Comparison of Spatially Explicit Annual Vegetation Disturbance Products Over the Conterminous United States

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I. Abstract and Introduction

Established programs like LANDFIRE (LF) (Rollins 2009) and relatively recent programs like Landscape Change Monitoring, Assessment, and Projection (LCMAP) and Landscape Change Monitoring System (LCMS) are producing periodic annual disturbance products for the conterminous United States (CONUS).

However, each program has distinct objectives with different algorithms (Multi-Index Integrated Change Analysis (MICA) Jin et al. 2013, LF: Continuous Change Detection and Classification (CCDC) Zhe and Woodcock 2014, LCMAP: Ensemble Classifier Housman et al. 2021 LCMS) and program-specific definitions for disturbance. In this work we compare the spatially explicit vegetation loss as mapped by each of these programs using LF annual vegetation disturbance data as a reference.

The LF disturbance data are an ideal choice of reference as the data include both remotely sensed imagery and submitted events (i.e., field-collected vegetation loss data) and are visually inspected by analysts. Furthermore, LF disturbance data incorporate spatially explicit fire-related disturbance data from Monitoring Trends in Burn Severity (MTBS), Bumed Area Equipment Response (BAER), and Rapid Assessment of Vegetation (RAVAG) fire programs.

II. Materials and Methods

- LF maps around Day Of Year (DOY) 175 & DOY 250 ± 50 days composite
- LCMAP time of spectral breaks maps change DOY but change land cover is defined for DOY 182
- LCMS maps lose between DOY 244 of consecutive years
- Minimum common match is between 2015 DOY 250-2016 DOY 175 (LF Seasonal Multi-Index Integrated Change Analysis (SMICA)) of the consecutive year
- Only disturbance clusters that were > 50 contiguous Landsat pixels avoiding regions defined as urban, water or agricultural lands by the National Land Cover Data base 2016 (Homer et al. 2011) were considered
- Tile-wise differences were quantified using Cohen’s kappa
- Fig. 1. Temporal reporting periods of the three disturbance mapping programs

III. Results

- Temporal reporting periods of the three disturbance mapping programs
- LCMAP wide lack at the disturbance products by the three programs: LF SMICA (2015 DOY 290+2016 DOY 2017 detection), LCMAP-2015 and 2016 LCMAP time of seasonal breaks and land cover changes, and LCMS-2016 with no temporal adjustment
- Temporal reporting periods were considered and adjusted before intercomparison
- Large disturbances in the Western United States are captured by all three programs
- Southeastern United States appears similar
- Differences are also evident, especially in central regions
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IV. Results (cont.)

- Fig. 2. CONUS wide lack at the disturbance products by the three programs: LF SMICA (2015 DOY 290+2016 DOY 2017 detection), LCMAP-2015 and 2016 LCMAP time of seasonal breaks and land cover changes, and LCMS-2016 with no temporal adjustment
- Temporal reporting periods were considered and adjusted before intercomparison
- Large disturbances in the Western United States are captured by all three programs
- Southeastern United States appears similar
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V. Conclusions

- Despite clean differences, a low to moderate spatial correlation was seen across all three products
- Maps varied regionally and tended to be lower near the central regions of the US
- Overall, LCMS disturbances were more spatially correlated with LF than with LCMAP.
- Closer examination of some of the larger discrepancies suggests that along with algorithmic differences, lack of temporal alignment between the three programs (i.e., reporting periods) was a significant factor for some of the observed differences.

VI. References


