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Leveraging Google Earth Engine to Couple Landsat and MODIS for Detecting Phenological Changes in Semi-Arid Ecosystems

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INTRODUCTION

Spectral classification over dryland regions is difficult because of the similar spectral responses of the plants. The reflectivity of the soil, and the quick senescence of plant species creates large errors when they are viewed through satellite imagery. Most public satellites do not have the ability to have the resolution – either temporally or spatially - to distinguish between the many different species that exist. As semi-arid regions have quick green-up immediately after rain fall, it is difficult to get properly timed imagery for best classification practices. This causes complications when faced with issues such as the invasion of Cheatgrass (Bromus tectorum) in areas that were historically Wyoming Sagebrush (Artemisia tridentata) and native grass dominated. Cheatgrass is known for its quick spread over regions, especially after fires have occurred, and creates a positive feedback loop for more frequent fires in the future. Fusion methods between multiple satellite systems will allow us to target higher temporal and spatial resolution views on these systems, which will aid with vegetation classification and monitoring.

GOOGLE EARTH ENGINE

Google Earth Engine (GEE) is an online repository and code engine that is used extensively in this project. GEE holds plethora’s of remote sensing information, and allows you to go through all of it quickly and easily without having to use your own memory or processors. GEE is used for all preprocessing, registration, and interpretation of the inputs and outputs for STARFM. This allows work that usually would have taken hours to be done in less than 10 minutes, and for large data sets to be easily included.

RESULTS

The GEE STARFM system was run on a study area in the Birds of Prey from March 2, 2016 to October 13, 2016. This used over 11 Landsat images and 225 MODIS images for interpolation.

CONCLUSIONS

• STARFM facilitated with GEE allows for easy and quick computation of large datasets for interpolation.
• Phenological differences of plants with similar spectral responses can be characterized in the time domain.
• Cheatgrass has a markedly different response from sagebrush, which can be used for classification at multiple time steps.
• Vegetation response to fire can be easily tracked and quantified, allowing for better understanding of regrowth and possible management tactics.

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