Towards multi-platform validation of active fire products from moderate resolution sensors in the Amazon

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BACKGROUND

One of the goals of the LBA-ECO Phase III study LC-35 (Analysis of long-term fire dynamics and impacts in the Amazon using integrated multi-source fire observations) is to evaluate fire detections from multiple moderate and coarse resolution sensors (i.e. MODIS, AVHRR, GOES) as part of the generation of a fused multi-sensor active fire product in the Amazon. This pilot study evaluates the potential for product validation using higher resolution sensors that are flown on separate platforms and therefore provide fire observations with a non-negligible time difference. The problem is analyzed by comparing validation results for the single-platform Terra MODIS and ASTER configuration with those for Terra and Landsat-ETM+

VALIDATION OF ACTIVE FIRE PRODUCTS

Active fire product accuracy is a function of observing conditions (i.e. satellite view angle); environmental conditions (non-fire background); sensor conditions (i.e. degradation of sensitivity). Validation is defined as the process of assessing by independent means the quality of the data products derived from system outputs.

For proper validation of the active fire products, simultaneous mapping of thermal conditions within the satellite pixel is required. The most viable option for a statistically robust analysis is the use of higher resolution satellite observations (Csizsar et al., 2006).

THE MODIS ACTIVE FIRE VALIDATION PROCESS: SINGLE-PLATFORM CONFIGURATION

Active fires from 1km Terra MODIS are validated using 30m fire masks from ASTER flown on the same satellite platform.

MODIS validation using Landsat-7/ETM+

The Landsat-7/ETM+ data are analyzed in terms of the following:

1. Impact of the diurnal cycle of fire activity
2. Residual differences in ASTER and ETM+ fire detections
3. Differences in ASTER and ETM+ fire detection probabilities
4. Comparison of several major higher resolution sensors near the 10:30 Terra orbit (drifting)

DATA

The orbits of Landsat-7 and Terra enable the collection of ETM+ and Terra MODIS imagery from the same day, but ~30 minutes apart.

RESULTS

There is a bias towards higher fire counts from ETM+ than from ASTER. Possible explanations:
1. Impact of the diurnal cycle of fire activity
2. Residual differences in ASTER and ETM+ fire detections

FUTURE PLANS

- Similar analysis is underway for the use of ASTER and ETM+ for the validation of the active fire product from the GOES Imager.
- The fire detection algorithms for ASTER and ETM+ will be refined to account for the anomalous sensor behavior at saturation (i.e. blooming, spikes, near-zero digital output).
- Further sensors will be included in collaboration with international partners within GOCO-Gold Fire and ECOVS WGCV Land Product Validation Subgroup.

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REFERENCES