Spatial variability of the spectral properties of forest structures over the Amazon

Authors: Liana O. Anderson, Yadvinder Malhi, Luiz Aragão, Yosio Shimabukuro

Email: lander@ouce.ox.ac.uk

The Amazon forest has been largely studied in terms of biodiversity, carbon cycle, and conservation. All these studies use different strategies and methodologies to capture the local scale findings and to understand the implications of the results in a regional level. However, the number and spatial location of the field inventories is still an issue of concern when we try to understand the Amazon forest variability in a large scale. Just recently the idea that Terra Firme forests might also represent ecologically different forest types was reported in the literature. In this study, we explore the spectral properties of 35 field site plots, located in different forest physiognomies over the Amazon. The main objective is to understand how the spectral properties of the remote sensing data reflect differences in the forest structure. To achieve this objective, we have precisely located all these field plots using Ground Positioning System (GPS) and field information to assure the high quality of the data. Field information was also used (Amazon Forest Inventory Network - RAINFOR project) such as tree inventory: density, species taxonomy and basal area. MODIS MO09GQK daily data product was used due to the high temporal image acquisition frequency permitting a cloud free image of the region of interest and high spectral quality. We have used not only the 7 spectral bands of the MODIS data, but we also generated water indexes based on the short wave infrared bands and fraction images derived from unmixing models. This data were integrated in a Geographical Information System (GIS), to extract the samples. Two statistical approaches are being carried out, the linear regressions and principal component analysis. Our preliminary results on the linear regression analysis have showed two new insights. The first one is in relation of the Band 4 – green channel. It showed significant relationship with the number of species (r^2=0.4) and density (r^2=0.66) and number of very large tress (r^2=0.7) at 95% confidence level. Secondly, we found a significant relationship of shade fraction derived from the MODIS data with the number of species. It indicates that green channel and also shade fraction contain information about forest structure and are being better investigated.