



## **High resolution regional soil carbon mapping in Madagascar : towards easy to update maps**

Clovis Grinand (1,2,3), Nadine Dessay (1), Tantely Razafimbelo (5), Herintsitoaina Razakamanarivo (5), Alain Albrecht (2), Romuald Vaudry (3), Matthieu Tiberghien (3), Maminiaina Rasamoelina (4), and Martial Bernoux (2)

(1) RD, UMR-EspaceDev, Maison de la télédétection, 500 Rue Jean François Breton 34000 Montpellier, France, (2) IRD, UMR-Eco&Sols, 2 Place Viala - 34060 Montpellier cedex 2 - France, (3) Etc Terra, 127 rue d'Avron, 75020 Paris, France, (4) WWF Madagascar, Antsakaviro, 101 Antananarivo, Madagascar, (5) LRI, Route d'Andraisoro, 101 Antananarivo, Madagascar

The soil organic carbon plays an important role in climate change regulation through carbon emissions and sequestration due to land use changes, notably tropical deforestation. Monitoring soil carbon emissions from shifting-cultivation requires to evaluate the amount of carbon stored at plot scale with a sufficient level of accuracy to be able to detect changes. The objective of this work was to map soil carbon stocks (30 cm and 100 cm depths) for different land use at regional scale using high resolution satellite dataset. The Andohahela National Parc and its surroundings (South-Est Madagascar) – a region with the largest deforestation rate in the country - was selected as a pilot area for the development of the methodology. A three steps approach was set up: (i) carbon inventory using mid infra-red spectroscopy and stock calculation, (ii) spatial data processing and (iii) modeling and mapping. Soil spectroscopy was successfully used for measuring organic carbon in this region. The results show that Random Forest was the inference model that produced the best estimates on calibration and validation datasets. By using a simple and robust method, we estimated uncertainty levels of 35% and 43% for 30-cm and 100-cm carbon maps respectively. The approach developed in this study was based on open data and open source software that can be easily replicated to other regions and for other time periods using updated satellite images.