MODIS 250m burned area mapping based on an algorithm using change point detection and Markov random fields.

Bernardo Mota (1), Jose Pereira (1), Manuel Campagnolo (1), and Rebeca Killick (2)

(1) Technical University of Lisbon, School of Agriculture, Forest Research Centre, Lisbon, Portugal (bmota@isa.utl.pt), (2) Department of Mathematics and Statistics, University of Lancaster

Area burned in tropical savannas of Brazil was mapped using MODIS-AQUA daily 250m resolution imagery by adapting one of the European Space Agency fire_CCI project burned area algorithms, based on change point detection and Markov random fields. The study area covers 1,44 Mkm^2 and was performed with data from 2005. The daily 1000 m image quality layer was used for cloud and cloud shadow screening. The algorithm addresses each pixel as a time series and detects changes in the statistical properties of NIR reflectance values, to identify potential burning dates. The first step of the algorithm is robust filtering, to exclude outlier observations, followed by application of the Pruned Exact Linear Time (PELT) change point detection technique. Near-infrared (NIR) spectral reflectance changes between time segments, and post change NIR reflectance values are combined into a fire likelihood score. Change points corresponding to an increase in reflectance are dismissed as potential burn events, as are those occurring outside of a pre-defined fire season. In the last step of the algorithm, monthly burned area probability maps and detection date maps are converted to dichotomous (burned-unburned maps) using Markov random fields, which take into account both spatial and temporal relations in the potential burned area maps. A preliminary assessment of our results is performed by comparison with data from the MODIS 1km active fires and the 500m burned area products, taking into account differences in spatial resolution between the two sensors.