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A comparison of land cover maps to define vegetation classes of fire risk in Brazil

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INTRODUCTION

Natural fires are essential in the structure and functioning of many ecosystems in the world. Some vegetation types are more vulnerable to fire, e.g.tropical forests, whereas others are fire dependent, like savannas. However, the constant and uncontrolled use of fire as an agricultural tool, particularly in developing regions, has contributed to accelerate land cover (LC) changes and to disrupt spatial distribution patterns of the original vegetation even in fire-prone ecosystems. Satellite-derived LC global products have been developed to quantify frequencies, processes and drivers of annual LC changes, where accurate characterization and mapping of LC is key to define the most fire affected vegetation types. In this context, the aim of this study was to evaluate LC maps to define the fire risk (FR) vegetation classes used in the INPE´s FR model.

MATERIAL AND METHODS

We compared the global ESA CCI Land cover v2.0.7 derived from the Meris-300m sensor and the NASA/MCD12Q1-IGBPv005 from Modis-500m data products with the regional LC Mapbiomas v3.1 derived from 30-m Landsat images, used here as a reference for the Brazilian territory. All maps were evaluated for the year 2012 at 1 km spatial resolution and reclassified in the seven LC classes used in the FR model: 1-Grasslands, 2-Croplands and Cropland/Natural vegetation mosaic, 3-Open Shrublands/ Savannas, 4-Closed Shrublands/Woody Savannas, 5-Evergreen Needleleaf Forests, 6-Deciduous Needleleaf/Mixed Forests, and 7-Evergreen Broadleaf Forests/Permanent wetlands (Figure 1).
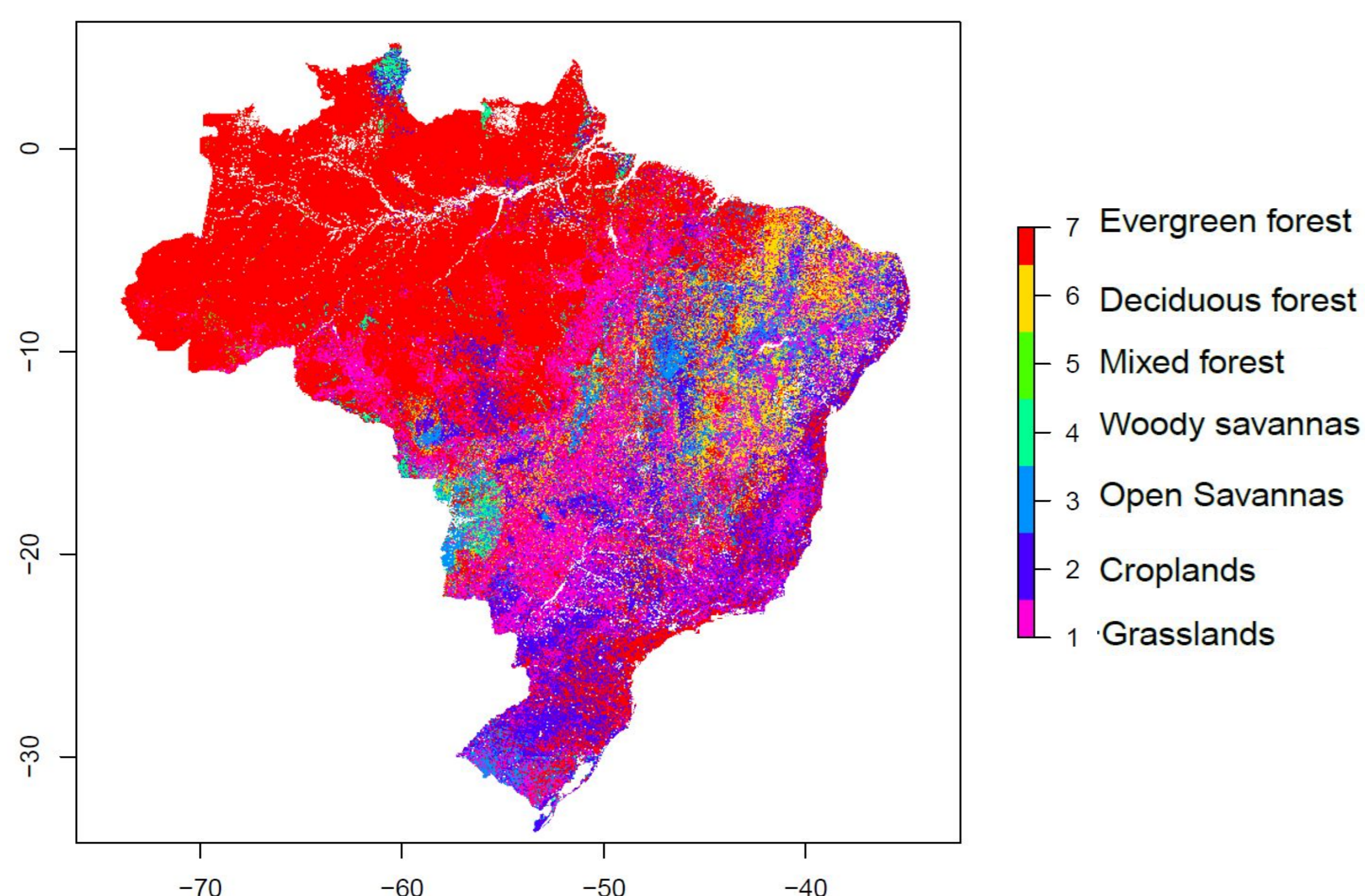

Figure 1. Land cover classes used in the INPE's Fire Risk model at 1km of spatial resolution for the year 2012, derived of Mapbiomas 3.1 dataset

RESULTS AND DISCUSSION

All LC datasets showed >40% of coincident pixels to class 7. The main differences were observed in the fire-prone ecosystems comparing global products and Mapbiomas, with ~34% of reduction to 3 and 4 and an increase of ~14% in 1, showing that global products tend to classify typical Brazilian savannas (class 2 and 3) as grasslands (class 1) (Figure 2).
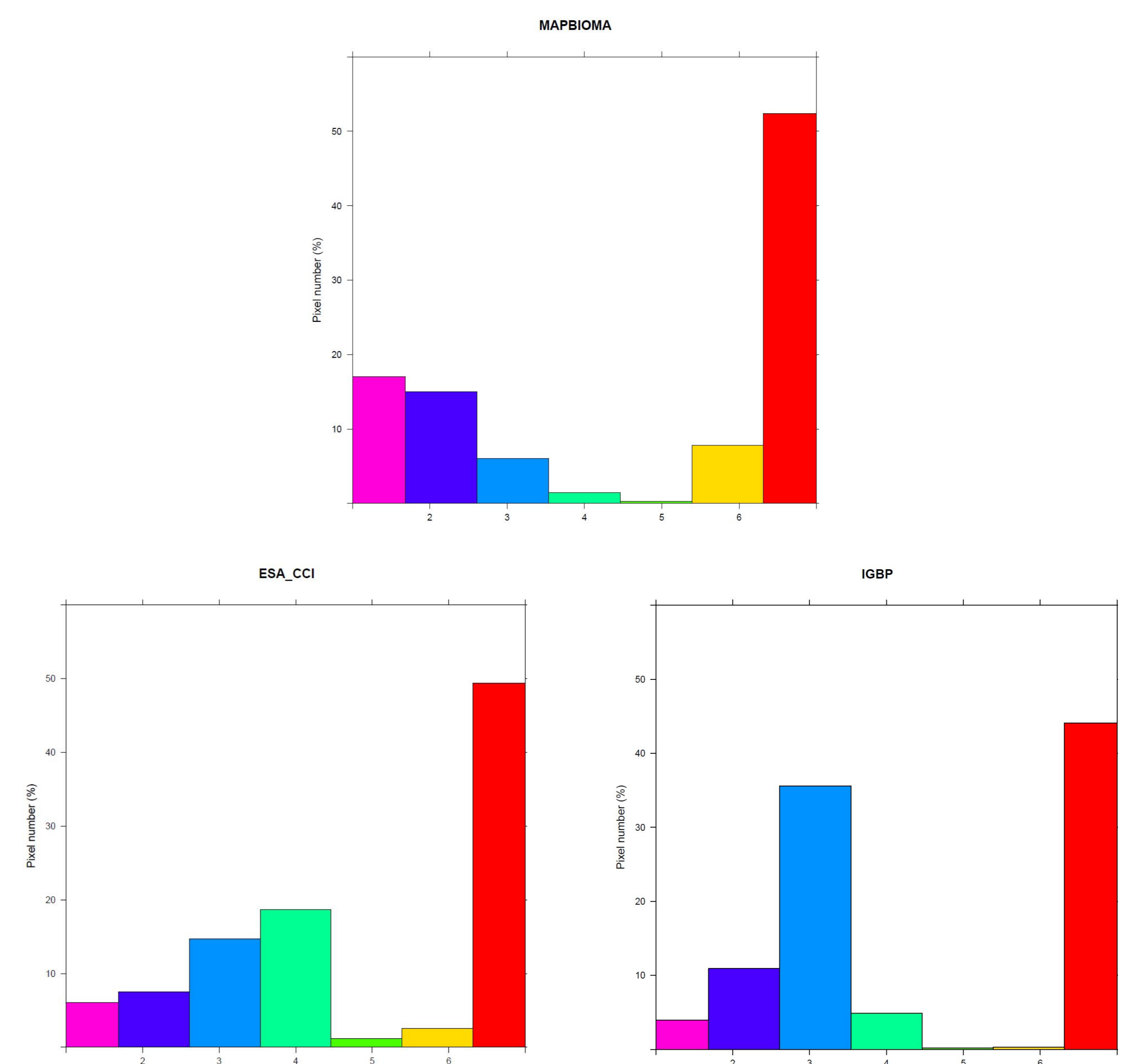

Figure 2. Comparison of pixel number(%) from vegetation classes of fire risk (1-7) among ESA CCI Land cover, NASA/MCD12Q1-IGBP and Brazilian MapBiomas datasets at year 2012.

CONCLUSION

Our results demonstrate the importance of a reliable regional LC map to improve the quality of spatial vegetation distribution to estimate fire risk. An accurate fire risk LC type characterization can support decision strategies in fire management and fire modelling. From these results, MapBiomas and its yearly updates were adopted as the vegetation map input for INPE´s FR, replacing MCD12Q1-IGBP.