Department of Geological Sciences
Department of Environmental Science and Ecology

UTSA Earth Symposium

4 September 2020

UTSA
The University of Texas at San Antonio™

Organization

Coordinator

Alexis Godet

Chair persons

Session 1: Jennifer Smith and Matthew Troia

Session 2: Yongli Gao and Brian Laub

Session 3: Allison Veach and Hongjie Xie

Session 4: Saugata Datta and Alan Whittington

Judges

Matt Cannon, Kevin Eddy, Alexis Godet, Jeffrey Hutchinson, Harshad Kulkani, Jennifer Smith, Janet Vote, Alan Whittington

Acknowledgements

All faculty members involved in the organization of this symposium would like to thank the support of the College of Sciences and Dean Silva, the Office of the Vice-President for Research, Economic Development and Knowledge Enterprise (sponsor of presentation awards), Stuart Foote and Patricia Ramirez (IT support), and Robert Granado (UTSA Academic Innovation).

We would also like to thank all attendees whose participation contributes to the success of this symposium.

Program

Abstracts are organized by alphabetical order starting on page page 9. In the program below, click on the author list or title of a presentation to access the full abstract.

8:00-8:10 am, ZOOM Webinar#1: Opening remarks, Alexis Godet and David Silva, Dean of the College of Sciences, UTSA

8:15-9:45 am, ZOOM Webinar#1: oral presentations session 1 ***"Ecology and Biodiversity Conservation"***

Chair persons: Jennifer Smith and Matthew Troia

8:15 - Amanda M. Lamberson and Jennifer A. Smith: Bird feeding effects on abundance and diversity of urban birds

8:30 - Omar Carrillo, Cody Campbell, Nancy Benavidez and Elizabeth Borda: Screening for Osmoregulatory Genes in Two Anchialine Cave Shrimp (***Atyidae***)

8:45 - Grace Tindall, Beatriz Yañez-Rivera, Mirandia Johnson, Anja Schulze and Greg Rouse: Cryptic Species of the Cosmopolitan Eurythoe

9:00 - Alexandra C. Sheldon: Studying Captive Gibbons to Aid in Conservation Planning in the Wild

9:15 - Sara Lucci: Colobus Population and Reproduction at Boabeng-Fiema Monkey Sanctuary

9:30 - Muttaki Bin Kamal: Primates as Indian Quasi Object

9:55-11:10 am, ZOOM Webinar#2: Session 2 ***"Challenges and Opportunities in Water Resources and Management"***

Chair persons: Yongli Gao and Brian Laub

9:55 - Crystal A. Moreland, Alberto M. Mestas-Nuñez, and Christian A. Sustayta: Oceanic Mixed Layer Depth and Subsurface Chlorophyll from Glider Observations

10:10 - Ashley Aguilar, Alberto M. Mestas-Nuñez, and Saugata Datta: Estimating rainfall in Central Mexico associated with the passage of Atlantic tropical cyclones

10:25 - Patrick Bryan, Blake Weissling, Yongli Gao, Alexis Godet, Doug Schnoebelen: Geophysics as a Tool to Better Understand Subsurface Hydrology and Groundwater Flow Paths in a Jointed Karst-Enhanced Limestone Environment

10:40 - Travis Hemphill and Matthew Troia: Building a geospatial dataset of freshwater protected areas for the contiguous US

10:55 - Rebecca Nunu, Ronald Green, Yongli Gao: Using Geochemical Analyses to Discern Source Areas of a Multi-Outlet Spring System in West Texas

11:35 am-12:30 pm, ZOOM Webinar#1: Keynote presentation

Chair person: Matthew Troia

Julia Cisneros, UT Austin: How do weirdly-shaped dunes both see into the past and predict the future, and why?

12:30-1:00 pm: lunch break

1:00-2:00 pm, ZOOM Webinar#2: Session 3 ***"The Changing Face of the Earth in the Context of Climate Change"***

Chair persons: Allison Veach and Hongjie Xie

1:00 - Jaydne Blomfield, Alberto M. Mestas-Nuñez, Hongjie Xie, Neil Debbage and YoungHyun Koo: The Impact of COVID-19 throughout Bexar County, San Antonio, Texas

1:15 - YoungHyun Koo, Hongjie Xie, Stephen F. Ackley and Alberto M. Mestas-Nuñez: Recent trend of ice thickness over Ross Sea from ICESat-2

1:30 - Miguel Bernardo and Alexis Godet: The development of porosity in the upper Cretaceous Austin Chalk Group of Texas

1:45 - Karson Moeller, Lance L. Lambert and Janet Vote: Potential correlation errors between the North American midcontinent basin and the Donets basin using conodonts and their growth stages

2:10-4:10 pm, ZOOM Webinar#1: oral presentations session 4 ***"Planetary Science: Extraterrestrial Environments and Terrestrial Analogs"***

Chair persons: Saugata Datta and Alan Whittington

2:10 - Karen C. Mendiondo, Alberto M. Mestas-Nuñez, Orens Pasqueron de Fommervault, and Hongjie Xie: Glider-based Ocean Current Velocity Observations: Data Processing and Applications

2:25 - Jullian Williams, Hongjie Xie, Alberto Mestas-Nuñez, Stephen Ackley: Changes in atmospheric aerosols before and after the COVID-19 global shutdown

2:40 - Evelynn Mitchell: Applications of Lidar Groundtruthing in Karst to Determine the Accuracy of Geophysical Methods for Detecting Cave Passages

2:55 - Joshua Ford, Alexis Godet, Harshad Kulkarni, Jennifer G. Blank and Saugata Datta: Putative Biomarker Speleothems in Terrestrial Analog Lava Caves

3:10 - Adeela Malik, Elizabeth Sooby Wood, Donald Hooper, Alan Whittington, Ronald Wells and Sam Ximenes: Microstructural and elemental analysis of a proposed Lunar Simulant

3:25 - Natalie Sherman: Lunar residency in a surface HAB

3:40 - Brenna Halverson, Alan Whittington, Julia Hammer, Rebecca Degraffenried, Einat Lev, Hannah Dietterich, Matthew Patrick, Carolyn Parcheta, Brett Carr, Michael Zoeller, Frank Trusdell and Edward Llewellin: Vesicularity and implications for rheology of the Kīlauea 2018 Lava Flows

3:55 - Aaron Morrison and Alan Whittington: Cryovolcanism: evolution and flow dynamics of cold lava flows

4:10-6:10 pm, ZOOM Webinar #2: poster presentations, all sessions

Session 1

Emily Glotfelty and Eva Wikberg: Behavioral Responses to Increasing Population Size in *Colobus vellerosus*

Eres A. Gomez and Jennifer A. Smith: Anticoagulant Rodenticides and Secondary Exposure to Raptors in Texas

Marina Ann Zannino and Jennifer A. Smith: The effects of rainfall on heron productivity

Cody Campbell, Omar Carrillo, Nancy Benavidez and Elizabeth Borda: Comparative Transcriptomics of Anchialine Shrimp (*Atyidae*)

Gabriela Vara and Jennifer A. Smith: The importance of herbaria in research

Jamie Killian and Jennifer Smith: Determining Texas horned lizard population abundance in Karnes and Wilson Counties using visual encounter surveys

Session 2

Logan Day, Skyla Garcia, Jamie Ramos, Victoria Register and Brian G. Laub: Mapping potential freshwater conservation areas in the San Antonio watershed

Namrata Giri and Brian G. Laub: Seasonal Dynamics of food resources in Cibolo Creek, Texas

Michael McMahan and Yongli Gao: Improving Best Management Practices for Sensitive Karst Features on the Edwards Aquifer Recharge Zone

Session 3

Rodolfo Fernandez, Alberto M. Mestas Nuñez, Karen Mendiondo and Christian A. Sustayata: Satellite Salinity Imaging Depicts Deceleration in Gulf Stream Current during Hurricane Dorian, 2019

Alexis Godet, Jacob Byerly, Annie Arnaud-Vanneau, Lucie Bonvallet and Brahimsamba Bomou: The impact of supergreenhouse conditions on Cretaceous marine sedimentation

Richard Gonzalez, Michael D'Emic, Simone Hoffmann and Thomas Adams: Evolution of Body Size in Pantodont Coryphodon during the PETM

Brenna Halverson, Stuart Kenderes, Jesse Merriman and Alan Whittington: Thermal Anomalies around

Salt Diapirs and their Effects on Maturation of Surrounding Hydrocarbons

Elizabeth Hebel and Hongjie Xie: Evaluating Ice Production of Ross Ice Shelf and Terra Nova Bay Polynyas during 2019 using Sentinel-1 SAR Images and ICESat-2 data

André Michon, Alberto M. Mestas-Nuñez, Hongjie Xie, Zhiwei Wang and Stephen F. Ackley: Satellite Remote Sensing of Snowpack Variability on Eagle Island, Antarctica

Dianna Price, Alexis Godet and Thomas Adams: Digitizing Early Cretaceous dinosaur trackways to preserve the geological heritage of central Texas

Christopher Ray, Yongli Gao, Benjamin Schwartz, Phil Lucas and Lijun Tian: Cave air CO_2 and hydrochemical monitoring of Helictite Cave, Va

Megan Schill, Shawn Brown, Richard Baird and Allison Veach: Southern Appalachian Mountain wildfires increase soil microbial nutrient scavenging with burn severity

Christian A. Sustayta, Alberto M. Mestas-Nuñez and Karen Mendiondo: Comparisons of Geostrophic Current Observations from Buoyancy Gliders and Satellite Altimetry

Session 4

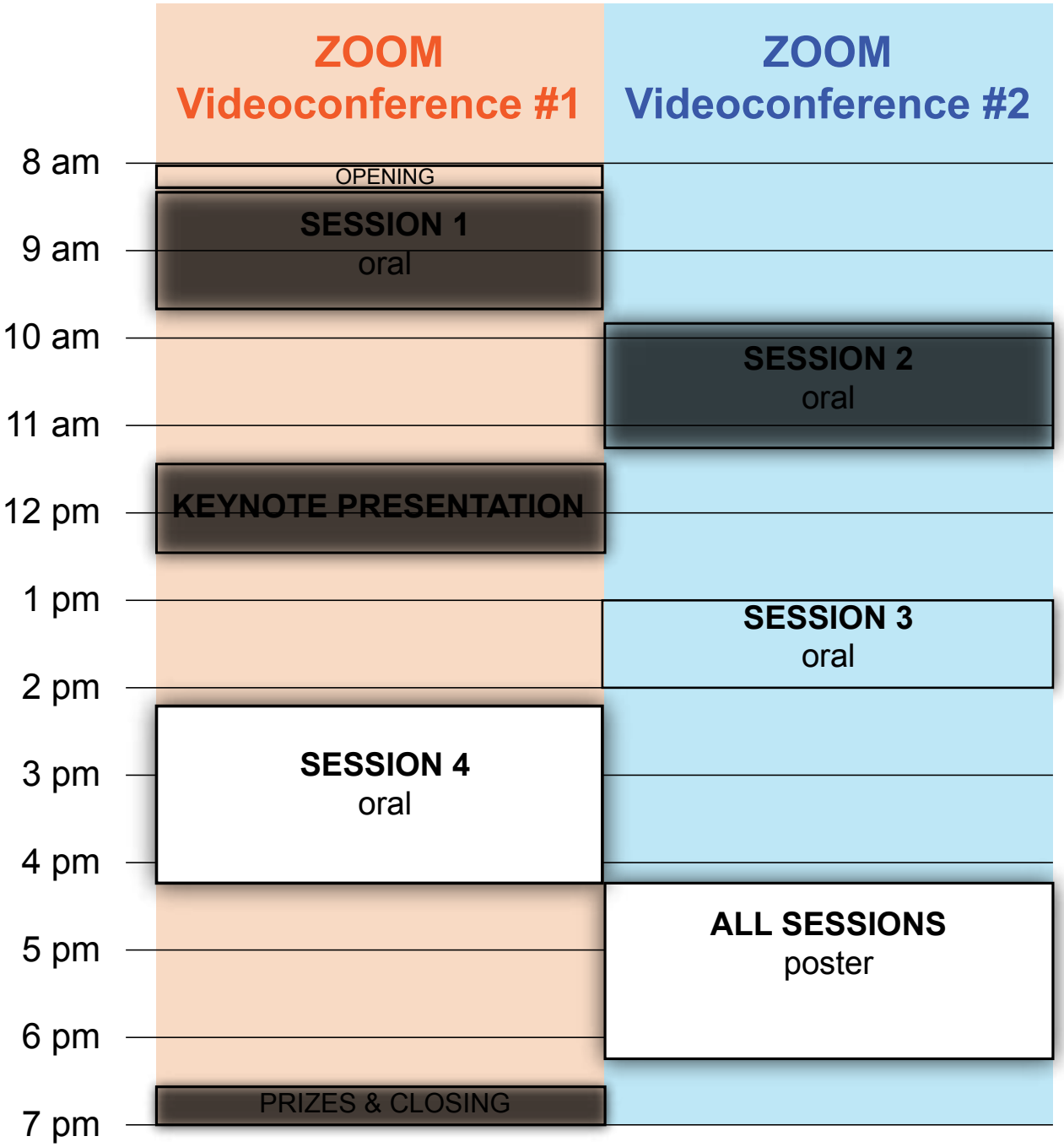
Don Hooper, S.W. Ximenes, R. Wells, E.L. Patrick and M. Necsoiu: Developing a Simulant to Replicate the Lunar Regolith

Alan G. Whittington, Graham D.M. Andrews, Stuart Kenderes, Shelby L. Isom, Sarah R. Brown, Holly D. Pettus, Brenna G. Cole and Kailee J. Gokey: There's a fault in my flow: A reinterpretation of "pressure ridges" in silicic lava flows

John Dye and Alan Whittington: Rheology of Mauna Loa's 1984 Eruption

Justice Lira, Alan Whittington and Brenna Halverson: Rheology of the Andesite erupted from Fissure 17 of the 2018 Kilauea Lower East Rift Zone eruption

6:40-7:00 pm, ZOOM Webinar#1: Award ceremony and closing remarks by Janis Bush (Department of Environmental Science and Ecology) and Hongjie Xie (Department of Geological Sciences), department chairs


ZOOM Videoconference #1
ZOOM Videoconference #2
8 am
9 am
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7 pm
OPENING
SESSION 1
oral
SESSION 2
oral
KEYNOTE PRESENTATION
SESSION 3
oral
SESSION 4
oral
ALL SESSIONS
poster
PRIZES & CLOSING

Invited keynote speaker

Julia Cisneros

The University of Texas at Austin

Julia Cisneros is a geologist and PhD candidate at the University of Illinois funded by an NSF Graduate Research Fellowship. She received her Bachelor of Science in Geology degree from Texas A&M University and was born and raised in Austin, TX. Her research seeks to identify the key mechanisms driving bedform formation and evolution across different environments. This is driven by her curiosity in how surface processes shape bedforms and how this can be used to excavate clues about the formative conditions of inaccessible and ancient environments. Julia is passionate about comprehensively describing bedform morphology with clear and direct language so all listeners can learn about Geology. Her PhD research investigates dunes that form at the bottom of the world's biggest rivers, including the Amazon River, Brazil and the Yellow River, China. Her future postdoctoral research, funded by an NSF Postdoctoral Fellowship, will develop a unifying framework for bedform morphodynamics that spans environments and scales through studying the morphodynamics of Earth's largest and most complex bedforms in deserts and rivers. This work will take her back to Texas, to work with research groups from Rice University, Texas A&M University, and the University of Texas at Austin to begin linking the key mechanisms that drive giant dune formation and movement in rivers and deserts. As a Tejana, Julia is also dedicated towards increasing diversity, equity and inclusion in the geosciences and it is her goal to further diversify geoscience fields through the recruitment and retention of underrepresented groups. In her graduate career, she has approached this through mentoring and outreach, which include the creation of a Geoscience camp and her leadership council role in the GeoLatinas professional group.

Read her abstract here.

Estimating rainfall in Central Mexico associated with the passage of Atlantic tropical cyclones

Ashley Aguilar, Alberto M. Mestas-Nuñez and Saugata Datta*

Center for Advanced Measurements in Extreme Environments (CAMEE) and Department of Geological Sciences, University of Texas at San Antonio

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Recharging of aquifers due to precipitation from tropical cyclone storm systems can provide a source of groundwater that seeps into faults along volcanic zones which leach minerals, such as Arsenic and Fluorides, that have been known to cause various illnesses in humans. The Independence Basin Aquifer System (IBAS) in Central Mexico was chosen as a location for investigation that exhibits this geological event. The purpose of this study is to determine when these tropical cyclones make landfall in a region with the described geology and how much water is being infiltered there during this time. A radius that encompasses the entire Independence Basin in Central Mexico was the target location of these storm systems investigated from within NOAA HURDAT2 datasets. This analysis revealed four occurrences in the Atlantic and one in the Pacific that had the target location in their paths, all taking place between the months of June to September and dating back to 1866 (a span of ~150 years). MATLAB was be used to process the identified data in order to come up with graphical representations of tropical cyclone storm system paths in the region as well as how much water is infiltered during the peak of the tropical cyclone season in each of these occurrences (where data is available). This investigation will be useful for further research in the delineation of the faults which contribute to the natural enhancement pathways of metals (like As & F) into the groundwaters within the IBAS

The development of porosity in the upper Cretaceous Austin Chalk Group of Texas

Miguel Bernardo and Alexis Godet*

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The Austin Chalk series were deposited in shallow to deep marine settings as testified by the diversity of its fauna. The original mineralogy controls the early compactional history of the Austin Chalk series and is responsible for its diagenesis and porosity evolution. This study aims to assess the relationship between depositional setting and differential diagenetic pathways within the upper Cretaceous Austin Chalk Group to constrain the parameters that favored the formation of porosity. Outcrops at San Antonio, Dallas and Del Rio are analyzed for their depositional setting, porosity, and diagenesis. The depositional texture and a different burial depth across the study area are hypothesized to control the variable development of porosity. Ecological changes within the Austin Chalk series will be derived from the petrographic analysis of thin sections and point counting allochems. Cathodoluminescence microscopy will help define diagenetic events that promoted or hampered the formation of porosity. Porosity values will be obtained for each sample by calculating the volume displacement and difference between dry and water-saturated weight. Finally, scanning electron microscopy will be used to assess the microtexture, and pore throats measurements. We expect that high porosity values will be found in the Dallas area due to shallower depositional setting and less influence of burial diagenesis.

Primates as Indian Quasi Object

Muttaki Bin Kamal
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This study focuses on the human impact on the behavior of non-human primates in the Indian Sub-continent. Due to the mythological significance of the non-human primates, Hindu devotees have an intimate relationship with them. In the Hindu epic of Ramayana, the monkey "race" has been veneered for glorified monkeys as Sugriva, Angada and most importantly, Hanuman, the monkey god. For such religious importance, Hindu devotees in India grow intimate relationship with them through worshipping, feeding and lodging them in temples. Such practices have actively changed the behavior and ecology of primate species as *Macaca Mulatta* (Rhesus Macaque), *Seminopithecus entellus* (Northern Gray Langur) and *Macaca radiata radiate* (Dark Bellied Bonnet Macaques). These primate species are habituated in an urban ecology, often dependent for food on humans and have learned urban behaviors that often lead them to conflict with human. This study will draw from secondary sources to discuss the dynamics of such relations and impacts of human on the behavior of such primates.

The Impact of COVID-19 throughout Bexar County, San Antonio, Texas

Jaydne Blomfield[1], Alberto M. Mestas-Nuñez[1], Hongjie Xie[1], Neil Debbage[2] and YoungHyun Koo[1]*

[1]Department of Geological Sciences and NASA Center for Advanced Measurements in Extreme Environments (CAMEE), UTSA; [2]Department of Political Science and Geography, UTSA

**corresponding author: jaydneblomfield@gmail.com*

December 2019 the news of coronavirus disease, commonly known as COVID-19, began spreading fast. This new disease is causing an outbreak of respiratory illness around the world. On March 13th, the collection of COVID-19 data for Bexar County began and is being stored on COVID-19 Recovery Texas website. The goal of this research is to determine how events surrounding COVID-19 have impacted zip codes throughout Bexar County using multiple map animations. The animations will highlight COVID-19 confirmed cases, deaths, and hot spots and will be compared to the spatial and temporal patterns of events that occurred during the same time frame.

Geophysics as a Tool to Better Understand Subsurface Hydrology and Groundwater Flow Paths in a Jointed Karst-Enhanced Limestone Environment

Patrick Bryan, Blake Weissling, Yongli Gao, Alexis Godet, Doug Schnoebelen*

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**corresponding author: Patrick.bryan01@yahoo.com*

Cibolo Creek in Central Texas is a partially effluent stream with its source near the city of Boerne, TX. The creek flows through the nearby Cibolo Preserve, a 645-acre natural preserve set aside for landscape and habitat restoration. The dominant geology at the Preserve serves as a contributing zone for the Edwards-Trinity Aquifer system. Throughout much of this reach, Cibolo Creek is a losing stream, meaning that surface water flow is diverted into the subsurface through variable sized karst features in the stream bed. The magnitude of streamflow loss is significant such that USGS stream gages along Cibolo Creek show that surface water in Cibolo Creek mostly disappears over a 16-mile stretch between the Cibolo Preserve and Bulverde, TX., even in times of very high flow. It is presumed that the primary mechanism of karst development in the streambed in the area is dissolution along subsurface joints in the Lower Glen Rose limestone as a result of upward movement of groundwater, opposed to epigenetic processes. The growing number of in-stream karst features as well as the magnitude of surface water loss suggests that the water from Cibolo Creek might play a greater role in recharge than has been thought in the past. Elevated levels of nitrates measured in the creek at the Preserve compels further research to understand the surface water-groundwater dynamics in the region.

Comparative Transcriptomics of Anchialine Shrimp (Atyidae)

Cody Campbell, Omar Carrillo, Nancy Benavidez and Elizabeth Borda*

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Anchialine caves are subterranean coastal cave ecosystems that are submerged with stratified water layers (freshwater to marine) and have indirect connections to the surrounding ocean. These cave systems, accessible via land-locked freshwater or brackish water entrance pools, are dominated by taxonomically diverse crustacean fauna, most of which are strictly adapted to life in complete darkness, low oxygen and limited organic inputs. This study aims to identify genes and biological networks potentially associated with adaptation to aquatic subterranean environments. Here we compare the transcriptomes of two anchialine shrimp (Atyidae), *Halocaridina rubra* from anchialine pools of the Hawaiian Islands and *Typhlatya dzilamensis* from cenotes of the Yucatan Peninsula (Mexico), with a non-cave freshwater species, *Marcobrachium australiense*. Publically available (*Halocaridina*, *Marcobrachium*) and newly sequenced transcriptome (*Typhlatya*) data will be *de novo* assembled, functionally annotated and analyzed comparatively via functional enrichment to identify biological processes that are over and under expressed among species.

Screening for Osmoregulatory Genes in Two Anchialine Cave Shrimp (Atyidae)

Omar Carrillo, Cody Campbell, Nancy Benavidez and Elizabeth Borda*

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**corresponding author: ocarr04@jaguar.tamu.edu*

Previous work on osmoregulation in the atyid *Halocaridina rubra*, an euryhaline shrimp, supports adaptation for both hyper- and hypo-osmoregulation to cope with salinity fluctuations associated with coastal life in anchialine pools of the Hawaiian Islands. In an effort to expand our understanding of osmoregulation in salinity variable environments, such as anchialine caves, here we screen for candidate genes potentially involved in osmoregulation and salinity stress in a distantly related anchialine cave shrimp, *Typhlatya dzilamensis*. *Typhlatya dzilamensis* is dominant in coastal and some inland cenotes of the Yucatan Peninsula (Mexico), and typically found below the halocline (i.e., in waters > 30ppt), deep within the subterranean, and distant from surface brackish water entrance pools. Publically available (*Halocaridina*) and newly sequenced transcriptome (*Typhlatya*) data will be assembled de novo, functionally annotated, ascreened for candidate genes (previously identified in the freshwater shrimp *Marcobranchium australiense*) and analyzed comparatively via functional enrichment to identify potential species specific levels of expression of osmoregulatory genes.

How do weirdly-shaped dunes both see into the past and predict the future, and why?

Julia Cisneros

The University of Texas at Austin

Formed through the transport of sediment through a shearing flow, bedforms record the conditions of their formation and give us clues about the movement of wind and water across an ancient landscape. In turn, bedforms also influence how sediment is transported. By influencing flow dynamics, bedforms create hydraulic roughness and heterogeneity. This talk will focus on the morphology and dynamics of dunes in alluvial channels, which make up the building blocks of alluvial channels and generate a flow field that aids in modulating the near bed shear stress by creating form roughness. Through creating variations in near bed shear stresses, dunes migrate downstream and are the major contributors to sediment transport via bedload transport. In turn, sediment transport and flow modify the dune shape in natural rivers. Understanding the links between flow, sediment transport, and bedform morphodynamics is key to leveraging these records of ancient environments, using modern bedforms to understand conditions of Earth and planetary systems, and improving how contemporary environments are managed.

This talk will highlight research that aims to investigate dune formation and dune shape in big and small rivers and under varying flow conditions. By utilizing robust bedform analysis techniques and a range of high spatial and temporal data, this talk will illuminate a new view of dune morphology in some of the world's biggest rivers and investigate how dunes change in response to fast-changing flows, like floods. This information is vital to improving our approach to managing contemporary rivers under modern stressors and revealing the deposits of ancient rivers. In addition, this talk will highlight the story of a Tejana (a Texan Latina) geoscientist in her journey from learning about career paths in the Geosciences towards becoming a career geoscientist.

Invited keynote speaker - link to her biosketch *back to program*

Mapping potential freshwater conservation areas in the San Antonio watershed

Logan Day[1], Skyla Garcia[1], Jamie Ramos[1], Victoria Register[1] and Brian G. Laub[2]*

[1]Alamo Colleges; [2]Department of Environmental Science and Ecology, The University of Texas at San Antonio

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Identifying areas of high ecological integrity in developing watersheds can help land managers prioritize mitigation efforts to protect aquatic resources and can help identify areas with high restoration potential. To identify areas of high ecological integrity in the San Antonio River watershed, we compiled and mapped existing data on biodiversity and water quality. We used data from the Fishes of Texas database (fishesoftexas.org) to map fish diversity, data from the Global Biodiversity Information Facility (gbif.org) to map amphibian, reptile, and mussel diversity, and data from the Texas Commission on Environmental Quality (TCEQ) and San Antonio River Authority (SARA) to map river sections with degraded water quality as indicated by high levels of *E. coli* and phosphorus. Although analysis is currently in progress, there appear to be several specific regions outside the city of San Antonio where biodiversity and water quality remain relatively high. The areas with high biodiversity and water quality would serve as important areas to protect from future development. Although additional analyses to identify important processes that maintain water quality and diversity would further improve classification of freshwater conservation areas, the current analysis serves as an important starting point for prioritizing conservation efforts in the San Antonio River watershed.

Rheology of Mauna Loa's 1984 Eruption

John Dye and Alan Whittington*
UTSA Department of Geological Sciences
**corresponding author: jdd0421@gmail.com*

Lava flows on Hawai'i pose an ever present threat to those living on Mauna Loa and Kilauea. I will investigate the rheology of lava erupted by Mauna Loa, in Hawai'i, during the 1983 eruption in order to better model the hazard posed to those living on volcanoes. The variation of ample rheology at standard atmospheric pressures, and under varied temperatures, will be explored in depth on materials collected from Mauna Loa in January of 2020. In order to do this, viscosity will be measured between the point the samples begin to deform up to the maximum temperature range the lava would naturally erupt. The rheological evolution of these samples at various cooling rates, along with the associated crystal growths, will also be analyzed to quantify lava rheology as a function of thermal history. A study of this nature has only been carried out once before in the area; however, it was conducted for the 1974 flow from Mauna Ulu, on Kilauea (Robert et al. 2014). The model I produce from these experiments will be compared to this previous research to determine if there are substantial differences between the rheology of the Mauna Loa and Kilauea volcanic structures.

Satellite salinitiy imaging depicts deceleration in Gulf Stream current during hurricane Dorian, 2019

Rodolfo Fernandez, Alberto M Mestas-Nuñez, Karen Mendiondo and Christian A Sustayta

Center for Advanced Measurements in Extreme Environments (CAMEE) and Department of Geological Sciences, The University of Texas at San Antonio

**corresponding author: notrodo@gmail.com*

In the 2019 hurricane season, Hurricane Dorian ravaged the Bahamas and became the most powerful Category 5 storm on record in the open Atlantic. Dorian's peak sustained winds were about 295 kmh before making landfall in the Bahamas' Abaco Islands on September 1, where it lingered and slowly weakened over two days. Magnetic cable measurements between Vero Beach, Florida and Grand Bahamas Island indicated a sharp decrease in Gulf Stream transport of 10 Sverdrup's, starting September 1 and stabilizing by September 9. The ESA's Soil Moisture and Ocean Salinity (SMOS) Satellite detected a significant decrease in 10 day mean sea surface salinity in the region between Florida and the Bahamas at 27oN of up to 2 psu as Dorian was over the Bahamas. The surface salinity estimates settled back to normal by the Sept 7-16 period. Ocean currents observed with Ocean Surface Current Analyses Realtime (OSCAR) data off the east coast of Florida during the time of Dorian's impact also indicate a significant change in the velocity field of the Gulf Stream.

Putative Biomarker Speleothems in Terrestrial Analog Lava Caves

Joshua Ford[1], Alexis Godet[2], Harshad V. Kulkarni[2], Jennifer G. Blank[3,4] and Saugata Datta[2]*

[1]Geology Department, Kansas State University, Manhattan, KS, USA 66506; [2]Geological Sciences, University of Texas at San Antonio, San Antonio, TX, USA 78249; [3]NASA Ames Research Center in Silicon Valley; [4]Blue Marble Space Institute of Science

**corresponding author: jaford@ksu.edu*

Speleothems (secondary mineral deposits) from terrestrial analog lava caves at Lava Beds National Monument (N. CA, USA) were assessed for their possible biogenic origin. Speleothems exhibited morphological diversity, including mineral crusts, cauliflower-like deposits, branching coral-like features, and gour formations. Analysis of speleothems by X-ray diffraction revealed opal-A and (Mg) rich calcite as dominant mineral phases, with opal predominating in the majority of samples. Mg-rich clays may also be present, but not confirmed by diffraction patterns. Chemical composition of speleothems was dominated by SiO_2, CaO, and MgO based on X-ray fluorescence measurements. Significant concentrations of potential biomarker elements like P, S, Cu and V were also detected which may indicate microbial mediation of speleothem formation. Presence of microstructures including microstromatolite-like laminae, porous opal, and concentric opal laminae in speleothems indicated biogenic formation. Electron microprobe analysis of these structures confirmed infilled calcite, as seen in the co-occurrence of SiO2 and CaO bandings within μscale lamina. A porous opal matrix is consistent with biofilm-induced binding of silanol groups; calcite precipitation is potentially driven by autotrophy-forced alkalization of the parent solution. Calcite corrosion surfaces and P precipitants suggestive of microbial activity were also observed in the form of elevated P concentrations atop calcite-rich lamina.

Seasonnal dynamics of food resources in Cibolo Creek, Texas

Namrata Giri[1] and Brian G. Laub[2]

[1]Department of Civil and Environmental Engineering, University of Texas at San Antonio, San Antonio, TX 78256; [2]Department of Environmental Science and Ecology, University of Texas at San Antonio, San Antonio, TX 78249

**corresponding author: namrata.giri@utsa.edu*

Food resources for fish, such as algae and leaf litter may be impacted by urban development. The goal of the project is to assess how food resources of a creek undergoing urban development and wastewater inputs change seasonally. We sampled benthic organic matter and algal biomass in Cibolo Creek in south-central Texas, at sites below three tributary confluences – Currey, Menger, and Browns Creek. Currey and Menger Creek are perennial streams carrying wastewater effluent, whereas Browns Creek is a natural ephemeral stream. Coarse particulate organic matter (CPOM) was not different between sites in summer and winter whereas, in fall, there was a difference with highest in Browns Creek and lowest in Menger Creek. Fine particulate organic matter (FPOM) was not different between sites in summer and winter whereas, in fall, there was a difference with highest in Browns Creek and lowest in Menger Creek. Ash Free Dry Mass (AFDM) for algae did not show much difference during the seasons for the tributaries. Chlorophyll-a did not show much difference between sites in all three seasons. For seasons, Menger differed in FPOM and Chlorophyll-a while Browns only differed in CPOM. Sites below each tributary showed different seasonal patterns which may be related to urban impacts such as wastewater effluent or urban runoff. More research encompassing all the influencing factors will provide a baseline for understanding future degradation of the food resources for fish.

Behavioral Responses to Increasing Population Size in *Colobus vellerosus*

Emily Glotfelty and Eva Wikberg*

Department of Anthropology, The University of Texas at San Antonio

**corresponding author: emglotfelty@gmail.com*

Increasing population sizes can result in lower food availability and increased feeding competition. To mitigate costs associated with feeding competition, animals may adjust ranging patterns. This study examined the effect of population size on ranging patterns in two Colobus vellerosus groups at Boabeng-Fiema Monkey Sanctuary in Ghana from 2000-2009. A complete count of the colobus population was conducted in 2000, 2003, and 2007. Ranging data were collected on group movements at half-hour intervals for two colobus groups (WW and BS) one year after each population survey. Home range size was calculated as the number of 0.25 ha quadrants each group entered . Population size increased from 200 individuals to 275 individuals over the eight-year period. Although the two groups' home range overlap increased over the study period, it was not significantly related to population size. Only the home range size of the smaller colobus group (BS) was significantly related to the population size. The different responses to increased population size may be caused by differences in the group's competitive potential as indicated by the WW group using the overlapping portion of their home range more frequently than BS. This study demonstrates the ability for colobus monkeys to adjust ranging patterns, however, groups may respond differently to changes in feeding competition and population size based on their competitive potential.

The impact of supergreenhouse conditions on Cretaceous marine sedimentation

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Shallow marine reefs support a highly diversified community. Yet, approximately 75% of these carbonate-producing systems are threatened by ongoing climate change and human activity. Investigating the Earth's history has the potential to identify mitigation processes for similar crises. About 120 million years ago (Early Cretaceous), the atmospheric content of greenhouse gases increased dramatically. Under such conditions, shallow marine carbonate-producing ecosystems either survived, adapted, or disappeared. Here, we present the design of a proposal that will investigate four localities in France, Italy and Oman, to assess the impact of a major environmental crisis known as the Oceanic Anoxic Event 1a on shallow-marine carbonate producers. Preliminary results from eastern France suggest that this event triggered a switch from photozoan (coral-dominated, oligotrophic conditions) to heterozoan (suspension feeder-dominated, mesotrophic conditions) associations. These ecosystems were located at moderately high latitudes, never recovered from this crisis and collapsed. We anticipate that the investigation of other study areas will deepen the knowledge on feedback mechanisms between the environment and carbonate production, quantify thermal and nutrient latitudinal gradients under super greenhouse conditions, and improve the understanding of the resilience of ecosystems during a period of global paleoceanographic perturbation.

Anticoagulant Rodenticides and Secondary Exposure to Raptors in Texas

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Anticoagulant rodenticides (ARs) are rat poisons shown to cause secondary exposure in non-target wildlife. Raptors often become exposed when they depredate contaminated prey or consume tainted carrion. Many raptors also experience sublethal effects which may increase risk to injury, disease, and predation. As urbanization increases, conflicts between humans and rodents are likely to increase, and thus so are the provision of ARs. Consequentially, the likelihood of secondary exposure of raptors to ARs is likely to increase. Texas has some of the fastest growing cities in the U.S. and is located within one of the major migratory routes for birds in North America. Yet, the rate of secondary AR exposure to raptors in this region is unknown. Objective One is to assess exposure of raptors to ARs in South-Central Texas by 1) using data from raptor rehabilitation facility admissions and, 2) collecting and analyzing bio-samples from admitted raptors. Objective Two is to educate members of the public about secondary exposure to ARs using results from objective one and science communication techniques to assess whether this approach can be used to reduce AR provisioning of people, and thus secondary exposure. By providing insight into secondary exposure rates, and by testing the efficacy of science communication to change the AR provisioning behavior, results can be used to inform AR mitigation plans in San Antonio and other urban areas in Texas where raptors may be at risk.

Evolution of Body Size in Pantodont Coryphodon during the PETM

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The Paleogene to Eocene Coryphodon is among the first mammals to evolve large body size after the end-Cretaceous extinction event. Based on tooth area, it has been inferred that Coryphodon underwent dwarfing during the Eocene in response to climatic changes. In this analysis, the hypothesized dwarfing is tested using mass estimates based on limb bone circumferences. The original inference of dwarfing was based on a fraction of its available fossil record, which comprises thousands of specimens. These specimens were usually surface collected opportunistically and mostly consist of isolated limbs or teeth. In order to incorporate more of the Coryphodon fossil record into a study of its body size evolution, we developed a large dataset of skeletal elements (N > 1000 specimens), collected from the Bighorn Basin as well as various institutions and museums. Regression models were utilized to predict the size of missing elements to better estimate body mass. We found that (1) limb bone circumferences can be readily predicted from articular end size and vice versa, (2) limb bone circumferences scale tightly with one another, and (3) tooth area underestimates body mass in Coryphodon. These results will allow us to estimate body mass in a prodigious sample of Coryphodon, which, coupled with new intensive fieldwork, will allow us to examine its body size evolution in fine stratigraphic resolution through the multiple hyperthermal events of the Paleogene.

Thermal Anomalies around Salt Diapirs and their Effects on Maturation of Surrounding Hydrocarbons

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Green energy is necessary for the future, but most current infrastructure still requires finite resources in the way of hydrocarbons. Some areas previously thought too deep or too shallow to be within the gas and oil windows may in fact still be potentially lucrative due to the high thermal conductivity of the salt bodies within them, resulting in high and low temperature anomalies in the surrounding sediments.

This study investigates the changes in heat-flow regimes of sedimentary basins due to the size and shape of salt bodies within them. A 2D finite-difference thermal model is used, calculating temperature through radiogenic heat production and conductive heat flow. The initial control geometry contains alternating limestone and shale layers above a halite bed, to which diapiric structures of varying sizes in taper, flare, or column geometries are added. Thermal data generated by these configurations are compared to those of the control geometry, revealing temperature anomalies due to the diapirs themselves. Preliminary data suggests positive and negative temperature anomalies that can exceed 20 °C and -100 °C respectively, depending on the size and shape of the diapir and whether it breaches the surface. Surface heat flow transects also show the potential to reveal the shape and size of buried diapirs, providing a valuable addition to seismic imaging

Vesicularity and implications for rheology of the Kīlauea 2018 Lava Flows

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The 2018 Kīlauea lava flows were among the best documented lava flows in history, with extensive ground-based observation and Unmanned Aerial Systems (UAS) overflights. This wealth of real-time data enabled us to select sampling locations along the Fissure 8 flow where overflows, ooze-outs, and breakouts had quenched and preserved flow textures.

Preservation of flow textures is especially important in highly vesicular flows, as was the case with Fissure 8, which erupted lavas with vesicularities up to ~80%. We collected samples from 22 locations along the Fissure 8 lava flow, comprising a range of emplacments times and distances from the vent. Our samples showed variations in volume fraction, shape, and size distribution of vesicles. The main vesicle shapes seen are sub-equant polygonal, collapsed polygonal meshes, spherical networks, and shearing/tearing. Some samples show a marked difference in vesicularity with depth, while others show alternating vesicle-rich and vesicle-poor bands. This range of vesicle shape and size distributions affects the rheology of the flow, a behavior that can be quantified using the capillary number, Ca, a ratio of shear stresses and surface tension acting upon the bubbles. The Ca and resulting change in vesicle shape can vastly affect the viscosity of the lava.

Future work will combine real-time video with textural measurements, rheological experiments, and numerical models to better understand the emplacement and hazards of Kīlauea lava flow.

Evaluating Ice Production of Ross Ice Shelf and Terra Nova Bay Polynyas during 2019 using Sentinel-1 SAR Images and ICESat-2 data

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Wind-driven polynya events in Antarctic waters are an important component to sea ice production because subsequent brine rejection and sinking of denser, high-salinity water influences the global thermohaline circulation and is an important habitat for wildlife and phytoplankton. Our study area focuses on the Ross Ice Shelf and Terra Nova Bay where polynya events were found to occur between March and November of each year. Using Sentinel-1 SAR and ICESat-2 data, we are able to calculate the area and ice thickness of each wind-driven ice production event.. The volume of ice production in 2019 is the sum of all ice production events in the area. The 2019 ice production will be compared with those from previous years. This study aims to further our understanding of ice volumes produced in this area and how best to measure it using remote sensing methods.

Building a geospatial dataset of freshwater protected areas for the contiguous US

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Over the past 50 years biodiversity has been declining more rapidly than any time in history. These effects are more pronounced on inland freshwater species, which declined by approximately 50% from 1970 to the year 2000. The design and establishment of protected areas is an essential tool in the preservation of biodiversity and maintenance of ecosystem function. In recent years large, open-source environmental datasets have become increasingly available for environmental management and conservation planning. We propose the creation of an extensive database that will inform protection of in-stream habitat, water quality, and imperiled species. We used GIS data from the National Hydrography Dataset (NHD) and the Protected Areas Database of the United States (PAD-US) to quantify how existing protected areas protect the 2.65 million inter-confluence stream reaches in the contiguous United States. Preliminary results indicate thatprotected areas cover approximately 591,087 km^2; however, only 2702 km^2 of these areas offering Level 1 protection according to the International Union on the Conservation of Nature (IUCN). Of the total protected area in the contiguous U.S, the Pacific Northwest and California has the highest levels of protection, and the Texas gulf has the least protection; 104,426 km^2, 104,423 km^2, and 2962 km^2 respectively. Ongoing analyses are using geospatial techniques to evaluate how protected areas in headwater catchments perpetuate their protective effects down.

Developing a Simulant to Replicate the Lunar Regolith

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Planetary scientists and engineers need to test their rovers, drills, or construction technologies with material that closely resembles the regolith, the loose, fragmental layer that overlies the bedrock. Numerous simulants have been made previously and we have developed a general-purpose lunar simulant called LCATS-1 (Lunar Caves Analog Test Sites). Raw simulant material was collected from the Vulcan Materials Company quarry in Knippa, Uvalde County, TX. Commonly called Knippa basalt, the petrologic classification is an olivine nephelinite. The lack of quartz and feldspar minerals, as determined by X-ray diffraction (XRD), coupled with the very low silica content determined by X-ray fluorescence (XRF), suggests a mantle source. LCATS-1 contains minor amounts of clay/phyllosilicate minerals, but these are interpreted to be weathering products. Knippa basalt is first processed at the quarry by a jaw crusher, and subsequent grinding, milling, and screening (sieving) reduces the simulant to desired grain-size fractions for spectroscopic, geotechnical, and physical properties testing. Overall, Knippa basalt is not an ideal chemical match for the lunar regolith, but it meets requirements for density, particle morphology, and access. Additionally, it has been used successfully for a robot test bed located at the UTSA main campus, as a staple for spacecraft landing pad bricks, feedstock for 3D printing, and for dust tests seeking to duplicate the lunar environment.

Determining Texas horned lizard population abundance in Karnes and Wilson Counties using visual encounter surveys

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Texas horned lizard (*Phrynosoma cornutum*; hereafter THL) populations have declined throughout their historic range resulting in state threatened status in Texas. Population declines are linked to habitat loss, introduction of exotic species, and loss of primary prey species, the harvester ant (*Pogonomyrmex* sp.). Due to low detectability, population abundance is unknown for much of the Texas horned lizard (THL) range, making conservation challenging. This is especially relevant in the South Texas Brush country where THLs are relatively understudied. Here, basic knowledge of habitat selection of THLs is lacking, further challenging population assessments. During the spring and summer of 2020, I conducted visual encounter surveys to determine population abundance of THLs in South Texas Brush habitat in Karnes and Wilson Counties, Texas. Study sites were representative of five habitat suitability ranks for THLs as determined by Texas Parks and Wildlife (TPWD). Surveys were conducted on 60 transects spread equally across the five habitat ranks. Along each transect, I conducted habitat surveys to assess habitat selection of THLs. No THLs were detected during visual encounter surveys indicating unsuitable survey methods or unoccupied habitat. Plans for future work to be conducted in 2021 will be discussed.

Recent trend of ice thickness over Ross Sea from ICESat-2

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Since the launch of NASA's ICESat-2 satellite in September 2018, this laser altimeter has been providing important information about sea ice cover in the cryosphere during these rapid climate changes. Compared to the other satellite altimeters, ICESat-2 is able to detect sea ice freeboard and thickness more accurately due to its good spatial resolution (17 m of footprint spaced by 0.7 m) and multiple photon beams. In this study, ICESat-2 freeboard data (ATL10) is used to figure out the ice thickness over Ross Sea, Antarctica, for recent two years. Weekly ice thickness over Ross Sea is mapped by applying geostatistical methods, and the spatial and temporal trends of the ice thickness for recent 2 years are identified from these ice thickness maps. The dynamics of sea ice in Ross Sea area is highly associated with the ice productions from the nearby polynyas: Ross Ice Shelf polynya (RSP), Terra Nova Bay polynya (TNB) and McMurdo Sound polynya (MCM). ICESat-2 shows a good performance in detecting low ice thickness for these polynya areas.

Bird feeding effects on abundance and diversity of urban birds

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Provision of wild bird food is a pervasive activity in many developed nations. Prior studies on effects of feeding wild birds have mainly occurred in temperate areas, in non-urban settings, and during the breeding season. Using a multi-step approach, we evaluated effects of wild bird food on the abundance and diversity of birds during the non-breeding season in San Antonio, Texas, an urban setting in a subtropical region as follows: 1) sales data were used to investigate what type, when, and where wild bird food is provided, 2) we used data from Objective 1 to inform a field-based study, and 3) we used surveys of residents to acquire site specific information about bird feeding habits. Results suggest that mixed seed and Nyjer seed were two most purchased or available foods. We randomly allocated 36 sites with either mixed seed, Nyjer seed, or no food (control) and used point counts to assess effects of food type on the diversity and abundance of birds. Preliminary results suggest bird diversity was higher at sites provided with bird food compared to control sites, while bird diversity was equivalent between mixed seed and Nyjer seed sites. Treatment type effects on abundance of birds varied by species; Lesser Goldfinches *Spinus psaltria* were more abundant at both Nyjer and mixed seed sites whereas there was no effect of food type on the abundance of Eastern Phoebes *Sayornis phoebe*. Our results highlight that bird food likely contributes to effects of urbanization on birds.

Rheology of the Andesite erupted from Fissure 17 of the 2018 Kilauea Lower East Rift Zone eruption

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Crystallinity and gas content are important controls on the eruptive style of magma. The Hawaiian Islands and other basaltic hot spot volcanoes are best known for erupting basalt. Mount Hualalai in Hawaii has erupted trachytes which are alkalic intermediate lavas, and are composed largely of alkali feldspar, not tholeiitic basalt. Mount Hualalai is proof that not only basalt can erupt on Hawaiian Islands. In 2018, a basaltic lava erupted on the Lower East Rift Zone (LERZ), and one of the fissures erupted andesite which is uncommon on this island. This volcanic rock contains coarse grained phenocrysts of plagioclase and two pyroxenes. We are investigating the petrology and rheology of the fissure 17 andesite to better understand the flow and how it was emplaced. We visited fissure 17 and collected samples in January of 2020. We will conduct petrographic analysis on thin sections of these samples using optical and electron microscopy. We will measure the viscosity of the lava using a concentric cylinder viscometer, at eruption temperatures of ~1200°C. This andesite is a new hazard to be aware of and the research is significant to communities on the rift zones of both Kilauea and Mauna Loa, which last erupted in 1984.

Colobus Population and Reproduction at Boabeng-Fiema Monkey Sanctuary

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Population density affects the health of animals in multiple taxa via disease transfer and reproductive rates. In primates, high population density can impact female reproduction due to increased aggression from conspecifics or stress from increased feeding competition. This study examined the potential effects of increasing population density on reproductive rates in the critically endangered species *Colobus vellerosus*. The population at Boabeng-Fiema Monkey Sanctuary, Ghana has increased in size since it became protected in the 1970's, while the forest has continued to decrease. I investigated demographic data of females and infants from up to 8 groups from 2000 to 2012. Rates of infant production decreased from 2008 to 2012, and interbirth intervals increased over that same time period, which shows a possible relationship between increasing population density and decreasing reproductive output. To prevent negative effects of high population density on female reproduction, future management strategies should aim to increase habitat size and connectedness. However, it is critical that illegal hunting of colobus that disperse outside this population stops. Because this population may be the last remaining population, effective management will be important to this species' survival.

Microstructural and elemental analysis of a proposed Lunar Simulant

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Space travel and habitation of the Moon is an ideal step for humankind to begin the first extraterrestrial migration. Exploration Architecture Corporation (XArc) and collaborators are developing lunar infrastructure construction applications ranging from habitats to landing pads, using in-situ resources such as lunar regolith for sintering, 3-Dimensional printing, and other additive construction technologies. Performing tests and simulations on Earth [ex-situ] aid in determining ideal methods and materials needed for construction at the lunar [in-situ] locations. For use as a main construction material, preliminary ex-situ testing uses terrestrial material "Knippa Basalt" due to the sparsity of lunar samples. The acquired basalt samples were characterized using optical microscopy, scanning electron microscopy (SEM), and energy dispersion spectroscopy (EDS), providing insight into the microstructural and chemical composition of the Knippa Basalt. Ongoing testing results will inform if the basalt is suitable as a compositional surrogate to produce reliable ex-situ data. Should the Knippa basalt scans yield satisfactory results, it will justify progression to further stages of testing, such as x-ray diffraction (XRD) analysis and structures refinement, to determine suitability in use for the modelling. In addition, this will determine how actual lunar regolith could be used in the process for lunar construction.

Improving Best Management Practices for Sensitive Karst Features on the Edwards Aquifer Recharge Zone

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Rapid development on the Recharge and Contributing Zones has led to increased risk of non-point source contamination of the Edwards Aquifer. Nutrients, as well as metals and other stormwater contaminants can build up during antecedent dry periods and runoff in relatively higher concentrations with first flush waters (Schwartz, 2003). The objective of this research is to define contaminant loading changes seasonally and during single events to design best management practices (BMPs) and offer improvements to existing designs to better protect karst features. Results from the water quality analysis of a tributary to Leon Creek show a strong first flush effect for total suspended solids and a weak first flush effect for nitrates. Seasonal loading for both nitrates and TSS are much more significant than concentration changes during single events. Conceptual BMP designs were developed using Solid Works software to blind swallow holes from first flush contaminants. Manual, pressure transducer, turbidity and conductivity sensor controlled BMPs were used to trigger recharge. All designs effectively reduced elevated concentrations of nitrate and TSS from entering potential recharge features, while continuing to allow recharge during the relatively cleaner periods of streamflow. The conceptual BMP designs were shown to reduce TSS 70% to 80% and nitrates 6% to 20% more than existing BMP designs.

Glider-based Ocean Current Velocity Observations: Data Processing and Applications

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Water velocities computed from high-resolution observations collected by an acoustic Doppler current profiler (ADCP) mounted on an underwater, autonomous glider yield in-situ water current data with valuable applications. For example, ocean current velocities are significant for validating coastal circulation models, studying the impacts of hurricanes and post-hurricane ocean recovery, monitoring the spreading of harmful algal blooms and dead zones, evaluating potential marine hydrokinetic energy regions, and estimating transport of water volumes, heat, sediments, nutrients, and pollutants. Obtaining water velocities from glider-ADCP observations involves a series of detailed data-processing steps which are customized to account for glider and sensor manufacturer differences and configuration options. Existing MathWorks® MATLAB code is adapted to compute water velocities for observations collected by the SeaExplorer glider, equipped with an upward-facing, Nortek one-MHz AD2CP, owned by the Department of Geological Sciences at The University of Texas at San Antonio. The glider's two-week test mission dataset, which was collected in April 2018 in the Northwestern Mediterranean Sea by the SeaExplorer manufacturer during the glider's production phase to ensure proper equipment and sensor operations, is utilized for this code development. Water velocities obtained will be statistically analyzed, visualized, and compared to manufacturer-processed results for the same dataset.

Satellite Remote Sensing of Snowpack Variability on Eagle Island, Antarctica

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Snow's albedo, or how much sunlight snow reflects back into the atmosphere, is extremely high, reflecting about 80 to 90 percent of incoming sunlight. This is important for Earth's energy balance because it reflects solar energy back into space, which helps cool the planet. Polar regions are very sensitive to climate change and therefore it is important to monitor the variability in snow accumulation at high latitudes. Eagle Island, a small island off the northern tip of the Antarctic Peninsula, is experiencing occasional events of extreme snowpack melt, some of which have been reported in the news. By using observations from NASA's Earth Observing System (EOS) project, particularly the TERRA satellite, we can examine these snowpack changes on Eagle Island. The sensor that provides these observations is the MODIS (Moderate Imaging Resolution Spectroradiometer), which tracks a wider array of Earth's vital signs than any other instrument aboard TERRA. In this study, MODIS observations of snowpack on Eagle Island over the past 20 years are analyzed to find climatological means and anomalies in snowpack to characterize extreme events. Relevant atmospheric climatic indices are analyzed to see if they are related statistically to recent, extreme snowpack melts. Studying these associations helps us understand how extreme snowpack events are related to climatic variability in a localized region of Antarctica, and may contribute new information to the global warming discussion.

Applications of Lidar Groundtruthing in Karst to Determine the Accuracy of Geophysical Methods for Detecting Cave Passages

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Because caves are environments shielded from direct solar radiation, determining where sizable cave passages exist on a planetary body is an important aspect of establishing future outposts for human space exploration. When exploring distant planets or moons for potential cave passages, scientists will initially be limited to remote sensing or surface geophysical techniques piloted by a rover. This makes understanding the capabilities and limitations of geophysical techniques in detecting void space crucial to identifying and planning development of human habitats. Terrestrial analogues can help us determine the limits of our equipment so that we can understand how accurate our estimates of the cave size will be. This talk will summarize work done in karst features local to the San Antonio area to document the discrepancies between GPR and electrical resistivity when compared to internal Lidar scans. While most features looked at on planetary bodies are of volcanic origin, the initial work shows where there are some dimensional discrepancies in limestone and where future work in this area should focus.

Potential correlation errors between the North American midcontinent basin and the Donets basin using conodonts and their growth stages

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The Late Paleozoic Ice Age was the last time Earth's global climate was like that of the current (Pleistocene through today) "ice-house" climate. The mid-Upper Carboniferous to the mid-Permian is characterized by cyclothem deposits, in which each cyclothem records a glacial cycle through sea-level rise and fall. Cyclothems can be studied to predict effects of future sea-level change(s) due to global warming. However, special attention must be taken to properly correlate individual cyclothems on different modern continents to construct accurate models. Most correlations are commonly based upon conodont faunas recovered from the maximum flooding units in individual cyclothems. Here, we present data from the North American Midcontinent Basin and the Donets Basin of eastern Ukraine to point out potential correlation errors that may result from misidentification of conodont species. Conodonts commonly evolved through heterochrony, a process by which adults of descendent species have characters that resemble juveniles of the ancestral species--or by which descendent species develop characters through a stage similar to adults of the ancestral species but continue to an adult morphology beyond the ancestral character-state. Our preliminary results suggest that adult growth stages were attained by midcontinent conodonts much more frequently than by the Donets conodonts. Recognition of the growth stage must be considered in conodont species identification for accurate correlations.

Oceanic Mixed Layer Depth and Subsurface Chlorophyll from Glider Observations

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Accurately estimating the Mixed Layer Depth (MLD) and the Subsurface Chlorophyll Maximum Depth (SCMD) are important tasks for studying physical-biological interactions in the ocean. For example, comprehending why these oceanic regions occur and how they influence the variability of phytoplankton in the ocean.

Using buoyancy gliders to estimate the MLD and SCMD offers many advantages. Gliders are autonomous underwater vehicles that can take measurements in all weather conditions, unlike survey ships and satellites. Gliders also examine the vertical structure of the water column while satellites are limited to the surface. In addition, gliders continuously collect a large amount of high-resolution data, allowing sudden changes in the water column to be detected. Another capability of gliders is to measure many physical parameters at once which allows us to analyze physical drivers for the SCMD.

We are using temperature and salinity glider data in the Gulf of Mexico to estimate the MLD using the threshold difference method. The MLD is defined as the depth where change in temperature or potential density is greater than a chosen threshold value relative to a reference depth near the surface. In addition to the MLD, we are estimating the SCMD in the Gulf of Mexico from simultaneous glider chlorophyll-a measurements.

Cryovolcanism: evolution and flow dynamics of cold lava flows

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Cryovolcanism is the eruption of aqueous material on icy bodies in the outer solar system. Cryogenic compositions cover a similar range of viscosity as silicate lavas albeit at a drastically different temperature regime. Few experimental studies have been done to determine how the fluid dynamic properties (i.e. rheology) evolve during emplacement and solidification of flows. Understanding the rheology and how viscosity changes as a function of cooling and crystallization, allows us to link the physical properties of the material to the resultant observable morphologies. Existing studies cover a very narrow compositional space, limiting our ability to effectively model features on different bodies. Thus, we attempt to measure rheology of crystal-liquid suspensions over a wide compositional range that will provide additional experimental data to support modeling efforts of cryogenic features. Understanding how these materials move, deform, and evolve upon crystallizing will help constrain what morphologies can form from various compositions. This data will also allow comparisons to terrestrial silicates and determinations of how similar the two materials behave. If they are analogous, are they formed and emplaced by the same mechanisms and processes further strengthening their link? And if not, what factors are contributing to the difference? Preliminary data will be presented along with the potential application to the efficiency of cryolava tubes as an emplacement mechanism.

Using Geochemical Analyses to Discern Source Areas of a Multi-Outlet Spring System in West Texas

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The San Solomon Springs system is situated in a karst landscape in West Texas and provides an example of a multi-outlet spring system with potentially different source areas for each spring. The San Solomon Springs system includes Phantom Lake, San Solomon, Giffin, Saragosa, West Sandia, and East Sandia springs. San Solomon, Phantom Lake, and Giffin springs are artesian springs, whereas Saragosa, East Sandia, and West Sandia springs are gravity springs. The conceptualization of each spring's source area remains poorly understood. This raises concern as demand for water resources in this semi-arid environment from unconventional oil and gas development in the Alpine High, in addition to other stressors, continues to increase. Hydraulic gradients and multivariate statistical analyses of the San Solomon Spring system hydrochemistry supports the conceptualization that Phantom Lake, San Solomon, and Giffin springs have a different source area than East Sandia, West Sandia, and Saragosa springs. Regional trends highlight the importance of structural controls on groundwater flow and geochemistry. The comprehensive approach of additional sampling, multivariate statistics, and geochemical modeling is necessary to establish that differences between the artesian and gravity springs are persistent and not ephemeral.

Digitizing Early Cretaceous dinosaur trackways to preserve the geological heritage of central Texas

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The aim of this study is to revisit several historic traditionally documented dinosaur tracks in Texas using high-resolution photogrammetry techniques. Dinosaur tracks lend valuable insight to the ecology of life in central Texas about 110 million years ago. Urbanization, seasonal flooding and weathering processes compromise the integrity of exposed tracksites. The use of 3D models offers an affordable, minimally invasive method of capturing and preserving fragile dinosaur tracks. Digitization of ichnology provides faster collaboration, preservation and educational resources that may otherwise be unavailable. High-resolution images will be captured through the use of unmanned drones, where the data will be rendered to create a 3D model of each trackway. Coupled with these photogrammetric techniques, reconstruction of the environment during the emplacement of the dinosaur tracks will be achieved by detailed analysis of rock samples using geochemical and microscopic methods. In the future, photogrammetry can provide a comparative method of assessing the changes that have occurred since the last study was conducted. Results integrated into an open-source database will be disseminated to the public through the Witte Museum in San Antonio, Texas, to create a platform where shared data can be used for scientific research and broaden participation and appreciation of geologic resources.

Cave air CO_2 and hydrochemical monitoring of Helictite Cave, Va

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A monitoring program was conducted at Helictite Cave, Va, from June 2016 to September 2018 in order to investigate how changes in precipitation and temperature experienced above the cave influence cave air circulation, drip rate, and hydrochemistry of dripwater within the cave. Discrete measurements of CO2 reveal a seasonal ventilation cycle and covariation of CO2 and δ13C of cave air indicates strong ventilation occurred in winter and subdued ventilation during the summer. Drip rates at two of the sampling stations were continuously monitored using drip frequency loggers. Flow at these drip sites showed no response to surface precipitation events, characteristic of seepage flow. The δ18O values of dripwater fall along the local meteoric water line and show much less variability compared to the δ18O of individual surface precipitation events, potentially indicating that water feeding these drips is well mixed with a long residence time in the epikarst. The essentially invariant concentrations of Mg2+ and SO42- support this hypothesis while changes in Ca2+ and alkalinity may be attributed to prior calcite precipitation. Results of this study highlight the importance of cave monitoring programs since processes occurring in the cave, soil, and epikarst can modify the proxy records preserved within speleothems used for paleoclimate studies.

Southern Appalachian Mountain wildfires increase soil microbial nutrient scavenging with burn severity

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Changing climatic conditions and years of fire suppression have caused increased susceptibility to wildfire across the United States. Specifically, in the Southern Appalachian Mountains, high severity wildfires occurred in 2016 due to increased drought. Based on the Composite Burn Index, 8 plots were established within Control, Moderate, Light, and Severe burns and sampled for mineral subsoil (approximately top 15-cm). Soils were collected from Nantahala Forest (NNF) in North Carolina, USA. Soil samples were collected over 3 time points (5 months, 9 months, 1.5 years post fire) among burn severity plots. Soil samples were prepared for microbial extracellular enzyme activities of beta-glucosidase (BG), cellobiohydrolase (CBH), beta-xylisodase (BX), beta-acetylglucosaminidase (NAG), leucyl aminopeptidase (LAP), and acid phosphatase (AP) using high-throughput fluorometric assays. Preliminary results for NNF location indicate that carbon (C) and phosphorous (P) acquiring enzyme production differed with wildfire severity 5 months after the burn event. Based on one-way analysis of variance (ANOVA) models, BG ($p < 0.001$), NAG ($p = 0.007$), and BX ($p = <0.001$) production differed among burn severity at NNF. Likewise, P (AP) acquiring enzyme production differed amongst burn severity plots ($p<0.001$) at NNF. These data imply that microbial nutrient limitation, particularly for carbon, may be high during immediate recovery across burn severity gradients in temperate forests.

Studying Captive Gibbons to Aid in Conservation Planning in the Wild

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Much of what we know about gibbons comes from captive studies since typically the sample size is larger, and it is much easier to monitor and observe nuances in behaviors that may be difficult to see in the wild. Research coming from captivity helps primatologists generate hypotheses about gibbon social behavior for research in both captive and wild populations. I studied the social dynamics of five groups of captive gibbons at the Gibbon Conservation Center in California. I measured the proximity of each individual to all of the others in their enclosures and used Hinde's proximity index to determine which individual was more responsible for maintaining proximity to the others. I found that as juveniles age, they spend more time further apart from their group members, an indication that they are nearing maturity and ready to leave their familial group. Understanding how much territory a gibbon group requires, especially as the juveniles age, provides valuable information for captive enclosure planning and land management for protected areas where gibbons live in the wild. Every species of gibbon is endangered. Combining research on captive and wild populations is an important step in understanding what influences population size and their ability to adapt to a changing environment. This will help inform conservation strategies as animals' habitats continue to change, becoming smaller and more degraded.

LUNAR RESIDENCY IN A SURFACE HAB

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A work-life balance has never been more crucial than now. Everyday experiences from the COVID-19 pandemic quarantine have proven the importance of a schedule, especially when balancing work in the home, a place previously dedicated to personal time. In the isolation of a lunar habitat designed for a crew of 4, crew members and researchers will be in physical contact with only 4 others for up to a year (or until consumables are restocked or crew members are sent home). To encourage the mental health necessary for stable levels of high productivity, a network of support consisting of strong relationships between residents is required. This network of support cements the ability to easily transition between a home and work environment so crew members can sustain high performance levels. High productivity is a key factor in the lives of lunar habitants. Scheduling personal growth activities/down time along with work and fitness in correlating periods alongside fellow residents allows for a shift in mentality between work and life activities in addition to developing relationships with other inhabitants, keeping habitants mentally fit, stable, and at their most productive. Every second they are off the ground of Earth is a costly one, lending importance to the efficient utilization of habitants' time. Keeping residents productive in their research and preparation of the site, as well as mentally and physically healthy, is essential in designing and implementing a surface habitat.

Comparisons of Geostrophic Current Observations from Buoyancy Gliders and Satellite Altimetry

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Our ability to estimate surface geostrophic currents in the ocean has improved by the development of autonomous buoyancy-driven underwater gliders and satellite altimetry. In the Gulf of Mexico, it is important to estimate surface current velocities to be able to track large, energetic, anticyclonic eddies that are shed intermittently from the Loop Current. These eddies have the potential to negatively impact the economy of the region by interrupting offshore oil-drilling operations. In this project, we compare geostrophic velocities estimated from gliders and satellite altimetry in the Gulf of Mexico. We seek to quantify the uncertainties of using the two approaches. For this comparison, we will use glider observations gathered by members of the Gulf of Mexico Coastal Observing System (GCOOS) and satellite altimetry data from the Jason-3 mission. Glider data allows density profiles of the water column to be computed to a depth of 1000 meters. These density profiles based on along-track density gradients, are then used to estimate geostrophic velocities perpendicular to the glider transect. Satellite geostrophic velocities, on the other hand, are derived from gradients of sea surface height. By selecting satellite orbital paths nearly parallel to the glider track and extracting satellite data nearly simultaneous with the glider mission, we compare the two cross-track geostrophic velocity estimates. The differences in velocity estimates are quantified and evaluated.

Cryptic Species of the Cosmopolitan Eurythoe

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Previous work has shown that the cosmopolitan marine fireworm, *Eurythoe complanata*, is a cryptic species complex characterized by deeply divergent populations in the Atlantic Ocean, Caribbean Sea and Atlantic/Pacific coasts of Panama, despite little to no morphological differences among representatives. Here we re-evaluate the phylogenetic relationships of *Eurythoe* with over 160 *Eurythoe* representatives sampled from populations throughout the eastern and western Pacific Ocean, Gulf of California, Mediterranean Sea, marine aquaria, as well as publicly available sequences, based on mitochondrial (COI and 16S rDNA) and nuclear gene (28S rDNA, ITS) sequence data. The objectives of this study are to: 1) identify the extent of "cryptic" speciation; 2) infer the phylogenetic relationships among globally distributed *Eurythoe* lineages; and 3) evaluate the population genetics and dispersal capabilities within *Eurythoe* lineages, given alternative reproductive and dispersal modes.

The importance of herbaria in research

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Herbaria are of scientific importance because they offer many beneficial reference materials to society for education and research. However, they are underutilized because the information they contain is not available to researchers. The Witte Museum located in San Antonio, Texas has a herbarium with information that has not been utilized. The objective of this study was to assess the value of the herbarium in providing historic information about Asteraceae (Compositae) in southern Texas. The family Asteraceae was selected for the study because it contains one the greatest number of described and accepted species of plant families in Texas. In order to use the information contained in the herbarium for research purposes, we digitized the Asteraceae specimens within the collection. The resulting dataset contained taxonomic information (genus, species), location, and collection date, and considered specimens from species collected between 1850-1975. As a second step, we downloaded publicly available point occurrence data for Asteraceae from the Global Biodiversity Information Facility (GBIF) and compared it with the herbarium data to evaluate the value of the herbarium for increasing information about the historic distribution (area of occupancy) and taxonomic diversity of Asteraceae in southern Texas. Our results suggest that small, herbaria harbor valuable information that can expand existing knowledge, and thus act as important contributors to an increasing pool of publicly

There's a fault in my flow: A reinterpretation of "pressure ridges" in silicic lava flows

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Folds on the surfaces of basaltic lavas, for example pahoehoe ropes, are among the most readily recognized geological structures. Orders of magnitude larger transverse ridges on silicic lava flows, typically referred to as 'ogives' or 'pressure ridges', have also been interpreted to be of fold origin. We challenge this widely accepted interpretation using examples from the western United States and Sardinia, Italy. Instead, we interpret the ridges and troughs on their upper surfaces, as fracture-bound structures rather than folds. We report on the absence of large-scale, buckle-style folds and note instead the ubiquitous presence of multiple generations and scales of tensile fractures comparable to crevasses in glaciers, and formed in ways similar to already recognized 'crease structures'. We report viscosity data and results of stress analyses that preclude folding (ductile deformation in compression) of the upper surface of silicic lavas at timescales of emplacement (weeks to months). Therefore, analysis of fold geometry (wavelength, amplitude, etc.) is erroneous, and instead the signal produced reflects the strength and thickness of the brittle upper surface stretching over a ductile interior. The presence of ogives on the surfaces of lavas on other planetary bodies may help to elucidate their rheological properties and crustal thicknesses, but relating to their tensile strength, not viscosity.

Changes in atmopsheric aerosols before and after the COVID-19 global shutdown

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The COVID-19 virus was first detected in Wuhan, China and its genesis was traced to infected bats, passed through an intermediate host (pangolins) to humans. COVID-19 or "Coronavirus" eached approximately 3 million confirmed cases between March and July 2020 in the United tates alone. The spread of this virus has affected both social and economic affairs on a global scale with more than 10 million confirmed cases worldwide. The pandemic has proven a global public health and socio-economic crisis. The virus warrants being studied to curtail its spread and prepare for future similar outbreaks.

Sentinel-5P has shown distinct changes in atmospheric aerosols over the COVID-19 epicenter in Wuhan. After Texas established similar shelter-in-place orders to curtail the spread of the virus, the state's industrial activity experienced an economic slowdown. Therefore, the virus provides a novel case in examining the impact of reduced greenhouse gases from changing economic activity on the atmosphere. This paper examines the changes in atmospheric aerosols before and after the COVID-19 global shutdown over major cities in Texas and Wuhan, China using satellite imagery.

The effects of rainfall on heron productivity

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I am researching the connection between annual rainfall and occupancy to evaluate changes in return rates and productivity of Great Blue Herons (Ardea herodias) in Cibolo Nature Preserve in Boerne, Texas. Count data was collected between the months of January to April and during the years of 2012 to 2019. Average annual rainfall rates will be used to help determine if there is a correlation between rainfall and productivity. Six sites with varying hydrological regimes were selected around the established rookery. Two game cameras were set up at each site to capture different varying behaviors exhibited by Great Blue Heron individuals during the duration of the count survey in 2019. Additionally, the cameras provided an understanding of the general wildlife composition of the area. Once my data is collected, I aim to use a Pearson correlation model to determine if my hypothesis of moderate rainfall the year prior yields the most success in occupancy, abundance, and reproductive success in the following year.