GG610
Pop Up Slides
2/10/2012

Standoff Biofinder for planetary exploration with fast detection

- Remote and fast method, wide area
- Key property: short lifetime of bio-fluorescence / long lifetime of mineral fluorescence

The biomaterials standout as bright objects due to strong fluorescence.


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Effects of variable magma supply on mid-ocean ridge magmatic processes

Alice Colman

- Spreading rate often used as proxy for magma supply at mid-ocean ridges
- At Galápagos Spreading Center, magma supply increases with proximity to Galápagos hotspot, at constant spreading rate
- We use lava compositions, crystallinity, and microtextures of samples from two study sites
- At high magma supply, evidence for more persistent, shallow, melt-rich magma chambers
- At low magma supply, magma chambers are apparently deeper, and present only intermittently

Elevated CO₂ on Plant Biomass

Two-parameter rectangular hyperbola for the total plant (A), above-ground (B), and below-ground (C) biomass with individual observations marked as open diamonds. Filled diamonds are observations of 23 herbaceous species from Hunt et al. (1991, 1993) with biomass increase curves, where the dashed lines are extrapolated values. a-e are previous results for root crops at elevated pCO₂ (a, Daucus carota, carrot; b, Raphanus sativus, radish; c, Beta vulgaris, sugar beet; d, Ipomoea batatas, sweet potato; e, Solanum tuberosum, potato)
Weighed Analyzed
(powder, fused bead, wt%, wt%)

SiO₂ 49.20 39.54
TiO₂ 0.51 1.87
Al₂O₃ 5.65 6.63
Cr₂O₃ 0.71 0.58
FeO 16.72 16.14
MnO 0.48 0.58
MgO 18.93 23.78
NiO 0.03 0.0024
CaO 6.81 7.73
Na₂O 0.64 0.047
K₂O 0.02 0.0015
P₂O₅ 0.30 3.26
Total 100.00 100.16

Discrepancies remain unexplained
Further analyses in progress
- Pre-conditioning of material
- Fusion of second bead

Sometimes experimental petrology is as much about the process as the results.

Raman Spectroscopy
Scattered light is shifted, giving vibrational energy spectrum
Detects organic molecules & minerals
Distinguishes between polymorphs

Spectral Images
Alteration vein in CR2 carbonaceous chondrite EET 92161

Emily First
Mystery of the Glass Bead

Patrick Gasda - Graduate Seminar
Samples courtesy GG mineral collection
Aegir: A Hole in the North Atlantic LIP

Heterogeneous Aqueous Alteration in CR Chondrites
Christie Jilly

CR Chondrites:
◊ Preserve record of earliest Solar System processes
◊ Mineralogy from anhydrous to completely hydrated
◊ Implications for early geologic and biologic evolution

Various styles of alteration present suggest localized and large-scale variation in alteration conditions
Applying linear inversion techniques to constrain plume sedimentation from tephra deposits

Case study of Ruapehu 17 June 1996 eruption, New Zealand

Revising the Absolute Plate Motion of Africa

- The Africa plate is a key player in global plate motion circuit models, but is not well resolved
- A new model of the African absolute plate motion can be made using both geometry and time constraints
- The consequences of the revised model can be tested in the global plate circuit
- It will be incorporated in and distributed through GPlates
Laser Space Weathering Simulation

Background
Space weathering bombards airless surfaces, masking the underlying pristine geology.

Objective
Understanding the physical (SMFe, npFe, agglutinates) and spectral effects (darkening, reddening, elemental absorption band fluctuations), allows removal of SW background from the remote sensing data.

Method
A high-powered laser was used to simulate μ-meteorite impact energies in common minerals revealing discrete physical and spectral changes.

Fundamental Solution of a Classic Problem in Geology, and Implications

- Topic: Sheeting Joints (surface-parallel mode I cracks)
- Conventional explanation (“unloading”) untenable
- High compression \((P)\) along a curved \((k)\) convex surface required:

\[
k_1 P_1 + k_2 P_2 > \rho g \cos \beta
\]
- Fundamental solution, broadly applicable

Sheeting Joints
Tenaya Canyon, Yosemite NP

S.J. Martel
The Norwegian Offshore Industry 2004-2020
Segments in Billion USD

Carolyn Parcheta

ERUPTIONS

Quantification  Modeling  Eruption Dynamics  Hazard Mitigation  Wind
The Optical Constants of Olivine

David Trang

• Modeling Fo-content of olivine from spectra is complicated by various variables (e.g., mixing).
• Radiative transfer models reduces the number of complexity for modeling, but require optical constants.
• We acquire optical constants of olivine as a function of Fo-content for spectral modeling.

<table>
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<th>A(Fo)²</th>
<th>B(Fo)</th>
<th>C</th>
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<td>Width 1µm</td>
<td>-2.0E-05</td>
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<td>Width 1.2µm</td>
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</table>

• Optical constants are based on Gaussian parameters and equation for a line.
• Modeled 36 spectra with various Fo-content.
Locating and quantifying coastal groundwater discharges originating from a wastewater reclamation facility

Problem
Semi-treated wastewater injection reaches coast in Lahaina, Maui

Objective
Quantify flux, rate, and composition of discharge from suspect submarine seeps (previous studies)

Methods
Mass balance of naturally occurring radionuclides

Results
- Submarine seep volumes account for up to 88% of injection volumes
- It is possible that injectate may escape via other groundwater outlets

Fault growth at the front of the Andean orogenic wedge
Jonathan R. Weiss1 Benjamin A. Brooks1 Gustavo Vergani2
1. University of Hawaii 2. Pluspetrol South America

Fault growth at the front of the Andean orogenic wedge

Modification from Burbank et al. 1996

... learn more on March 16th ...
Crash Course in Os-Related Characteristic Impacts