Dr. Donald R. Hood

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CAREER GOAL I work in geological remote sensing to explore the physical and chemical process that have shaped the martian surface. I use a combination of remote imaging, optical spectroscopy, and gamma spectroscopy as well as statistical and spatial analysis to examine processes occurring on a global scale. I supplement this remote work with fieldwork done here on Earth in geologically analogous locations. I am currently seeking a position as a tenure-track professor at a university.

HIGHLIGHTS

- Expertise in **remote sensing**, **statistical investigations**, and **multidimensional analysis**.
- Experience designing and executing hypothesis-driven statistical and analytical investigations.
- Developed **python-based** automated **object identification** code for detection of boulders on the Martian surface.
- Expertise in written and visual communication through scientific manuscripts, public lectures, and poster presentations.

PUBLICATIONS

Inferring Airflow across Martian Dunes from Ripple Pattern and Dynamics *2021*
D.R. Hood, R.C. Ewing, K.P. Roback, K. Runyon, J.-P. Avouac, M. McEnroe
Frontiers in Earth Sciences

- Tracking **aeolian ripples** on Martian dunes using repeat imagery
- Combined ripple motion, ripple tracking, and **airflow models**
- Made **first measurement of flow reattachment** on Mars

Contrasting Regional Soil Alteration across the Topographic Dichotomy of Mars 2019
D.R. Hood, S. Karunatillake, O.Gasnault, A. Williams, B. Dutrow, L. Ojha, S. Kobs, K. Kim, J. Heldmann, C. Fralick
Geophysical Research Letters, DOI: 10.1029/2019GL084483

- **Dimensional reduction** reveals geochemical shifts along Martian dichotomy
- Utilize **Principal Component Analysis** to examine elemental correlations
- Uses Mars Odyssey **Gamma-Ray Spectrometer** data

Assessing the Geologic Evolution of Greater Thaumasia, Mars 2016
D.R. Hood, T. Judice, S. Karunatillake, D. Rogers, J.M. Dohm, D. Susko, L. Carnes
Journal of Geophysical Research: Planets, DOI: 10.1002/2016JE005046

- Combines **chemical, mineralogical, morphological data** at regional scale
- Support **regional volcanic evolution** possibly tied to mantle evolution

Co-Author
Multiphase Volatilization of Halogens at the Soil-Atmosphere Interface on Mars 2021
X. Wang, Y. S. Zhao, D.R. Hood, S. Karunatillake, D. Laczniak, M.E. Schmidt, M.

Vithanage *Journal of Geophysical Research: Planets*, DOI: 10.1029/2021JE006929

Disambiguating the Soils of Mars 2020
G. Certini, S. Karunatillake, Y. S. Zhao, P. Meslin, A. Cousin, D.R. Hood, R. Scalenghe
Planetary and Space Science, DOI: 10.1016/j.pss.2020.104922

Contributions

Geochemical Interpretations Using Multiple Remote Datasets 2017
S. Karunatillake, L. Carter, H.B. Franz, L. Hallis, J.A. Hurowitz
Chapter 17 in *Remote Compositional Analysis: Techniques for Understanding Spectroscopy, Mineralogy, and Geochemistry of Planetary Surfaces*
Cambridge University Press

HONORS & AWARDS

NASA Mars Data Analysis Program *2019*
Investigating boulder pattern formation in the martian northern lowlands using spatial analysis of HiRISE images

Louisiana Space Consortium Graduate Student Research Assistantship 2016, 2017
2016: *Developing the Martian Boulder Automatic Recognition System: MBARS*
2017: *Examining Periglacial Boulder Clustering with MBARS*

Academic Scholarships

New Orleans Geological Society Lee H. Meltzer Memorial Scholarship 2015, 2016
Louisiana State University Moffit Fellowship 2014-2017
Louisiana State University Encana Graduate Student Scholarship 2017-2018
Houston Energy Scholarship 2018-2019

Elected Positions

Mentorship Chair, Baylor Association of Women Geologists 2022-2023

EDUCATION

Bachelor of Science, Physics, 2014
Emphasis on Condensed Matter Physics
Carnegie Mellon University, Pittsburgh, PA

Ph.D., Geology, 2019
Dissertation Advisor: Suniti Karunatillake
Dissertation Title: *Exploring Planetary Surfaces with Remote Sensing*
Louisiana State University, Baton Rouge, LA

CURRENT RESEARCH

The Martian Boulder Automatic Recognition System: MBARS

- **Python**-based algorithm to automatically detect boulders in HiRISE images
- Enable simplified investigation of large datasets
- Future application to **rapid terrain classification** in planetary exploration

Remote and in-situ characterization of Serpentinite bodies in Sri Lanka

- Planned and guided soil and rock sampling campaign in Sri Lanka, August 2018
- Used **Landsat 8** data to identify field sites
- Successfully adapted field plan opportunistically to maximize sample diversity

Geophysical Exploration of the Brushy Creek structure, St. Helena Parish, LA

- Possible young, late Pleistocene **impact structure**
- **Co-leader** of geophysical survey of Brushy Creek Structure
- Performed **Ground Penetrating Radar** and **Subsurface Resistivity** surveys of structure

EXPERIENCE

Postdoctoral Research Associate June 2021 - Present
Baylor University Geosciences, Waco, TX

- Served as Science PI of NASA MDAP Grant (2021-2023)
- Set science goals for other postdoctoral and graduate researchers
- Instructor of Record for 4000-level GIS course (Fall 2021)

Postdoctoral Research Associate July 2020 - May 2021
Texas A&M Geology and Geophysics, College Station, TX

- Analyzed geomorphology of dunes and aeolian structures on Earth and Mars
- Used spatial statistics to examine dunefield-scale patterns in morphology
- Composed technical reports and scientific manuscripts on findings

Graduate Research Assistant Dec 2017 - Dec 2019
LSU Geology and Geophysics, Baton Rouge, LA

- Carried out pilot research in support of NASA proposals
- Member of successful proposal to NASA Mars Data Analysis Program
- Wrote and reviewed multiple funding proposals

Graduate Teaching Assistant Aug 2014 - Dec 2017
LSU Geology and Geophysics, Baton Rouge, LA

- Taught introductory-level geology courses, GEOL 1601
- Taught Sophomore level geology major courses, GEOL 2081 (Mineralogy), GEOL 3041 (Petrology)
- Developed course material (quizzes, presentations, etc.)
- Graded coursework
- Managed administration of multiple class sessions

LECTURES AND TALKS

Oral Presentation at Lunar and Planetary Science Conference **2019**
Contrasting Regional Soil Hydration Processes Across the Topographic Dichotomy of Mars, Abstract 1887
Don R. Hood, S. Karunatillake, O.Gasnault, A. Williams, B. Dutrow, L. Ojha, S. Kobs, K. Kim, J.L. Heldmann, C. Fralick

Lecture at National Institute of Fundamental Studies **2018**
Kandy, Sri Lanka
Hydration and Alteration of Martian Soil

Lecture at University of Sri Jayawardenepura **2018**
Nugegoda, Sri Lanka
Alteration and Habitability of Maritian Soil

Lecture at Lunar and Planetary Institute, Houston, Texas **2016**
Assessing the Geologic Evolution of Greater Thaumasia, Mars

Oral presentation at the ISLPS, Wuhan, China **2016**
International Symposium on Lunar and Planetary Science
Martian Bulk Soil Hydration Revealed by Principal Component Analysis of Regional Chemical Data

Poster Presentations
Lunar and Planetary Science Conference **2022**
The Martian Boulder Automatic Recognition System: Comparison to Old and New Tools for Large-Scale Automatic Boulder Measurement, Abstract 1483
Don R. Hood, R.C. Ewing, S. Karunatillake, S.F. Sholes, C.I. Fassett, P. James
Lunar and Planetary Science Conference **2021**
Interpreting Airflow Dynamics from Ripple Patterns and Migraiton Rates on Mars, Abstract 2106
Don R. Hood, R.C. Ewing, K.P. Roback, K. Runyon, J-P. Avouac, M. McEnroe
Lunar and Planetary Science Conference **2019**
Verification of Automatically Measured Boulder Populations in HiRISE Images, abstract 1893
Don R. Hood, S. Karunatillake, C.I. Fassett, S.F. Sholes
Lunar and Planetary Science Conference **2018**
Automated Boulder Detection and Measuring in HiRISE images, abstract 2437
Don R. Hood, S. Karunatillake, C.I. Fassett, S.F. Sholes
American Geophysical Union Fall Meeting **2017**
Mapping of Boulder Ejecta around Late Amazonian Impact Craters on Mars, Abstract 208687
Don R. Hood, S. Karunatillake, C. Fassett
Lunar and Planetary Science Conference **2017**
Semi-Automated Measurement of Boulder Clustering in the Martian Northern Plains, Abstract 2640
Don R Hood, S. Karunatillake

TECHNICAL SKILLS

Languages & Software:
Python, C++, Mathematica, LaTeX, ArcGIS, ArcGISPro

Workshops:
AI for Earth System Science Summer School, June 2020

Analytical Skills:
Multivariate Analysis, Photoanalysis, Image Processing, Data Reduction

Technical Skills:
Scanning Electron Microscopy, Optical Petrography, Ground Penetrating Radar