



Geography

Geography Newsletter

February 2019

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February Happenings

February is the shortest month, which explains why this newsletter is coming out late? But we shall strive to do better and tell you about upcoming events for the rest of the month:

Tuesday, February 19 – 3:30 PM – Keso Room: PhD Candidate **Colton Flynn** will defend his dissertation titled “Predicting Nutrient Content, Plant Health, and Site Suitability: A Case Study of *Eragrostis tef*.” The defense is open to the public.

Thursday, February 21 – 6:30 PM – MUR 341: Geography Club will have a screening of the animated film “Atlantis: The Lost Empire” for its first Movie Night of the year.

Sunday, February 24 – 11:59 PM: Geography Club spring t-shirt deadline: <https://osugeographyclub2019.itemorder.com/sale>

Thursday, February 28 – 6:00 PM – Student Union Suite 1600: Dr. Dale Lightfoot will lead a discussion about “Arab Culture” in an event sponsored by the OSU Arab Student Association.

[Research Week](#) is February 18-22 at OSU, and this year there are a lot of events scheduled – including “[Celebrating Authors](#)” which will include Carlos Cordova with his new book *Geoarchaeology*.



RW **RESEARCH WEEK**
2019
FEBRUARY 18-22

**CELEBRATING OSU RESEARCHERS
WHO CHANGE THE WORLD**

Geography Undergraduate Mentors Program (GUMP)

BS student Racine Swick submitted this report about her 2017-18 research project as part of the department's GUMP program:

“The GUMP experience changed my life. This program enables undergraduate students, passionate about research, to work closely with a faculty member and gain hands-on experience in a field they are excited about.

Through the weeks of July 16th through the 21st, 2018, I was a part of this program with Dr. Amy Frazier. This internship involved me in an organization called CLOUD-MAP that was in conjunction with multiple universities such as The University of Oklahoma, University of Kentucky and University of Nebraska. CLOUD-MAP utilizes atmospheric data collected from UAV's to better predict the weather.

The entire trip was a great learning experience. Dr. Frazier and her colleagues opened my eyes to field practices, data collection, and technical expertise I could not have gotten with any other group. Being hands on and collecting the data, created a want to expand my physical geography knowledge. After the trip, I was able to look at the data and begin to understand the difference in the atmospheric layers.

I have two favorite attributes that I take away from this program: the first is that through this experience I was able to better understand a subject that I didn't understand in the classroom. Through my research we utilized NDVI as a comparison to our atmospheric variables. In the classroom, I was unable to wrap my head around the concepts, however, through perseverance and a lot of research, I now understand it better than I ever thought possible. The second take-away is that, this experience has opened so many doors for me. I am now a research assistant to a fellow CLOUD-MAP team member, I was able to attend the AGU conference in Washington DC as a co-author on Dr. Frazier's poster, and I have made many life long friends along my journey.”

Geography Undergraduate Mentors Program (cont.)

Impacts of Land Surface Heterogeneity on Thermodynamic Variables Collected from Unmanned Aircraft Systems: Results from the 2018 LAPSE-RATE Field Campaign

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Abstract

In the past, it has been difficult to collect systematic, thermodynamic measurements in the atmospheric boundary layer (the first 1000s of the atmosphere). Because meteorological towers and weather balloons are limited in their spatial and/or temporal sampling frequencies, using small (small unmanned aircraft systems), aircraft are now able to capture measurements at high spatial and temporal scales, providing much greater insight into atmospheric dynamics that can potentially be used to improve weather forecasting. However, we do not know how these three scale variables are related to each other, and how these three thermodynamic variables collected by small, unmanned, temperature, and humidity change with respect to land cover and terrain. We collected atmospheric transects at different altitudes over diverse terrain and land cover in summer 2018 in the San Luis Valley of Colorado, as part of the 2018 LAPSE-RATE field campaign. In combination with a high-resolution digital terrain model produced from UAV imagery and land cover variables extracted from satellite data, acquired concurrently, we investigated how atmospheric variables change with respect to varying terrain and land cover.

Methodology

The UAV platform used in this project included a DJI Phantom 3 (Figure C) and a DJI Mavic Pro (Figure D).

Figure C: DJI Phantom 3
 Figure D: DJI Mavic Pro

An Intel i720 UAV sensor was used to capture atmospheric measurements around the 2018 field. The sensor was placed in a 20' vertical mast on top of the platform (Figure C). An Intel i720 sensor was also used to capture atmospheric measurements around the 2018 field (Figure D). These sensors collect humidity, temperature, and pressure variables and also have a GPS receiver.

The transects at Santa, NorthStar, and NorthStar were flown with a 100' base elevation as background, at an altitude range of 50 - 70 meters. The Saginaw transect was flown with the M300 at an altitude range of 50 - 100 meters. Terrain elevation was noted below each transect.

Study Area Locations

The map was created by R. Seick using a satellite image from the Google Earth Engine. The map shows the location of the study area in the San Luis Valley of Colorado. The map includes the following locations: Santa, NorthStar, and NorthStar.

Results

Results show moderate to strong relationships between the atmospheric variables, humidity, temperature, and density, and terrain and land cover. However, the direction of some of the relationships change with land cover and terrain, suggesting impacts on measurements from land surface heterogeneity.

Correlation Analysis

Calculations of Pearson Correlation Coefficients between atmospheric and environmental variables using the equation:

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

These findings can be used to improve atmospheric data obtained from UAVs, particularly with the goal of improving weather predictions and creating a higher quality map of the atmosphere. Weather data, such as thunderstorms.

Acknowledgements

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CLOUDMAP

UAS Data Collection

During the week of 10-12 July 2018, we collected atmospheric transects at 4 terrain sites in the San Luis Valley, Colorado with varying land cover and terrain as part of the 2018 LAPSE-RATE field campaign.

Saginaw 1125 m
 Santa 114 m
 NorthStar 1025 m

Terrain and Land Cover

Small scale maps obtained from the 2018 field campaign.

Figure E: Small scale maps obtained from the 2018 field campaign.



“The week before classes resumed (January 6-10, 2019), I presented my findings at the 99th Annual Meeting of the American Meteorological Society (AMS) in the Student GIS Poster session in Phoenix, Arizona. GUMP has taught me to push my limits as a scientist, to have patient endurance when it comes to research, and to never limit my ability to break my own boundaries. I intend to apply to many graduate schools and continue my education into the field of Planetary Science.”