James P. Cassanelli, Ph.D.

Data Geoscientist – Planetary Geophysics Doctorate

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EDUCATION & RESEARCH

Brown University: Ph.D. in Geology and Geophysics   2013 – 2019

Brown University: M.Sc. in Geology and Geophysics   2013 – 2015

Emphasis on: planetary science, geophysics, numerical modeling
Thesis topic: Geophysical and numerical analysis of planetary geologic processes, primarily martian hydrology.

Specific research projects included: (1) Modeling thermal and physical properties of ice sheets on early Mars. (2) Numerical modeling of lava-ice interactions. (3) Modeling cooling and crystallization of lunar impact melt deposits. (4) Structural analysis of lunar impact basins through forward gravity modeling. (5) Modeling sedimentary diagenetic conditions produced on Mars. (6) 3-D numerical modeling of permafrost evolution in the Antarctic Dry Valleys. (7) Modeling and assessing sediment transport and fluvial system erosion/formation on Mars.

University of Connecticut: M.Sc. in Geology and Geophysics   2009 – 2011

University of Connecticut: B.S. in Geology and Geophysics   2005 – 2009

Emphasis on: hydrogeology, geology, geophysics
Thesis topic: Regional scale geostatistical analysis of spatial and temporal trends in groundwater salinity.

Research activities focused on geostatistical investigation of the broad-scale impact of road salt application on the groundwater resources of the state of Connecticut. Collected and analyzed water quality data spanning the last century to assess temporal and spatial trends in the distribution of salt within Connecticut's groundwater and correlations to known sources of salt contamination. This work was supported by field investigations of temporal and spatial trends of groundwater salinity in local water quality monitoring wells.

PROFESSIONAL EXPERIENCE

Geologist – Occidental Petroleum Corporation (formerly Anadarko)   March 2019 – Present

- Generated maps to rank TX Delaware Basin asset acreage and refine development strategies through geostatistical analysis utilizing unsupervised machine learning clustering. Results adopted by company to guide >$1 billion development program.
- Developed multivariate analysis models to forecast/optimize well production as part of the Analytics & Data Science team.
- Enhanced drilling efficiency through statistical predictions derived from a series of tools developed using Python and SQL to collect, organize, store, and analyze previously un-used interpretation data in conjunction with drilling data.
- Greatly reduced manual workload required for completions design by developing an automated Python model to process downhole petrophysical data through stochastic optimization to automatically customize well completions configurations.
- Improved operational quality of life, workflow efficiency, and facilitated interdisciplinary communication by producing several software tools through the integration of Python with geologic software packages.
- Ensured optimal placement of ~20 Delaware Basin horizontal wells with average in-zone percentage >90% through interpretation of real-time geologic and drilling data.
- Regional and local scale geologic structure and hazard mapping to generate pre-drill geologic prognoses.
- Process post-drill geologic and drilling data to document challenges and extract lessons-learned.
- Collaborate with development geologists, drilling engineers, and field staff to facilitate drilling activities.

Geosciences Intern – Anadarko Petroleum Corporation   May 2018 – August 2018

- De-risked a new ventures Cretaceous basin floor fan play through a comprehensive, basin-wide analogue analysis.
- Characterized basin petroleum system elements and developed an integrated basin depositional model through regional interpretation of seismic and well data.

- Collaborated with subject matter experts to refine and test source and reservoir provenance models.
- Outlined recommendations for business decisions in company acreage through commercial overview of analogue basin.

Hydrogeologist – Leggette, Brashears, and Graham Inc.   June 2010 – April 2013

- Collected and documented critical data for water supply exploration and environmental remediation projects.
- Conducted data and sample analyses and prepared technical reports for clientele and regulatory agencies.
- Supervised drilling, installation, and testing of water supply, monitoring, and remediation wells.
- Completed projects on time and under budget by consistently maintaining a billable time percentage >90%.
- Supervised and documented hazardous waste site remediation projects.
- Worked in a team-based environment maintaining close communications with colleagues and managers.

COMPUTATIONAL COMPETENCIES ─────────────────────────

Languages – Python | MATLAB | JavaScript/HTML/CSS | SQL | Git | some experience: C++, Fortran, VB, R

Programs – ArcGIS | DecisionSpace Geo. | StarSteer | Petra | Petrel | SAS JMP | ADOBE suite |

Mathematica | ERDAS Imagine | ENVI | AQTESOLV | Surfer/Grapher | MS Office (incl. Access)

Modeling and Geoscience

- Extensive experience in scientific computing, numerical modeling (finite difference & volume), and quantitative analyses.
- Proficient in construction and application of geologic models (1-D, 2-D, 3-D) to simulate physical processes/properties (*e.g.* heat flow, fluid flow, compaction, phase changes, convection, gravitational anomalies) and solve scientific problems.
- Skilled in utilization/visualization/interpretation of geospatial, geologic, geophysical, remote sensing, and other datasets.
- Application of geostatistical and geophysical analyses to answer business and scientific questions.

Data Science and Analytics

- Experienced in manipulation, transformation, processing, and storage of large data sets (Python, SQL, Access, Excel).
- Application of data science and statistical practices, including supervised and unsupervised machine learning models, to guide informed business decision-making.
- Proficient in application of coding and modeling skills to derive actionable insights through data analytics and visualizations.
- Created and maintain a coding/data science personal blog: *jpcassanelli.com/Blog*

TECHNICAL COMPETENCIES ─────────────────────────

Hydrogeology/Hydrology

- Supervision and analysis of aquifer characterization tests including: low flow sampling, slug & pump testing.
- Professional experience in geologic field operations and oversight including well drilling and remediation activities.
- Aqueous geochemistry, well profiling, bore logging, soil characterization, laboratory chemical analyses, water quality monitoring, tracer studies, installation and operation of monitoring equipment, well planning and design.
- Characterization of surficial hydrology: drainage basin assessment, fluvial system properties, discharge and erosion estimates.

Geology

- Regional and local scale geologic mapping (structure, isopach/isochore, geologic properties, heat flow).
- Interpretation, correlation, and evaluation of petrophysical logs.
- Experienced in characterization and interpretation of geomorphologic features.
- Experience in basin and petroleum system analysis including: seismic interpretation and mapping, geochemical source rock evaluation, subsurface lithology and poroperm characterization, reservoir provenance characterization.

Geophysics

- Adept at analytical and numerical modeling of physical processes including heat and fluid (surficial and porous media) flow.
- Application of quantitative analyses to evaluate geophysical properties (*e.g.* density, porosity, temperature, conductivity).
- Experience working with potential field data to evaluate basin structure.

General

- Experience in the integration of disparate data (in type and scale) and models to address scientific and business problems.
- Significant experience in technical writing and communication including publication of >10 papers and delivery of presentations at numerous national and international science and industry conferences.

FIELD EXPERIENCE

Deepwater Reservoir Presence and Architecture: Brushy Canyon Formation, West Texas/New Mexico.	*October 2019*
PBS-SEPM Young Professionals and Intern Delaware Basin Geology Trip, West Texas.	*June 2019*
Sedimentary cycle course field trip: Permian Basin, New Mexico and West Texas.	*June 2016*
3rd Nordic-Hawaii NASA Astrobiology Institute Summer School: Iceland.	*July 2015*
Brown University geology graduate summer field trip: Nova Scotia, Canada.	*August 2013*
Hydrogeology consulting field experience: Connecticut and New York	*2010 – 2013*
Spring field trip course in structural geology, sedimentology, and geomicrobiology: Puerto Rico.	*March 2008*
Field problems in Earth structure: New York and Vermont.	*October 2007*

TEACHING EXPERIENCE

Introductory & Graduate Level Planetary Science Teaching Assistant – Brown University: 4 Semesters

- Conducted introductory planetary science course lab sections including petrographic inspection of lunar rock samples.
- Delivered guest lectures on the hydrology and climate of Mars in graduate level planetary science seminar courses.

Introduction to Geology Teaching Assistant – University of Connecticut: 2 Semesters

- Taught introductory geology lab classes and provided supplementary instruction to students.
- Assisted in the development of lab exercises, prepared and delivered lectures, and assessed and recorded student grades.

AWARDS & CERTIFICATIONS

Occidental Petroleum Thanx Award – For work on machine learning project	*February 2020*
Anadarko Employee Excellence Award – For operational performance	*September 2019*
Anadarko Employee Excellence Award – For producing an automated completions design tool	*August 2019*
Lunar Planetary Institute Career Development Award – For outstanding conference abstract	*March 2018*
Rocky Mountain Rendezvous (AAPG/SEG/UWYO) – 2nd Place Poster Award (out of ~75 presentation)	*September 2017*
Brown University Dissertation Fellowship recipient – For research excellence	*July 2017*
Sigma Xi Honor Society Nominee – For academic performance	*February 2016*
Brown University First Year Fellowship recipient	*June 2013*
OSHA 8 Hr. HAZWOPER Supervisor certified	*June 2011*
OSHA 40Hr. HAZWOPER certified (last refreshed January, 2013)	*December 2009*
Environmental Professionals of Connecticut scholarship recipient in environmental sciences	*September 2009*
University of Connecticut Dean's List – For academic performance	*2008, 2009*
New England Scholar – For academic excellence	*2008*

PROFESSIONAL AFFILIATIONS & SERVICE

Houston Geologic Society NeoGeos – Committee Member: assist in planning and holding society events	*2020 – Present*
Houston Geologic Society (HGS) – Member	*2020 – Present*
Young Professionals in Energy (YPE) – Member	*2019 – Present*
West Texas Geological Society (WTGS) – Member	*2019 – Present*
Peer reviewer: Journal of Environmental Quality, Icarus, Geology, Geosciences, Water	*2017 – Present*
Elsevier Earth and Planetary Science book proposal reviewer	*March 2017*
American Geophysical Union (AGU) – Member	*2017 – Present*
American Association of Petroleum Geologists (AAPG) – Member	*2017 – Present*
Society of Exploration Geophysicists (SEG) – Member	*2017 – Present*
Society for Sedimentary Geology (SEPM) – Member	*2017 – Present*
Brown Univ. Geology Mentor Representative – Instituted and oversaw improved geology mentoring program	*2016 – 2019*

Brown Univ. Geology Club President – Organized and led meetings, planned events, led faculty interaction   *2015 – 2016*
Geological Society of America (GSA) – Student Member   *2007 – 2009*

SELECTED CONTINUING EDUCATION

Introduction to Energy Machine Learning (Daytum online course)	*March 2020*
Introduction to Geomodeling (Occidental In-house training)	*February 2020*
Petroleum Economics and Risk Analysis (Nautilus)	*November 2019*
Unconventional Petrophysics Introduction (StarSteer User Meeting)	*October 2019*
Probability (Harvard)	*October 2019 – Present*
JMP Software: ANOVA and Regression	*August 2019*
JMP Software: Data Exploration	*July 2019*
Applied Subsurface Geological Mapping (Subsurface Consultants and Associates)	*June 2019*
Petrophysics Overview (Anadarko In-house training)	*June 2019*
Anadarko Data Scientist Curriculum (Anadarko In-house training)	*May 2019 – Present*
Introduction to Seismic (Anadarko In-house training)	*May 2019*
Reservoir Geomechanics (Stanford)	*March – June 2018*
Petroleum Exploration: A Field Example (AAPG/IRIS Series)	*January – February 2018*
What a Geologist Should Know about Petrophysics (AAPG/SEG/UWYO RMR)	*September 2017*
Permian Basin Geologic/Reservoir/Completion Models (AAPG)	*August 2017*
Basic Tools for Shale Exploration (AAPG)	*August 2017*
Geomodeling for Development and Production Geology (AAPG)	*August 2017*
Concepts and Applications in 3D Seismic Imaging (SEG)	*August 2017*
Geology and Geophysics in the Petroleum Industry (AAPG/IRIS Series)	*June – October 2017*
Geoscience Geophysical Short Course (ExxonMobil)	*February 2017*

PUBLICATIONS & PRESENTATIONS

Peer-reviewed Publications (*Google Scholar Profile*)

Cassanelli, J.P., and Head, J.W., (2019). Glaciovolcanism in the Tharsis province of Mars: Implications for regional geology and hydrology. *Planetary and Space Science*, 169, 45-69.

Rosenberg, E.N., Palumbo, A.M., Cassanelli, J.P., Head, J.W., and Weiss, D.K., (2019). The volume of water required to carve the martian valley networks: Improved constraints using updated methods. *Icarus*, 317, 379-387.

Cassanelli, J.P., and Head, J.W., (2018). Assessing the formation of valley networks on a cold early Mars: Predictions for erosion rates and channel morphology. *Icarus*, 321, 216-231.

Cassanelli, J.P., and Head, J.W., (2018). Large-scale lava-ice interactions on Mars: Investigating its role during Late Amazonian Central Elysium Planitia volcanism and the formation of Athabasca Valles. *Planetary and Space Science,* 158, 96-109.

Cassanelli, J.P., and Head, J.W., (2018). Formation of outflow channels on Mars: Testing the origin of Reull Vallis in Hesperia Planum by large-scale lava-ice interactions and top-down melting. *Icarus,* 305, 56-79.

Deutsch, A.N., Head, J.W., Ramsley, K.R., Pieters, C.M., Potter, R.W.K., Palumbo, A.M., Bramble, M.S., Cassanelli, J.P., Jawin, E.R., Jozwiak, L.M., Kaplan, H.H., Lynch, C.F., Pascuzzo, A.C., Qiao, L., Weiss, D.K., (2017). Science Exploration Architecture for Phobos and Deimos: The role of Phobos and Deimos in the future exploration of Mars. *Advances in Space Research,* 62(8), 2174-2186.

Weiss, D.K., Head, J.W., Palumbo, A.M., and Cassanelli, J.P., (2017). Extensive Amazonian-aged fluvial channels on Mars: Evaluating the role of Lyot crater in their formation. *Geophysical Research Letters*, 44(11), 5336-5344.

Cassanelli, J.P., and Head, J.W., (2016). Did the Orientale impact melt sheet undergo large-scale igneous differentiation by crystal settling? *Geophysical Research Letters*, 43(21), 11156-11165.

Cassanelli, J.P., and Head, J.W., (2016). Lava heating and loading of ice sheets on early Mars: Predictions for meltwater generation, groundwater recharge, and resulting landforms. *Icarus*, 271, 237-264.

Cassanelli, J.P., and Head, J.W., (2015). Firn densification in a Late Noachian "Icy Highlands" Mars: Implications for ice sheet evolution and thermal response. *Icarus*, 253, 243-255.

Cassanelli, J.P., Head, J.W., and Fastook, J.L., (2015). Sources of water for the outflow channels on Mars: Implications of the Late Noachian "Icy Highlands" model for melting and groundwater recharge on the Tharsis Rise. *Planetary and Space Science*, 108, 54-65.

Cassanelli, J.P., and Robbins, G.A., (2013). Effects of road salt on Connecticut's groundwater: A statewide centennial perspective. *Journal of Environmental Quality*, 42(3), 737-748.

Conference Proceedings

Cassanelli, J.P., Didi-Ooi, S., Taylor, S., and Turner, O., (2019). Unconventional completions stage design through automation-assisted "like-rock" targeting. *StarSteer User Meeting*.

Cassanelli, J.P., and Head, J.W., (2018). Assessing the formation of valley networks on a cold early Mars: Predictions for erosion rates and channel morphology. *49th Lunar and Planetary Science Conference*, Abstract 1124.

Cassanelli, J.P., and Head, J.W., (2018). Evaluating the role of large-scale lava-ice interactions during Elysium Planitia volcanism and the formation of Athabasca Valles. *49th Lunar and Planetary Science Conference*, Abstract 1125.

Head, J.W. et al., (2018). Volcanic ash (tephra) deposition as a mechanism for melting snow and ice in a late Noachian icy highlands climate. *49th Lunar and Planetary Science Conference*, Abstract 2246.

Ji, J. et al., (2018). Impact basin melt seas: Morphologic/morphometric evidence of geometry and cooling behavior from the lunar Orientale basin Maunder formation. *49th Lunar and Planetary Science Conference*, Abstract 2520.

Head, J.W. et al., (2018). Two oceans on Mars?: History, problems, and prospects. *49th Lunar and Planetary Science Conference*, Abstract 2194.

Cassanelli, J.P., and Head, J.W., (2018). Impact melt sheet composition, age, and igneous differentiation?: Commercial mission goals. *Lunar Science for Landed Missions Workshop*. Abstract LLW2018-28.

Cassanelli, J.P. (2017). Formation of valley networks in a cold and icy early Mars climate: Predictions for erosion rates and channel morphology. *2017 American Geophysical Union Fall Meeting*.

Cassanelli, J.P., and Head, J.W., (2017). Formation of valley networks in a cold and icy early Mars climate: predictions for erosion rates and channel morphology. *4th Conference on Early Mars*. Abstract 3020.

Cassanelli, J.P., and Head, J.W., (2017). Formation of the Reull Vallis outflow channel by large-scale lava-ice interactions and top-down melting. *48th Lunar and Planetary Science Conference*, Abstract 1188.

Cassanelli, J.P., and Head, J.W., (2017). Valley network formation in a "cold and icy" climate regime: Theoretical predictions for erosion rates and channel morphology. *48th Lunar and Planetary Science Conference*, Abstract 1191.

Denton, C.A., Head, J.W., and Cassanelli, J.P., (2017). Protonilus Mensae: Origin by contact and deferred melting associated with emplacement of late Noachian flood volcanism. *48th Lunar and Planetary Science Conference*, Abstract 2182.

Cassanelli, J.P., and Head, J.W., (2016). Did the Orientale impact melt sheet undergo large-scale igneous differentiation by crystal settling? *7th Planetary Cratering Consortium*.

Cassanelli, J.P., and Head, J.W., (2016). Did the Orientale impact melt sheet undergo large-scale igneous differentiation by crystal settling? *47th Lunar and Planetary Science Conference*, Abstract 1174.

Cassanelli, J.P., and Head, J.W., (2016). Lava heating and loading of ice sheets on early Mars: Predictions for meltwater generation, groundwater recharge, and resulting landforms. *47th Lunar and Planetary Science Conference*, Abstract 1176.

Ramsley, K.R. et al., (2016). Science exploration architecture for Phobos and Deimos: Are the moons of Mars in the critical pathway of human exploration of Mars? *47th Lunar and Planetary Science Conference*, Abstract 2345.

Cassanelli, J.P. et al., (2015). Ice sheet basal melting on Mars: Potential for long-term habitats. *3rd Nordic-Hawaii NASA Astrobiology Institute Summer School, Iceland*.

Cassanelli, J.P. et al., (2015). Sources of water for groundwater-fed outflow channels on Mars: Implications of the Late Noachian "Icy Highlands" model for melting and groundwater recharge. *46th Lunar and Planetary Science Conference*, Abstract 1529.

Cassanelli, J.P., and Head, J.W., (2015). Lava-loading of ice sheets in a Late Noachian "Icy Highlands" Mars: Predictions for meltwater generation, groundwater recharge, and resulting landforms. *46th Lunar and Planetary Science Conference*, Abstract 1533.

Head, J.W., and Cassanelli, J.P., (2015). Late Noachian-early Hesperian flood volcanism in Hesperia Planum: Large-scale lava-ice interactions and generation and release of meltwater. *46th Lunar and Planetary Science Conference*, Abstract 2250.

Cassanelli, J.P., and Head, J.W., (2014). Volcano-ice interactions in a Late Noachian "Icy Highlands" Mars: Implications for groundwater recharge and outflow channel water sources on the Tharsis Rise. *5th Moscow Solar System Symposium*.

Cassanelli, J.P., and Head, J.W., (2014). Firn densification on Late Noachian Mars: Implications for ice sheet formation and thermal characteristics. *8th International Conference on Mars*, Abstract 1032.

Cassanelli, J.P., and Head, J.W., (2014). Firn densification on Late Noachian Mars: Implications for ice sheet formation and thermal characteristics. *45th Lunar and Planetary Science Conference*, Abstract 1265.

Cassanelli, J.P. et al., (2014). Late Noachian "Icy Highlands" Mars: Implications for melting and groundwater recharge across the Tharsis Rise. *45th Lunar and Planetary Science Conference*, Abstract 1501.

Head, J.W., and Cassanelli, J.P., (2014). Valley network formation: Predictions for fluvial processes in a late Noachian icy highland climate regime. *45th Lunar and Planetary Science Conference*, Abstract 1413.

Cassanelli, J.P., and Robbins, G.A., (2010). Evaluating impacts of anthropogenic salt influxes to Connecticut's groundwater though water quality monitoring and tracer studies. *45th Geological Society of America Northeastern Section Meeting,* Abstract 57-11.

Cassanelli, J.P., and Robbins, G.A., (2009). Assessing the impacts of road salting on ground and surface water in Connecticut using GIS. *44th Geological Society of America Northeastern Section Meeting,*

Robbins, G.A., and Cassanelli, J.P., (2009). Temporal and spatial trends in the salt content of Connecticut's groundwater over the last 100 years. *44th Geological Society of America Northeastern Section Meeting.*

Thesis Publications

Cassanelli, J.P. (2019). Evaluating the Hydrology of a Cold and Icy Early Mars. *Brown University Doctoral Thesis.*

Cassanelli, J.P. (2015). Assessing Ice Sheet Growth, Heat Transfer, and Melting Mechanisms: Implications for Liquid Water Generation in a Late Noachian "Icy Highlands" Mars. *Brown University Masters Thesis.*

Cassanelli, J.P. (2011). Salt Contamination of Ground and Surface Water in Connecticut: A Compilation and Synthesis of Historic Data and Local Scale Testing. *University of Connecticut Master's Thesis*, Paper 69.