REDD at national & project scales dedicated geo-spatial solutions to meet user needs

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United Nations / Indonesia
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REDD+ : a stepwise process where **EO technology** enables negotiations & policy making

Assets of satellite imagery

- Vision of the past
- Objective information
- Large areas monitoring
- Detailed view of the land
- Reactive

Satellite imagery to bring transparency expected by all stakeholders!

SPOTMaps 2.5m natural colour mosaic, Bolivia

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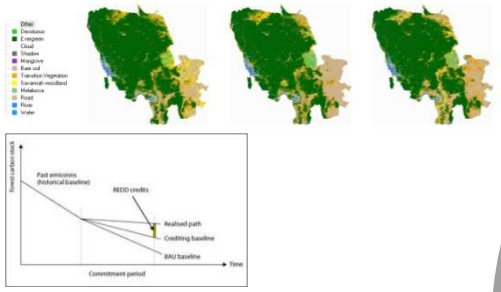
REDD+ & Forest : need for geo-information

BASELINES : to determine additionality brought by carbon projects and then the crediting profile of the project, to select eligible areas to accommodate new activities, etc.



REGISTRY : carbon emissions accounting, projects & policy reinforcement actions recording, ownership & land tenure, land planning

Baseline

NSDI

Registry

MRV

MEASUREMENT, REPORTING, VERIFICATION – to control & certify project performance to allow issuance of carbon credits, can be extended to risk management tool, CAPEX control, control and evaluation of incentive programs, reporting towards international bodies (certification, etc.)

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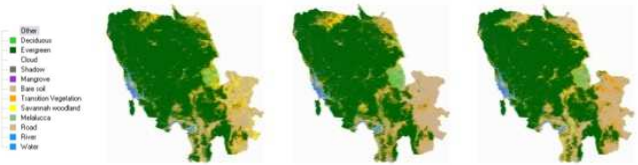
REDD+, a stepwise process enabled by EO

Planning & design → Establishment of monitoring system → Analysis & reporting

Reference Emission Level

Vision of the past

Crediting profile



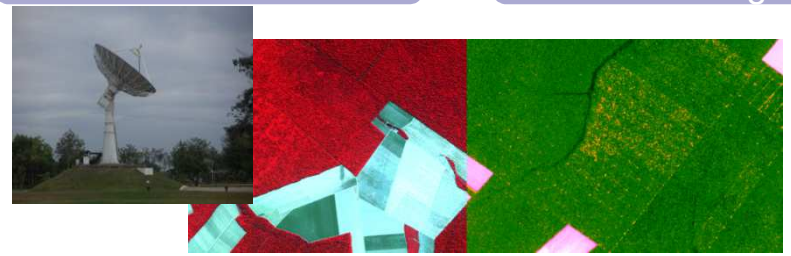
MRV

Carbon credits issuance

Risk management

Policy and Measures effectiveness

Planning & Decision Making



Environmental & rural cadastre

Decision making & policy reinforcement

Cadastre & Registry

Referencing

Trading & investment boosting

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Astrium contribution : overview

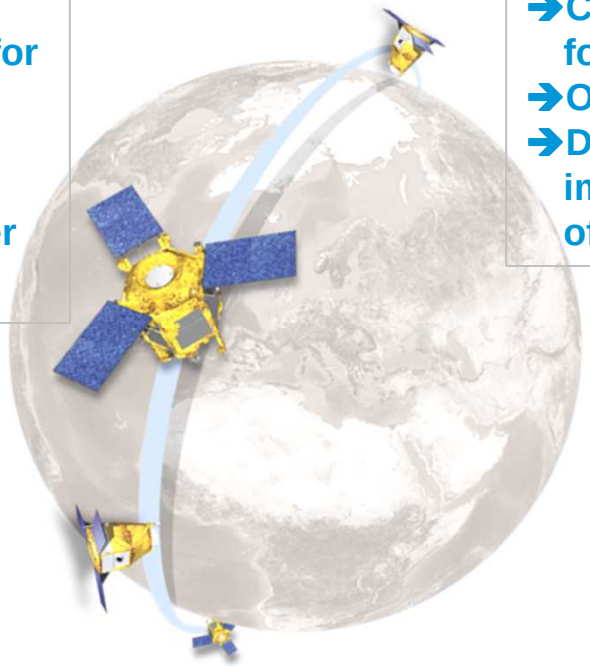
- **Comprehensive and worldwide archives** to step back in the past
- **A unique portfolio of satellite imagery**
  - ➔constellation operated by Astrium : Spot family, Pleiades, TerraSAR-X & TandemX
    - ➔Thanks to Astrium investment in Spot 6/7 programme image access is secured up to 2023 !
  - ➔third party missions (e.g. Formosat, Deimos)
- **Added value products & services**
  - ➔Worldwide reference data bases
  - ➔Pixel Factory™ & Overland™ processing suites
  - ➔Proprietary technology allowing effective capacity building and local implementation
- **Data access & data management tools**

Satellite image collection

Astrium operates a new and unique constellation of satellites designed to meet more stringent requirements for forest monitoring at national or project levels

SPOT6 & 7, designed to :
- ➔Cover large area (country-wide)
- ➔Cover fast, with dedicated modes for specific regions of interest
- ➔Optimise cloud free acquisitions
- ➔Deliver 1.5m resolution colour images that can be used for a wider range of applications

SPOT6 image, Cotriguaçu



Pleiades 1A&1B, designed to :
- ➔Cover fast, with dedicated modes for specific regions of interest
- ➔Optimise cloud free acquisitions
- ➔Deliver 0.5m resolution colour images allowing to get higher level of detail over areas of interest

Pleiades image, Cotriguaçu

SPOT6/7 and Pléiades1A/1B operated as a constellation to optimise revisit frequency and positively respond to growing demand for permanent forest monitoring

Collection capacity

System fully designed and configured to cover broad areas

SPOT 6 & SPOT 7 constellation
→ 6M sq. km / day

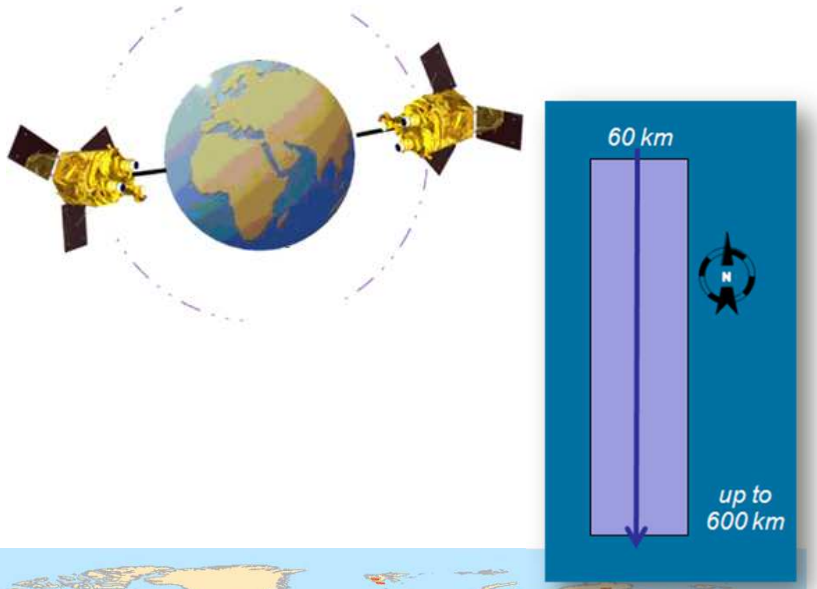
4 weather forecasts per day taken into account
→ Optimization of the resource
→ Increase ratio of successful attempts

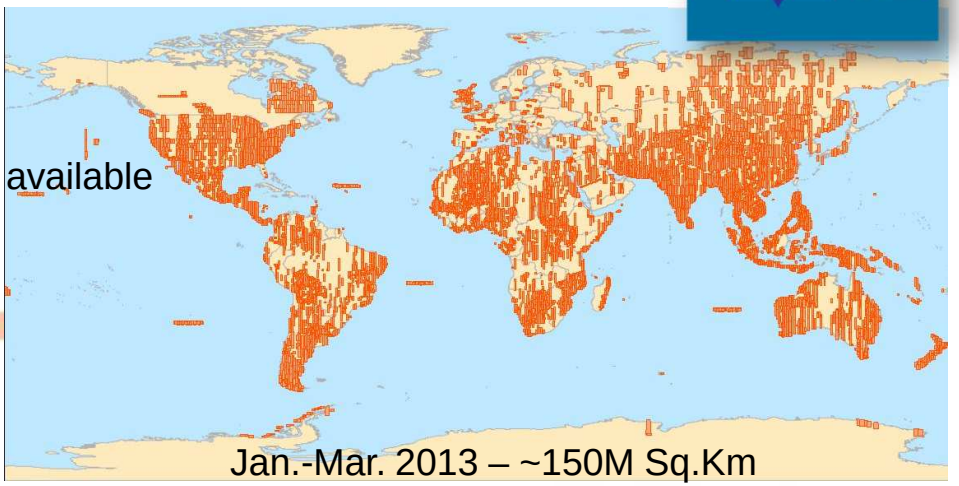
Huge onboard storage capacity

Agility
→ Faster access to the next area to be covered
→ Conflicts avoidance

Automatic ortho production
- 10m CE90 geoloc accuracy with Ref3D where available
- 35m elsewhere (technical specification)

High delivery capacity





Satellite image collection

Target Collection : benefits for Forest Monitoring

-Efficient acquisition over permanent plots, e.g. preparation of field survey, validation of forest maps.

- Additional images required over specific areas to mitigate seasonal effects or to get higher level of details

Typically **20 targets**

over 1,000 km within a

+/-30 deg corridor for Pléiades,

600 km-long strips with

Spot 6 & 7

Satellite image collection

Single-Pass Strip Mapping : benefits for Forest Monitoring

- Capability to optimise acquisition over difficult areas as soon as conditions are good (*6 meteorological analysis per day for SPOT6*)

- Capability to cover large areas in same conditions to facilitate the interpretation and processing of the images

Up to **100 x 150km** with Pléiades,

240 x 240km with Spot 6 & 7

Innovative solution to serve forest market at project level : GO Monitor Forest

Reporting obligations towards certification organisation & local authorities

Field inventories preparation

CAPEX control and risk management

Forestry & forest project follow-up

Forest resource assessment

Business Intelligence

Save time and cost, accelerate time to market for your project

- GO Monitor Forest aims to positively respond to the fast growing demand from **professionals** (both private and public sectors) for a **reliable and accurate monitoring service**

➔GO Monitor Forest provides **surveillance information** on any area of interest on a **frequent, reliable and cost-effective** basis.

➔GO Monitor Forest delivers **change detection reports** and **comprehensive interpretation reports**, through email alerts and a dedicated WEB portal, available 24/7.

GO Monitor Forest at a glance

Monitoring service is run according to a Service Level Agreement which clearly specifies service features and quality level

Forest & REDD+

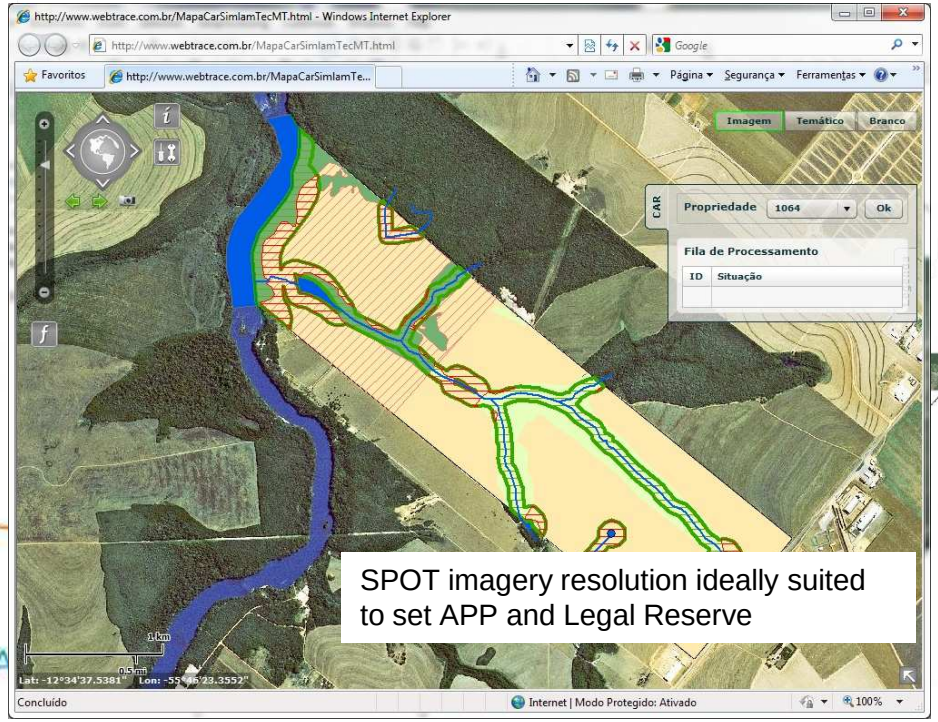
Be concrete !

Few Astrium achievements in a glimpse

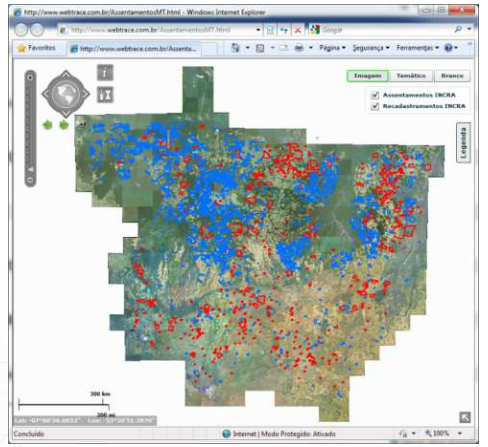
Environmental policy implementation : brazil example

- 3 Amazonian states concentrating most severe deforestation in Amazon (Mato Grosso, Para & Rondonia) selected SPOT 2.5m imagery to produce ***Cadastro Ambiental Rural*** *(CAR,* Rural & Environmental Cadastre)
  - CAR to be a mandatory policy making tool in the recently adopted Brazilian Forest Law.

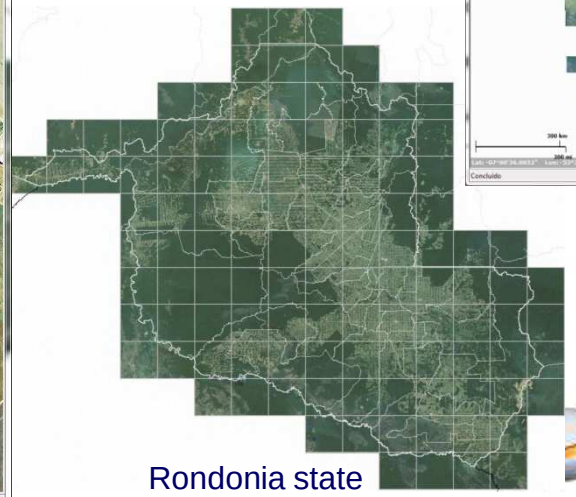
Para state



SPOT imagery resolution ideally suited to set APP and Legal Reserve



Mato Grosso state



Rondonia state

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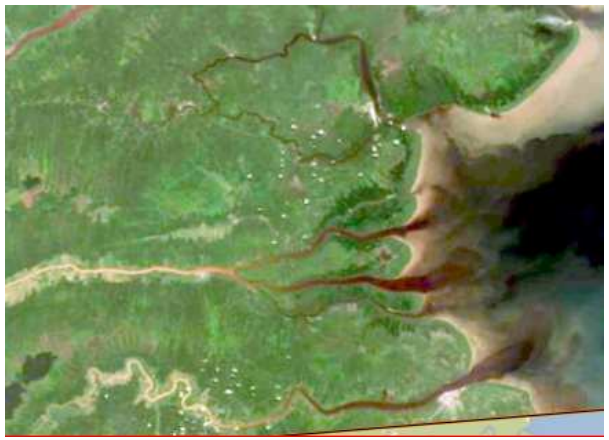
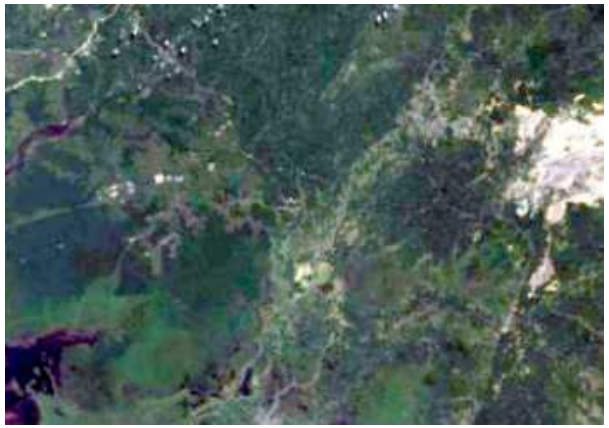
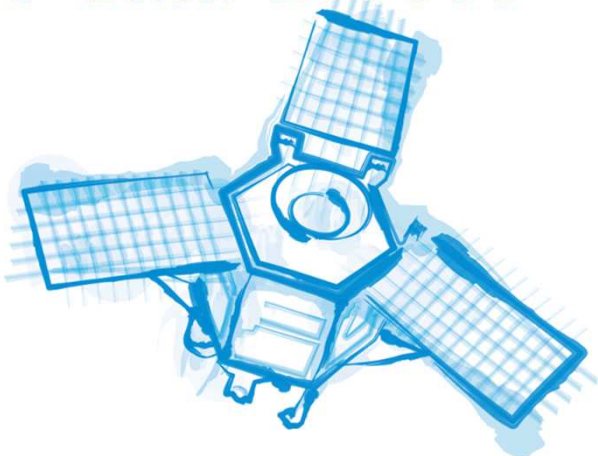
National forest monitoring: Direct Receiving station to secure data access







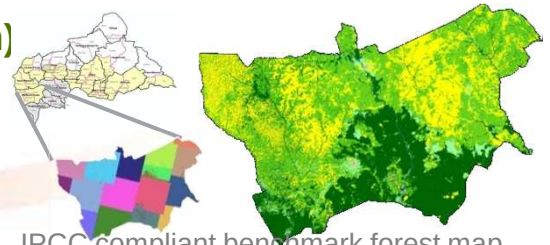
Indonesia, one of the largest forest country worldwide will rely upon SPOT constellation to roll-out its national REDD strategy

Spatial Observatory of Tropical Forests

- **France engaged in forest protection and REDD+ mechanism**
- **<u>Partnership AFD / Astrium Services</u> to supply best of space technology to Congo basin countries (namely Gabon, Centrafrican Republic, Cameroon, Congo and DRC)**

http://bassinducongo.reddspot.org

- **Coverage :** tropical rainforest over the Congo Basin + CAR
  - ➔ 2 millions sq.km of Tropical forest
  - ➔ up to 3 millions sq.km in total
- **SPOT Imagery (grouped around "epochs" 2000-2010-2015)**
  - Multispectral mode, cloud coverage less than 20%
  - SPOT 1/2/3/4 (20m) & SPOT 5 (10m)
  - SPOT5 2.5m mosaic in Central African Republic
- **Forest maps & baselines (Centrafrican Rep. + province in Cameroon)**
  - Historical analysis 1990-2000-2010: Forest/ Non Forest and Change maps
  - Benchmark Forest map as at 2010 (reference map)



IPCC compliant benchmark forest map

- **Consortium established to pilot the project**

  IGN-FI (Leader), CNES, IGN, IRD, ONFI

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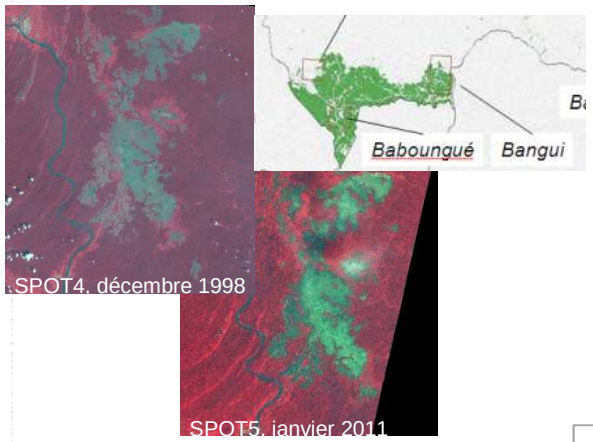
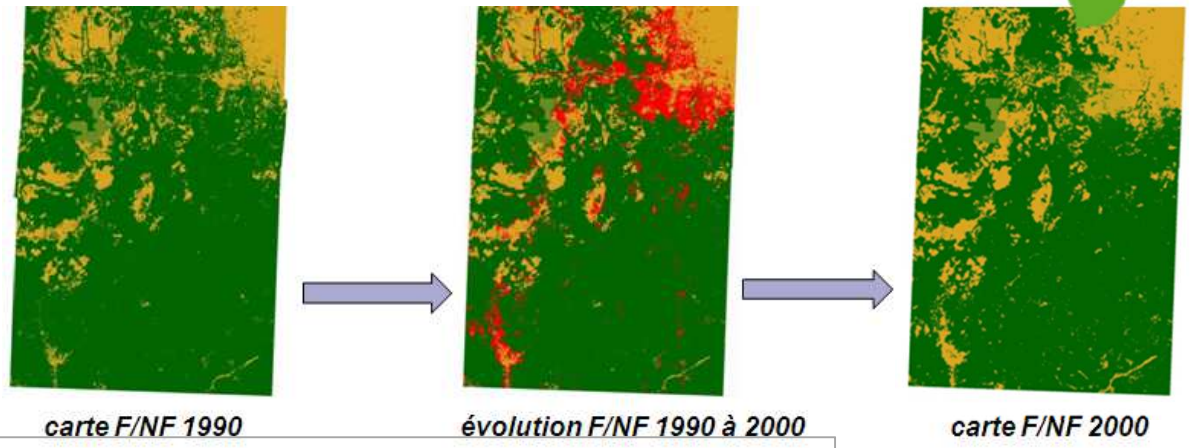
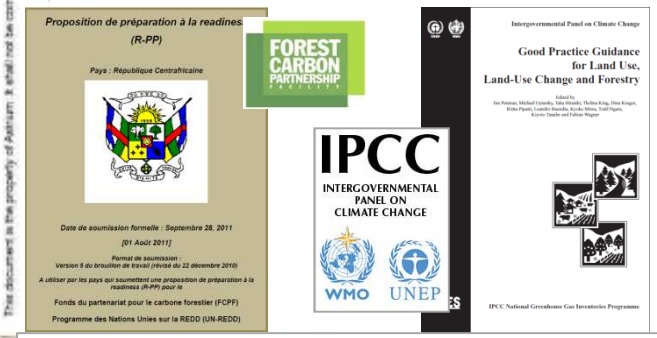
Focus on : Establishment of baselines

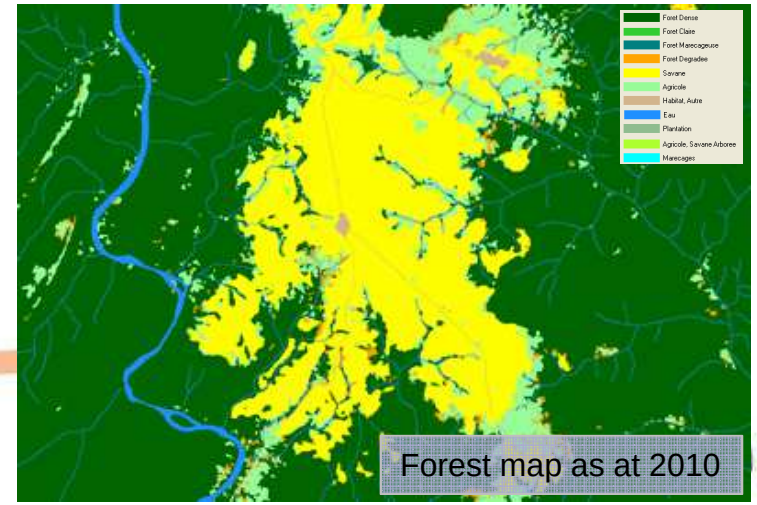




Forest / Non Forest & Change map between 1990 & 2000



Tools & methodologies compliant with IPPC guidelines & national strategy (R-PP)



Forest map as at 2010

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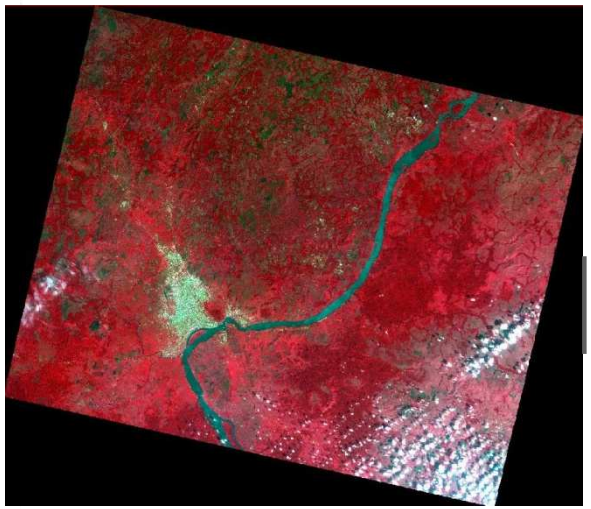
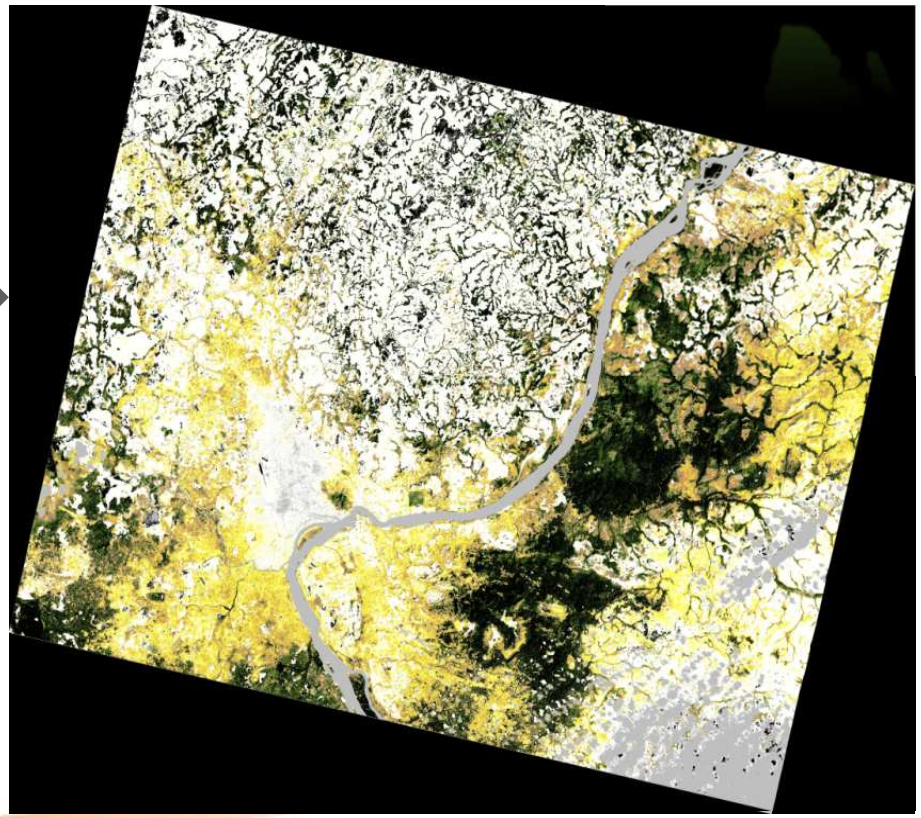
Forest mapping based upon unique proprietary technology enabling physical description of forest



Biophysical processing



.... traduction en rugosité du couvert

Results

- 3rd party independent validation

➔Four calibration sites : different forest typologies (e.g. dense, transition, dry forest)

➔Statisticians to set validation protocol

➔Validation methodology based upon VCS

- IPCC performance levels all achieved

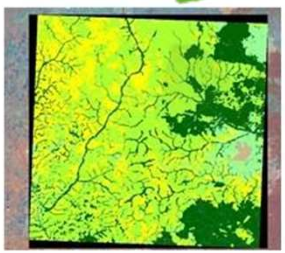
➔Better than 90% accuracy on Forest/Non Forest (in fact better than 95%)

➔Better than 80% on forest area changes

➔Better than 80% on reference forest map as at 2010

- An operational process to quickly produce national baselines…

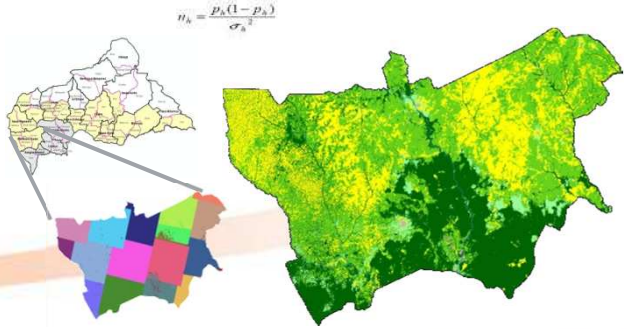
Satellite images SPOT5- 2010 Berberati



Detailed forest map -2010 -Berberati

Validation point spread over the site area:

Example of validation Matrix obtained



Pivot date 2010 – Land use / Land cover map (IPCC compliant , 10 m resolution)

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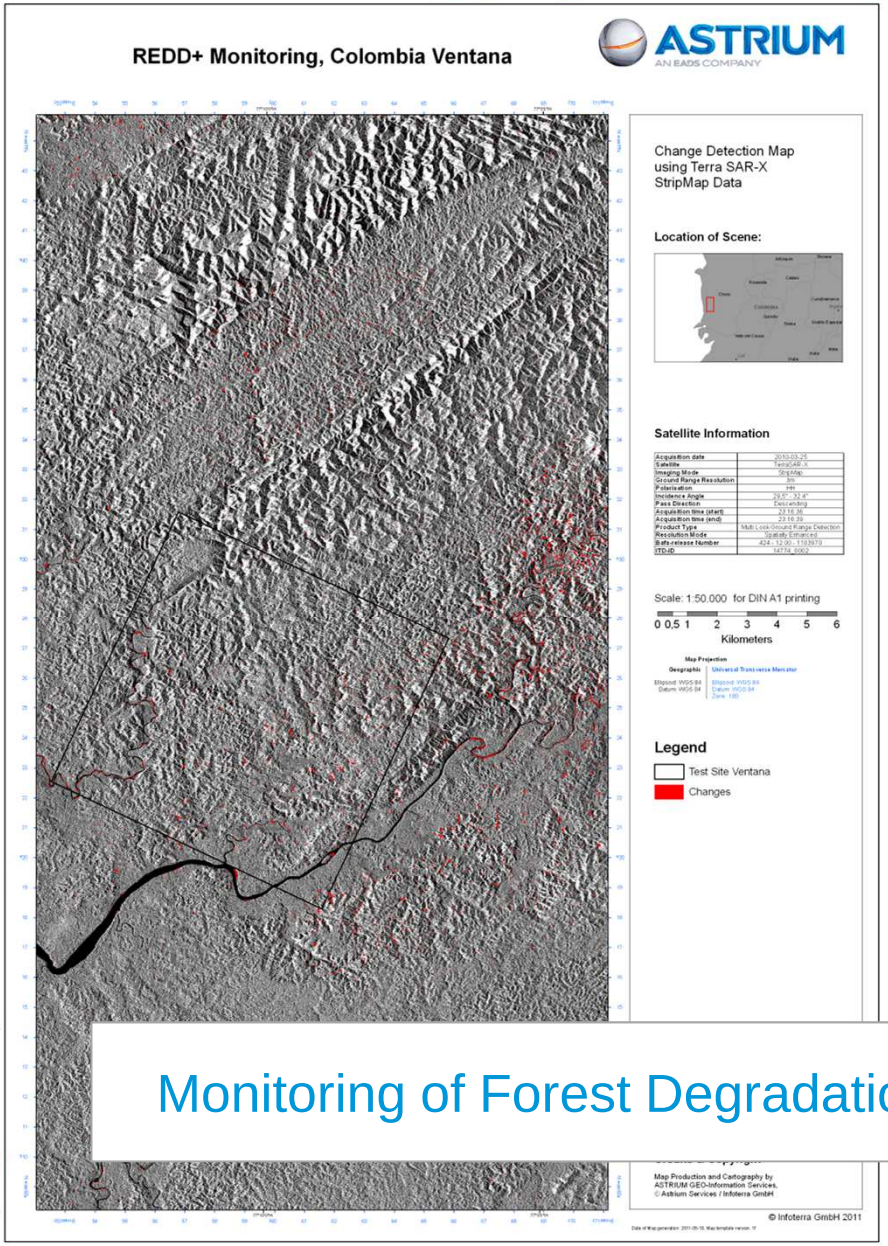
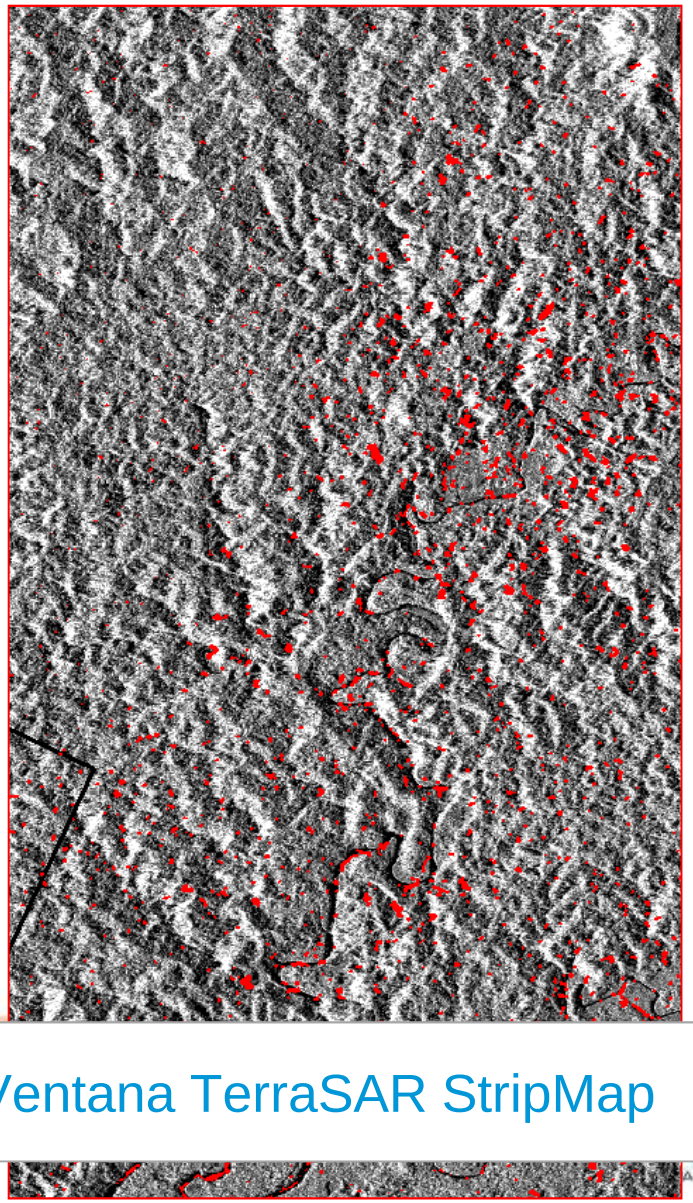
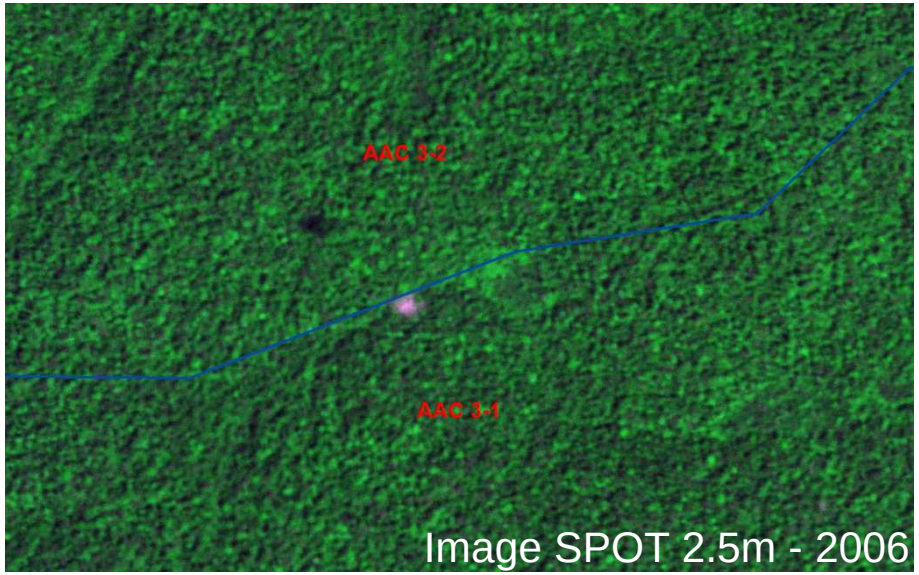
Monitoring Reporting Verification : degradation & selective logging monitoring with TerraSARX

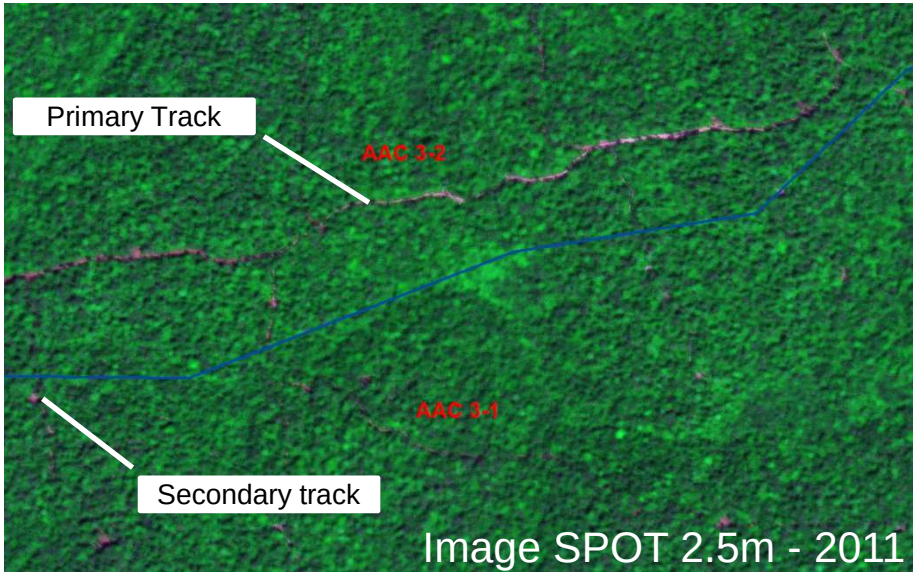




Monitoring of Forest Degradation Ventana TerraSAR StripMap

GO Monitor Forest : Forest investment, exploitation assessment of a concession





Context

- Forest concession in Congo basin. Study requested by a private company prior to the auctioning of the concession to evaluate its economical value in order to reduce costs (inventory) and risks (inability to get a FSC-like certification).

Objective

- Control that concession is exploited in compliance with the management plan

Constraint:

- Management plan (and all cadastral information) in paper format
- Diachronic analysis to observe a trend, recent image required for the second date

Solution:

- Analysis of SPOT 2,5m Colour image (2006 & 2011)
- Detection of Forest tracks & harvest holes
- Determination of exploitation status for each harvest plot / site

Conclusion

Technology is available to allow countries & projects to move forward and make REDD+ a reality

Astrium constellation to meet REDD+ needs

- Consistent and accurate monitoring to fulfil IPCC & Voluntary Standard requirements

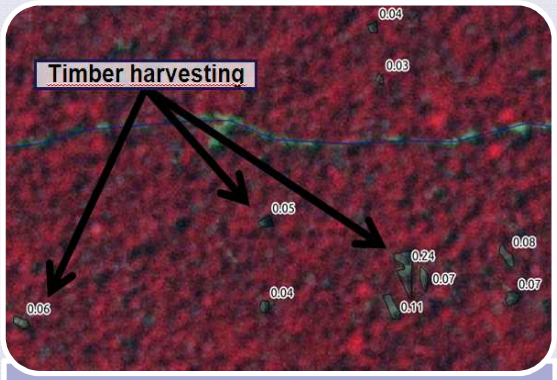
➔Best features combination, i.e. Swath vs. Resolution, Continuity

➔Very well adapted to feed monitoring strategy at any jurisdictional and project levels for a successful implementation of a “nested approach”

- Monitoring to mitigate risks: early identification of precursor signs of further deforestation or unauthorised land use change

➔Astrium constellation to provide flexibility wrt monitoring strategy, i.e. from change detection at any scale to local analysis to determine causality of what is observed (anthropogenic activity vs. Natural hazard).

Astrium solutions : beyond MRV, to enable a successful implementation of REDD+



National Forest Inventory

➔ Forest stratification and design of the “permanent sampling plots” scheme

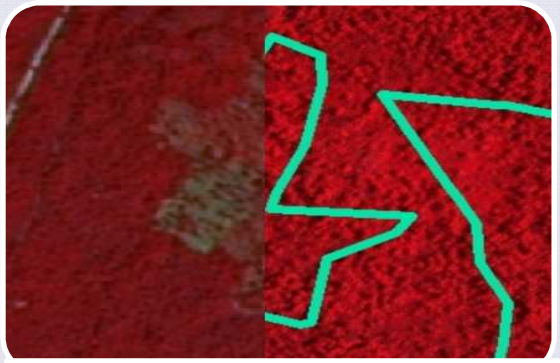
➔ Regular monitoring of sample plots to prepare and optimize ground work needed to measure carbon stocks (Tier 3).

Policy reinforcement & promotion of good practices

➔ Deployment of like-NCAS system (Carbon Accounting System)

➔ Traceability of projects actions and management of ownership & land tenure

➔ Access to basic socio-economic information (e.g. urban sprawl)



Awareness and outreach

➔ Inform and educate all stakeholders, including forest communities

➔ Connect people to each other.

Benefits of relying upon high quality services

- Higher is the quality of the monitoring service :

➔ Higher is the readiness of investors to establish bilateral agreements and develop projects

➔ Higher is the financial return (low uncertainty awarding)

Astrium is committed to support REDD+

- Ensuring continuity of missions to preserve user investments
- Developing solutions to support REDD+ stakeholders in achieving their goals in a cost-effective manner
- Supplying services that bring quality in REDD+ projects

Thanks for your attention

Your contacts :

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