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Mapping fuel loads in the Brazilian protected areas of the Cerrado in support of integrated fire management

J. Franke [a,*], P. A. Dias [b], R. Beatty [c], A. A. Hoffmann [d], P. De A. Cândido [e], A. E. Melchiori [e], F. Siegert [a], P. Buss [d]

[a] RSS – Remote Sensing Solutions, Isarstrasse 3, 82065 Baierbrunn, Germany – franke@rssgmbh.de
[b] Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio)
[c] 321Fire , Praia do Tofo, Inhambane - Mozambique
[d] Deutsche Gesellschaft für Technische Zusammenarbeit (GIZ) GmbH
[e] Instituto Nacional de Pesquisas Espaciais (INPE)

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ABSTRACT:

The Cerrado is considered to be the most species-rich savannah region in the world covering ~2million km^2. Uncontrolled late dry season large-scale fires promote deforestation, cause intensive greenhouse gas emissions (~25% of Brazil's land-use-related CO_2 emissions between 2003 and 2005) and are a major threat to biodiversity. The Brazilian-German Cooperation Project "Prevention, control and monitoring of bushfires in the Cerrado" aims at improving integrated fire management in the Brazilian savannah. One objective of integrated fire management is the implementation of controlled early burning in protected areas, to reduce the occurrence of large-scale late season fire by fragmentation of areas of different fuel load levels and thereby reducing fire severity. The planning and implementation of controlled early burning activities is supported with geo-information on fuel load conditions over large areas.
Based on Landsat-8 data, green and dry biomass was estimated as an indicator for fuel load conditions at the beginning of the dry season for three pilot areas, Parque Estadual do Jalapão, ESEC Serra Geral do Tocantins and National Park Chapada das Mesas. A spectral mixture analysis, the "Mixture Tuned Matched Filtering" was applied to Landsat-8 data, whereby high-resolution RapidEye data was additionally used to find optimal spectral endmembers and to monitor the controlled burning. These early dry season fuel load maps were provided to park managers as a planning tool for controlled early burning. In addition, the burned areas between 2000 and 2014 have been derived from Landsat time series in order to assess the fire history. At the end of the dry season, updated fuel load maps have been created for the monitoring of fire effects and for planning of early burning measures in 2015. Due to the demonstrated wide-ranging benefits of the fuel load maps, an operational provision of these maps through Brazilian authorities is envisaged.

* Corresponding author.