

Department of Geological Sciences
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BACKGROUND AND EDUCATION

BORN: 31 January 1978, St. Petersburg, Russia

CITIZENSHIP: U.S. citizen

EDUCATION:

University of Arizona, Tucson, AZ

August 2000 – May 2006; Doctor of Philosophy (Planetary Sciences,
Molecular and Cell Biology minor)
GPA: 3.78/4.00

Clarkson University, Potsdam, NY

August 1995 – May 1998; Bachelor of Science (Biology), with honors
GPA: 3.62/4.00

DISSERTATION:

Title: Impact-Induced Hydrothermal Activity on Earth and Mars

Summary: A numerical modeling approach was used to investigate the dynamics, lifetimes, and biological habitability of impact-induced hydrothermal systems in a range of craters on Earth and Mars. Models were constrained using mineralogical, geochemical, and isotopic data, primarily from the Chicxulub Scientific Drilling Project.

Dissertation Advisor: David A. Kring

POST-DOCTORAL EMPLOYMENT

RESEARCH INTERESTS:

Mars, impact cratering, thermal modeling, hydrothermal systems, origin and evolution of life, detection of biomarkers, analytical geochemistry.

POSITIONS:

NASA Postdoctoral Program Fellow, August 2007 – present

University of Colorado, Boulder, CO

Computer modeling, laboratory analyses, and field work are used to study conditions on Earth during the period of Late Heavy Bombardment, approx. 3.9 billion years ago. Computer modeling is carried out at the University of Colorado, laboratory work (ion microprobe analysis of ancient zircons) is carried out at University of California - Los Angeles, and field work is conducted at several locales throughout the world, including Canada, Australia, and Greenland.

Postdoctoral Researcher, August 2006 – August 2007

Southwest Research Institute, Boulder, CO

Conducted computer modeling of endogenic hotspots on Europa. Constructed a thermal model of the south pole vents of Enceladus, constrained with data from the CIRS instrument onboard the Cassini spacecraft. Analyzed data from the New Horizons Jupiter encounter, and determined temperatures of Io volcanoes. Assisted with setup of a biotechnology lab.

GRANTS / RESEARCH FUNDING:

NASA Postdoctoral Program award (2007-2009), *Habitability of Early Earth: Thermal Modeling of the Lithosphere During the Late Heavy Bombardment*, **Principal Investigator**.
NASA award NNX07AV53G (2007-2010), *Exploring the Late Heavy Bombardment*, **Collaborator**.

OTHER PROFESSIONAL ACTIVITIES AND SKILLS

TEACHING EXPERIENCE (GRADUATE STUDENT):

NATS 101, Planet Earth: Evolution of a Habitable World, Spring 2006 (Renu Malhotra):
Homework and test grading, administering labs, office hours
NATS 102, The Universe And Humanity: Origin And Destiny, Spring 2004 (John S. Lewis):
Occasional lectures, homework and test grading, administering labs, office hours, review sessions, website maintainance

PROFESSIONAL ORGANIZATIONS:

American Geophysical Union (AGU)
Geochemical Society

COMPUTING SKILLS:

Operating Systems: UNIX, MS Windows, Macintosh
Analytical Software: Maple, OpenDX, IDL, ISIS, Excel, HYDROTHERM, Tecplot, HEATING, GNU Plot, Origin, Generic Mapping Tools
Programming Languages: C, FORTRAN, Perl
Word Processing & Presentation: MS Word, LaTeX, HTML, Adobe Photoshop, MS PowerPoint

FELLOWSHIPS AND HONORS

Fall 2007 NASA Postdoctoral Program Fellowship (\$56,000 per year)
Fall 2005 Imaging Fellowship (\$7,500, merit-based), University of Arizona
Fall 2005 Registration Scholarship (\$3,000, merit-based), University of Arizona
Summer 2005 NASA Mars Exploration Program conference travel award
Spring 2005 LPSC/GSA Stephen E. Dwornik Award Student Paper Honorable Mention
Fall 2004 University of Arizona Student Showcase winner in the Graduate science category
Fall 2004 NASA Mars Exploration Program conference travel award
Spring 2004 Galileo Circle Scholarship (\$1,000, merit-based), University of Arizona
Spring 2004 Graduate and Professional Student Council conference travel award
Spring 2002 Registration Scholarship (\$3,000, merit-based), University of Arizona
Fall 2001 Graduate College Fellowship (\$10,000, merit-based), University of Arizona
Spring 1998 Presidential Scholar, Clarkson University

PREVIOUS RESEARCH EXPERIENCE

Graduate Research Assistant, Summer 2001 – Spring 2006

University of Arizona, Tucson, AZ

Used a numerical modeling approach to investigate the dynamics, lifetimes, and biological habitability of impact-induced hydrothermal systems in a range of craters on Earth and Mars. Constrained models with mineralogical, geochemical, and isotopic data analyses of samples from terrestrial craters. Evaluated methods for the interpolation of data from Mars Orbiter Laser Altimeter (MOLA) instrument onboard the Mars Global Surveyor spacecraft, and used MOLA data to analyze Martian valley networks.

Bioinformatics Assistant, February 2000 – August 2000

Metabolex, Inc., Hayward, CA

Analyzed, annotated, clustered, and archived DNA sequence data. Programmed in Perl, created and maintained internal website, completed all projects with minimal supervision.

Research Associate, September 1998 – February 2000

Metabolex, Inc., Hayward, CA

Carried out inoculations, DNA minipreps, sequencing reactions, gel loading, and data extraction as part of a high-throughput sequencing group. Designed protocols and wrote software for several custom projects.

Research Assistant, May 1998 – August 1998

Cornell University Theory Center, Ithaca, NY

Assisted with computer modeling of the sun's convection zone. Used FORTRAN and IBM Data Explorer on an IBM SP2 supercomputer for programming and data rendering. Created visualizations on a Macintosh platform.

Research Intern, May 1997 – August 1997

Adirondack Biomedical Research Institute, Lake Placid, NY

Worked on molecular characterization of Cellular – Retinaldehyde Binding Protein (CRALBP) using mutagenesis, mass spectroscopy, isotopic labeling, protein purification, SDS-PAGE, and Nuclear Magnetic Resonance (NMR).

PUBLICATIONS

JOURNAL ARTICLES:

Abramov, O. and S.J. Mojzsis, Microbial habitability of the Hadean Earth during the late heavy bombardment, *Nature*, 459, 419-422.

Abramov, O. and J.R. Spencer, Endogenic heat from Enceladus' south polar fractures: New observations, and models of conductive surface heating, *Icarus*, 199, 189-196, 2009.

Abramov, O. and J.R. Spencer, Numerical modeling of endogenic thermal anomalies on Europa, *Icarus*, 195, 378-385, 2008.

Spencer, J.R., S.A. Stern, A.F. Cheng, H.A. Weaver, D.C. Reuter, K. Retherford, A. Lunsford, J.M. Moore, **O. Abramov**, R.M.C. Lopes, J.E. Perry, L. Kamp, M. Showalter, K.L. Jessup, F. Marchis, P.M. Schenk, and C. Dumas, Io Volcanism Seen by New Horizons: A Major Eruption of the Tvashtar Volcano, *Science*, 318, 240-243, 2007.

Abramov, O., and D.A. Kring, Numerical modeling of impact-induced hydrothermal activity at

the Chicxulub crater, *Meteor. Planet. Sci.*, 42, 93-112, 2007.

Abramov, O., and D.A. Kring, Impact-induced hydrothermal activity on early Mars, *J. Geophys. Res.*, 110, E12S09, doi:10.1029/2005JE002453, 2005.

Abramov, O., and D.A. Kring, Numerical modeling of an impact-induced hydrothermal system at the Sudbury crater, *J. Geophys. Res.*, 109, E10007, doi:10.1029/2003JE002213, 2004.

Abramov, O., and A.S. McEwen, An evaluation of interpolation methods for MOLA data, *Int. J. Rem. Sens.*, 25(3), 669-676, 2004.

CONFERENCE PRESENTATION ABSTRACTS:

Abramov, O., and S.J. Mojzsis, Thermal effects of impacts on the Hadean Earth, *Goldschmidt Conference Abstracts*, A5, 2009.

Abramov, O., Modeling hydrothermal activity associated with martian impact craters: an overview, *Workshop on Modeling Martian Hydrous Environments*, abstract 4029, 2009.

Abramov, O., and S.J. Mojzsis, Microbial habitability of the Hadean Earth during the Late Heavy Bombardment, *Lunar Planet. Sci. XXXX*, abstract 2379, 2009.

Abramov, O., and S.J. Mojzsis, Thermal State of the Lithosphere During Late Heavy Bombardment: Implications for Early Life, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract V11E-08, 2008.

Mojzsis, S.J., **O. Abramov**, T.M. Harrison, D.A. Kring, H.F. Levison, D. Trail, and E.B. Watson, Exploring for early bombardments on Earth from pre-3.85 Ga thermal effects recorded in Hadean zircons - a status report, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract V11E-07, 2008.

Abramov, O., and S.J. Mojzsis, Thermal State of the Terrestrial Lithosphere During the Late Heavy Bombardment: Implications for Habitability, *Early Solar System Impact Bombardment*, abstract 3019, 2008.

Mojzsis S.J., **O. Abramov**, T.M. Harrison, D.A. Kring, H.F. Levison, D. Trail, and E.B. Watson, Exploring for Early Bombardments on Earth from Pre-3.83 Ga Thermal Effects Recorded in Hadean Zircons — A Status Report, *Early Solar System Impact Bombardment*, abstract 3025, 2008.

Abramov, O., and S.J. Mojzsis, Thermal state of the lithosphere during Late Heavy Bombardment, *Geochim. Cosmochim. Acta*, 72(12), A2, 2008.

Abramov, O., and S.J. Mojzsis, Thermal Modeling of the Terrestrial Lithosphere During the Late Heavy Bombardment, *Lunar Planet. Sci. XXXIX*, abstract 1036, 2008.

Spencer, J.R., S.A. Stern, K. Retherford, **O. Abramov**, D. Reuter, A. Cheng, H.A. Weaver, A. Lunsford, J. Moore, J. Perry, R.M. Lopes, L. Kamp, and New Horizons Science Team, New Horizons Observes Io's Volcanic Activity, DPS meeting #39, *Bull. Am. Astron. Soc.*, 39, p. 437, 2007.

Spencer, J.R., S.A. Stern, J. Moore, R.M.C. Lopes, K. Retherford, **O. Abramov**, M. Showalter, A.F. Cheng, H.A. Weaver, D.C. Reuter, A. Lunsford, C. Olkin, H. Throop, and K.L. Jessup, New Horizons Observations of Io's Volcanism, *Workshop on Ices, Oceans, and Fire: Satellites of the Outer Solar System*, abstract 6030, LPI Contribution No. 1357, p.134-135, 2007.

Abramov, O., and J.R. Spencer, South Polar Thermal Anomaly on Enceladus: Modeling and Observations, *Lunar Planet. Sci. XXXVIII*, abstract 2343, 2007.

Abramov, O., and J.R. Spencer, Numerical Modeling of Endogenic Thermal Anomalies on Europa, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract P23E-0101, 2006.

Spencer, J.R., J.C. Pearl, M. Segura, **O. Abramov**, and C.C. Team, Heat Flow From the South Pole of Enceladus: Spatial Distribution and Power Supply, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., Abstract P22B-05, 2006.

Abramov, O., and D.A. Kring, Numerical modeling of impact-induced hydrothermal activity at

- the Chicxulub crater, *Lunar Planet. Sci. XXXVII*, abstract 2102, 2006.
- Abramov, O.**, and D. A. Kring, Impact-induced hydrothermal activity at central-peak and peak-ring craters on early Mars, *Workshop on the Role of Volatiles and Atmospheres on Martian Impact Craters*, Laurel, Maryland, abstract 3028, 2005.
- Abramov, O.**, and D.A. Kring, Impact-induced hydrothermal activity on early Mars, *Lunar Planet. Sci. XXXVI*, abstract 1048, 2005.
- Abramov, O.**, and D.A. Kring, Numerical modeling of impact-induced hydrothermal activity on early Mars, *2nd Conf Early Mars*, abstract 8062, 2004.
- Abramov, O.**, and D.A. Kring, Impact-generated hydrothermal activity at Gusev Crater: Implications for the Spirit mission, *Lunar Planet. Sci. XXXV*, abstract 1976, 2004.
- Abramov, O.**, and D.A. Kring, Impact-induced hydrothermal system at the Sudbury crater: Duration, temperatures, mechanics, and biological implications, *Lunar Planet. Sci. XXXV*, abstract 1697, 2004.
- Abramov, O.**, and D.A. Kring, Numerical modeling of the impact-induced hydrothermal system at Sudbury crater, *Eos Trans. AGU, 84(46)*, Fall Meet. Suppl., Abstract P52A-0477, 2003.
- Abramov, O.**, and D.A. Kring, Finite-difference modeling of impact-induced hydrothermal systems, *Lunar Planet. Sci. XXXIV*, abstract 1846, 2003.
- Abramov, O.**, Richardson, J., and A.S. McEwen, Altimetry-based analysis of valley systems on Mars, *Eos Trans. AGU, 83(47)*, Fall Meet. Suppl., Abstract P51B-0361, 2002.
- Abramov, O.**, and A.S. McEwen, An evaluation of interpolation methods for MOLA data, *Eos Trans. AGU, 82(47)*, Fall Meet. Suppl., Abstract P42A-0567, 2001.