Evaluating the Atmosphere-Land Exchange Inverse Evaporative Stress Index for the Alaskan Environment to Determine Wildfire Likelihood

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Overview
Alaska’s wildfire season has progressively increased in duration and intensity over the last decade, leaving forested areas subject to devastating destruction. These increases in wildfire occurrence are due to a gradual rise in land surface temperature, decrease in precipitation levels, and lack of soil moisture throughout the state. This causes concern for air pollution as well as the destruction of homes and wildlife habitats within or around forests. Using the Atmosphere-Land Exchange Inverse (ALEXI) Evaporative Stress Index (ESI) generated by the NASA Short-term Prediction Research and Transition Center (SPoRT), the team determined that ALEXI ESI provided lead time on the evaluation of vegetation stress.

Objectives
- Utilize MODIS and VIIRS sensors to introduce improved methods of evaluating vegetation stress and determining wildfire likelihood in Alaska
- Evaluate and calibrate the ALEXI ESI product when applied to the Alaskan environment
- Identify areas throughout Alaska that are prone to drought and wildfires

Methodology

Data Processing
- NDVI Calculation
- Mean
- Standard Deviation
- Anomaly
- Drought Monitor
- Reclassify
- CFWI
- Reclassify

Data Analysis
- Visual Comparisons
- Pearson’s Correlation Coefficient – Spatial Correlation
- Confusion Matrix – Accuracy Assessment

Earth Observations
- Aqua & Terra MODIS
- Suomi NPP & NOAA-20 VIIRS

Results
Visual comparison

June – July 2018
a. ALEXI ESI
b. NDVI Anomaly
b. USDA Drought Monitor

Quantitative analysis displaying the relation between the ALEXI ESI and NDVI Anomaly

Quantitative analysis displaying the accuracy between the ALEXI ESI and US Drought Monitor Classification

Conclusions
The ALEXI ESI had a low correlation to the MODIS-derived NDVI products, which demonstrates that the ALEXI ESI product may be detecting stress in green vegetation, providing increased lead time in wildfire detection. The ALEXI ESI also had an overall accuracy of 61% when compared to the USDA Drought Monitor drought classification areas during June and July of 2018, showing that in the areas classified as drought with the US Drought Monitor, the ALEXI ESI mostly agreed.

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