.

Qualifications: A Ph.D. in earth or environmental sciences, with an outstanding record of original and high-quality research or demonstrated potential for developing such a record. Demonstrated experience in the development and use of a wide range of geophysical methods for exploring biogeochemical processes, such as electrical, acoustic and electromagnetic approaches. Ability to work successfully within multi-disciplinary research teams. Proficiency in using a wide variety of analytical techniques for quantifying biogeochemical processes, such as ion chromatography, ion coupled plasma, electron microscopy, and x-ray diffraction. Familiarity with environmental remediation approaches and problems.

Information about the Earth Science Division is given at
http://www-esd.lbl.gov/

Information about the Environmental Remediation Program at LBNL is given at http://www-esd.lbl.gov/ERT/index.html

Submit an application to position 20815 through the LBNL job site
http://jobs.lbl.gov/LBNLCareers

To contribute material to the NS-letter e-mail before the first of the month to:

George Tsoflias tsoflias@ku.edu <mailto:tsoflias@ku.edu>

GUIDELINES FOR SUBMISSIONS:

All members are welcome to submit content of interest to the NS community. Please keep messages brief and provide contact information and (if available) a hyperlink for additional information. AGU requests formatting of e-mail messages to be as simple as possible (no bold characters (use ALL CAPS instead), no color font, or other special formatting of text and paragraphs) to ensure compatibility with e-mail recipients outside the US. Do not submit e-mail attachments for distribution.