



## JRC CONFERENCE AND WORKSHOP REPORTS

# The ReCaREDD project

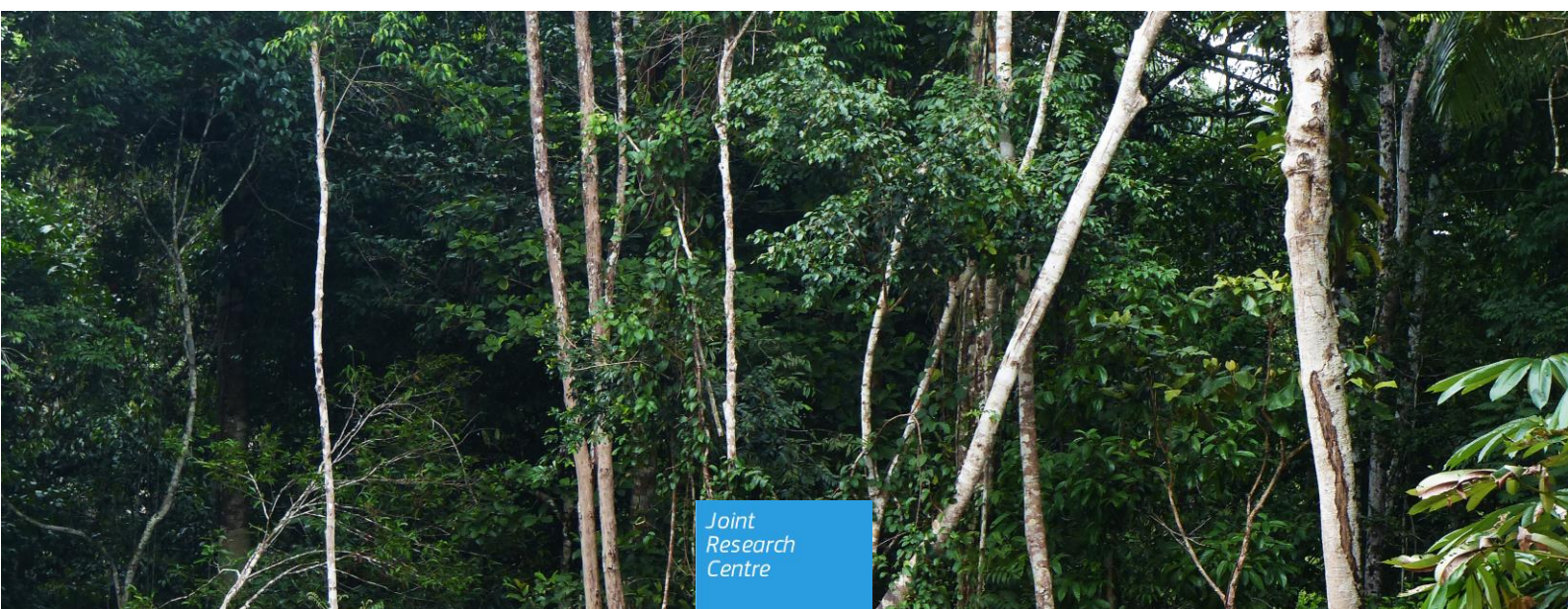
*Brazil workshops – Curitiba and São José dos Campos,  
13<sup>th</sup> – 20<sup>th</sup> April 2016*



Brazil

René Beuchle and Dario Simonetti  
<http://forobs.jrc.ec.europa.eu/>

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## **Background**

The ReCaREDD (Reinforcing Capacities for REDD) project is hosted by the Bio-Economy Unit of the European Commission's Joint Research Centre. It is funded by the EU overseas cooperation service DG DEVCO. Its goal is to enhance the ability of institutions in partner countries to report on forest degradation, in a reliable and cost-efficient manner. Further objectives are to develop, share and adapt appropriate monitoring methods and to provide direct assessments of the status and evolution of tropical forest cover in support to forest policies and national and international negotiations on emission reductions. In this framework the JRC is running a set of workshops to inform partner institutions and train them in techniques for monitoring and assessing forest degradation using remote sensing and field surveys.

### **Goals:**

Reinforce the capacity to process, interpret and extract data on forest cover and on forest cover change from satellite data

Propose options and strategies for forest degradation monitoring to national environmental agencies

Provide SENTINEL 2 data and image processing software for forest degradation monitoring

# **1 Workshop in Curitiba, Brazil (13<sup>th</sup> – 15<sup>th</sup> April 2016)**

The workshop was held at the headquarters of EMBRAPA Florestas in Curitiba/Colombo from 13<sup>th</sup> – 15<sup>th</sup> April, as a follow-up of EMBRAPA's visit in Ispra in November 2015 (supported by the 8th EU-Brazil Sector Dialogues Programme). EMBRAPA Florestas is responsible for the development of a remote sensing – based methodology for the 'Landscape Approach' as part of the currently ongoing Brazilian National Forest Inventory. In this context, the newest version of the JRC IMPACT Toolbox was presented to EMBRAPA's team. IMPACT is an essential tool integrated in the methodology of the 'NFI Landscape Approach', which should at some stage be applied to more than 5.000 sample units. Eight researchers from EMBRAPA Florestas attended the workshop.

## **1.1 Main Results**

- Altogether more than 5000 sample units of 10km X 10km RapidEye imagery, distributed over the Brazilian territory, will be processed in the context of the 'Landscape Analysis' (as part of the Brazilian National Forest Inventory). The methodology of EMBRAPA Florestas developed for this analysis is built in a substantial part on the JRC IMPACT Toolbox. The discussion related to this issue was on possible ad hoc editing for specific needs for the 'Landscape Analysis' such as e.g. the integration of scripts to allow to apply ArcMap statistical models in batch mode. Landscape Analysis Indices - mostly generated using the JRC GUIDOS Toolbox - were identified that could be of use also in other contexts, and thus could be envisaged for integration into IMPACT. The problems during the production process of an object-based forest mask with RapidEye imagery were discussed, possible solutions for better forest masking were examined and tested.
- Indices for Landscape Analysis: On the basis of 20 classified (land use / land cover) sample units over Paraná State, a Landscape Classification was proposed through Landscape Composition Indices, Morphological Habitat Indices, Landscape Mosaic Models, Border Interface Models, Landscape Connectivity, Landscape Taxonomy Classes etc. The indices were discussed 'one by one' during the meeting, as well as the cartographic products resulting from the analysis.
- Review of the currently used methods regarding the Brazilian NFI 'Landscape Analysis' with an emphasis on the class 'Trees Outside Forest' and on options for the methods adaption for other Brazilian biomes in the dry and semi-dry domain (Caatinga and Cerrado biomes).
- Review of the Google Earth Engine scripts used by EMBRAPA Florestas
- The important issue concerning intellectual property was discussed on the background of the possible usage of IMPACT, GUIDOS and INPE's segmentation software (integrated in IMPACT) by private companies during the planned outsourcing of the Brazilian NFI Landscape Analysis.

- Contact has been initiated with the JRC COIN (Composite Indicators Research Group), which reviews (amongst others) environmental indicators, for EMBRAPA Florestas to get more scientific input in this field.
- EMBRAPA Florestas proposed a participation of the JRC at the international NFI Symposium in Goiânia in July 2016 and in addition proposed a series of joint publications on different topics related to the 'Landscape Analysis', such as the use of indices to classify 'Landscape sample units' into areas of 'similar development', the RapidEye image classification concept, the concept and mapping of 'Trees Outside Forest' (TOFS).

#### Future steps:

- The issue of distribution rights / intellectual property rights of JRC IMPACT Toolbox have to be clarified on JRC side. EMBRAPA should be informed about new tools added to IMPACT.
- Discussion on the usage and future development of the JRC GUIDOS Toolbox
- First steps for joint publications should be taken. A possible opening of the 9th Call for the EU-Brazilian Sector Dialogues should be followed.

Both workshops were organised by Dario Simonetti & René Beuchle

For more information on the ReCaREDD activities in South America:

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## **2 Workshop in São José dos Campos, Brazil (18<sup>th</sup> – 20<sup>th</sup> April 2016)**

A three-day workshop, attended by 15 researchers, was held at the INPE Remote Sensing department, the main topics discussed were the possible usage by the JRC of the new version of INPE's TerraLib segmentation software, the presentation of the new version of the JRC IMPACT Toolbox, several joint INPE-JRC research projects (long-term forest cover change assessment in the Amazon, selective logging monitoring in Mato Grosso State), and, in the general the way forward of the remote sensing – based forestry research collaboration between the two research centres, with a specific focus on forest degradation monitoring. INPE is responsible for the technical aspects regarding the Brazilian REDD reporting.

### **2.1 Main Results**

- 680 GB of Sentinel-2 data (134 scenes) were delivered to the remote sensing department of INPE (DSR). The IMPACT toolbox was presented to INPE as means to (pre-) process Sentinel-2 data and to use the INPE segmentation software in a dedicated environment of tools for satellite image classification and statistics analysis. Future development of the software was discussed.
- Presentation of and discussion about the JRC approaches to map selectively logged areas in tropical forests with the soil fraction information (by 'spectral unmixing') and with the Normalised Burned Ration (NBR), both integrated in the IMPACT Toolbox.
- The DSR presented the work of several doctoral students in the field of forest disturbance detection by a variety of methods, e.g. the quantification of burned forest in the Amazon by using LIDAR data, the field assessment of long term fire impact in Amazon forests and the application of the JRC software GuidosToolbox for the quantification of the Amazon forest fragmentation.
- Vanildes Ribeiro, responsible for the hands-on work of PRODES (within the FUNCATE foundation) explained the day-to-day issues during the data collection and statistical analysis of the PRODES, DETER, DETEX and DEGRAD projects. The PRODES project has an official minimum mapping unit of 6,25 ha, but interpreters are encouraged to map smaller units of deforestation areas. These smaller areas are not included in the official yearly statistical analysis, but nevertheless constitute a considerable amount of deforestation in the Brazilian Amazon. The more detailed analysis of this interesting dataset will be started by INPE very soon.
- Alberto Setzer (Department of Weather Forecast and Climate Studies - CPTEC) presented his work on the active fire and burned areas monitoring with coarse and medium resolution satellite imagery. While MODIS-based active fire and burned areas detection is available for the entire Brazilian territory. The results are automatically fed into the INPE web system for fire monitoring

(<http://www.inpe.br/queimadas/>) and used by e.g. fire brigades all over the country. Landsat-based analysis is operational only for the Cerrado biome. However, the service is due to be extended to the whole of Brazil by 2017.

- Thales Körting from the INPE Image Processing department (DPI) agreed to the usage by the JRC of the new version (V5) of the INPE segmentation software TerraLib and to accompany the integration of the new version into IMPACT.
- Dario Simonetti presented the integration of a 'Forest Normalisation Tool' as a new feature of IMPACT. The tool inter-calibrates Landsat, Sentinel-2 and RapidEye imagery, improving the forest classification results considerably and thus reducing the workload of the INPE interpreters dealing with the production of forest masks.
- INPE researchers expressed their interest to contribute to the work of Rosana Grecchi (JRC) who is establishing a method of automatic assessment of selectively logged areas in the Brazilian Amazon with remotely sensed data (Landsat and Sentinel-2). In addition, research collaborations are planned between INPE and the JRC (ForObs) for the analysis of the selected LiDAR data in the Southern Amazon in combination with forest cover change maps, produced by the JRC ROADLESS-FOR project, and for the long-term assessment of forest cover change 1975-2015 in the Brazilian Amazon biome, based on the analysis of historical and recent Landsat imagery.
- The possibilities to intensify the collaboration between INPE and the JRC were discussed.

#### Future steps:

- The collaborative work should be continued, with currently two concrete research issues, the work on selective logging mapping in the Southern Brazilian Amazon (Grecchi et al.) and the long-term forest cover changes in the Brazilian Amazon biome 1975-2015 (Velasco Gomez et al.). In this context a follow-up a possible 9th Call for the EU-Brazilian Sector Dialogues would be desirable.
- Any new tools within the JRC IMPACT toolbox, specifically regarding the processing of Sentinel-2 data, will be reported and made available to INPE.
- The possibility of temporarily hosting a researcher from INPE at the JRC (at no cost for the JRC) will be evaluated.
- First steps for joint publications should be taken. A possible opening of the 9th Call for the EU-Brazilian Sector Dialogues should be followed.
- Interactive sessions on the JRC IMPACT tool for forest degradation assessment. Presentations and hands-on training.
- Review of methods for detecting and quantifying degradation with satellite data. Potential stratification methods for a forest degradation assessment method based on sampling



### 3 Annexes

#### 3.1 Workshop Agenda – EMBRAPA Florestas (Curitiba, Brazil)

Wednesday, 13 April 2016

09h00-09h30	<b>Arrival at Embrapa Forestry and meeting with Dr. Edson Tadeu Iede (Embrapa Forestry General Director)</b>
09h30-10h00	<b>Overview on the recent developments at JRC – Sentinel 2, biomass, Caatinga mapping</b>
10h00-10h30	Coffee break
10h30-12h00	<b>Overview on the recent developments at JRC - TOFs</b>
12h00-13h30	Work Lunch
13h30-15h00	<b>Overview on the recent developments at Embrapa</b>
15h00-15h30	Coffee break
15h30-17h00	Technical discussions <b>Land Use and Land Cover classification</b> <b>Landscape selected indices – presentation, analysis and discussion of each index for different UAPs</b>
17h00	Transport to hotel

Thursday, 14 April 2016

09h00-09h30	<b>Arrival at Embrapa Forestry</b>
09h00-10h00	Technical discussions <b>Landscape selected indices – presentation, analysis and discussion of each index for different UAPs</b>
10h00-10h30	Coffee break
10h30-12h00	Technical discussions <b>Landscape selected indices – presentation, analysis and discussion of each index for different UAPs</b>
12h00-13h30	Work Lunch
13h30-15h00	Technical discussions <b>UAPs diagnosis – grouped indices and their interpretation</b>
15h00-15h30	Coffee break
15h30-17h00	Technical discussions <b>UAPs diagnosis – grouped indices and their interpretation</b> <b>UAPs clustering - Paraná example – first results (2 or more clusters)</b>
17h00	Transport to hotel

**Friday, 15 April 2016**

09h00-09h30	<b>Arrival at Embrapa Forestry</b>
09h00-10h00	Technical discussions <b>Statistics</b>
10h00-10h30	Coffee break
10h30-12h00	Technical discussions <b>Joint publications</b>
12h00-13h30	Work Lunch
13h30-15h00	Technical discussions <b>R&amp;D – additional variables - carbon stock, change detection</b>
15h00-15h30	Coffee break
15h30-17h00	<b>Meeting wrap-up and Cooperation Agreement update</b>
17h00	Transport to hotel

### **3.2 List of Participants – EMBRAPA (Curitiba, Brazil)**

Yeda Maria MALHEIROS DE OLIVEIRA, Maria Augusta DOETZER ROSOT, Marilice CORDEIRO GARRASTAZU, Wilson Anderson HOLLER, Maristela AVILA ABRANTES, Claudia GARBUIO (all EMBRAPA Florestas), Naíssa BATISTA DA LUZ, Jessica Caroline MARAN (both Brazilian Forest Service / FAO)



### 3.3 Workshop Agenda – INPE (São José dos Campos, Brazil)

Monday 18 April 2016	
9:00-9:30	<b>Arrival and entry procedures at INPE</b> Visitors: René Beuchle, Dario Simonetti (JRC)
9:30-10:15	<b>Welcome / agreement on the WS agenda</b> Overview of DSR (Flavio Ponzoni)
10:15-10:45	<b>Presentations of the DSR/INPE</b> Environmental changes in Amazonia (Luiz Aragão)
10:45-11:00	Coffe break
11:00-11:30	<b>Presentations of the DSR/INPE</b> Quantifying Amazon fragmentation using Guidos Toolbox (Laura Vedovato)
11:30-12:30	<b>Discussion</b>
12:30-14:00	Lunch
14:00-14:30	<b>Presentations of the DSR/INPE</b> Quantifying forest fire impacts using airborne Lidar (Luciane Sato)
14:30-15:00	<b>Presentations of the DSR/INPE</b> Field assessment of long term fire impact in Amazon forests (Camila Silva)
15:00-15:30	Coffe break
15:30-17:00	<b>Overall plan for our collaboration</b>
Tuesday 19 April 2016	
9:00-9:15	<b>Arrival at INPE and transfer to LABGeo</b>
9:15-10:45	<b>Presentations of the JRC</b> New features in the updated IMPACT version (René Beuchle)
10:45-11:00	Coffe break
11:00-11:30	<b>Presentations of the JRC</b> show the state of the forest cover change analysis 1975-2015 (with INPE MSS data)
11:30-12:30	<b>Discussion</b>
12:30-14:00	Lunch
14:00-15:00	<b>Presentations of the JRC</b> New results / developments in the JRC ReCaREDD and RoadLess projects
15:00-15:30	Coffe break
15:30-16:30	<b>Presentations of the CPTEC/INPE</b> The burned scar mapping for Brazil (Alberto Setzer)
16:30-17:00	<b>Discussion</b>

<b>Wednesday 20 April 2016</b>	
9:00-9:30	<b>Arrival at INPE and transfer to LABGeo</b>
9:30-10:30	<b>Presentations of the DSR/INPE</b> Panamazonia II – Burn Scar (Valdete Duarte)
10:30-12:00	<b>Presentations of the hands-on PRODES process</b> (Vanilde Ribeiro, FUNCATE)
12:00-13:45	Lunch
13:45-15:00	Visit to Laboratório de Integração e Testes (LIT)
15:00-15:15	Coffe break
15:15-17:00	Discuss possible joint publications and future plan of collaboration

### **3.4 List of Participants – INPE (São José dos Campos, Brazil)**

Luiz Eduardo OLIVEIRA E CRUZ DE ARAGÃO, Yosio Edemir SHIMABUKURO, Egidio ARAI, Thales SEHN KÖRTING, Alberto WAINGORT SETZER, Valdete DUARTE, Laercio MASSARU NAMIKAWA, Flavio Jorge PONZONI, João Roberto DOS SANTOS, Yhasmin MENDES DE MOURA, Laura BARBOSA VEDOVATO, Luciane YUMIE SATO, Camila Valéria DE JESUS SILVA (all INPE), Vanilde RIBEIRO (FUNCATE), Thomas HILKER (Oregon State University, USA)



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