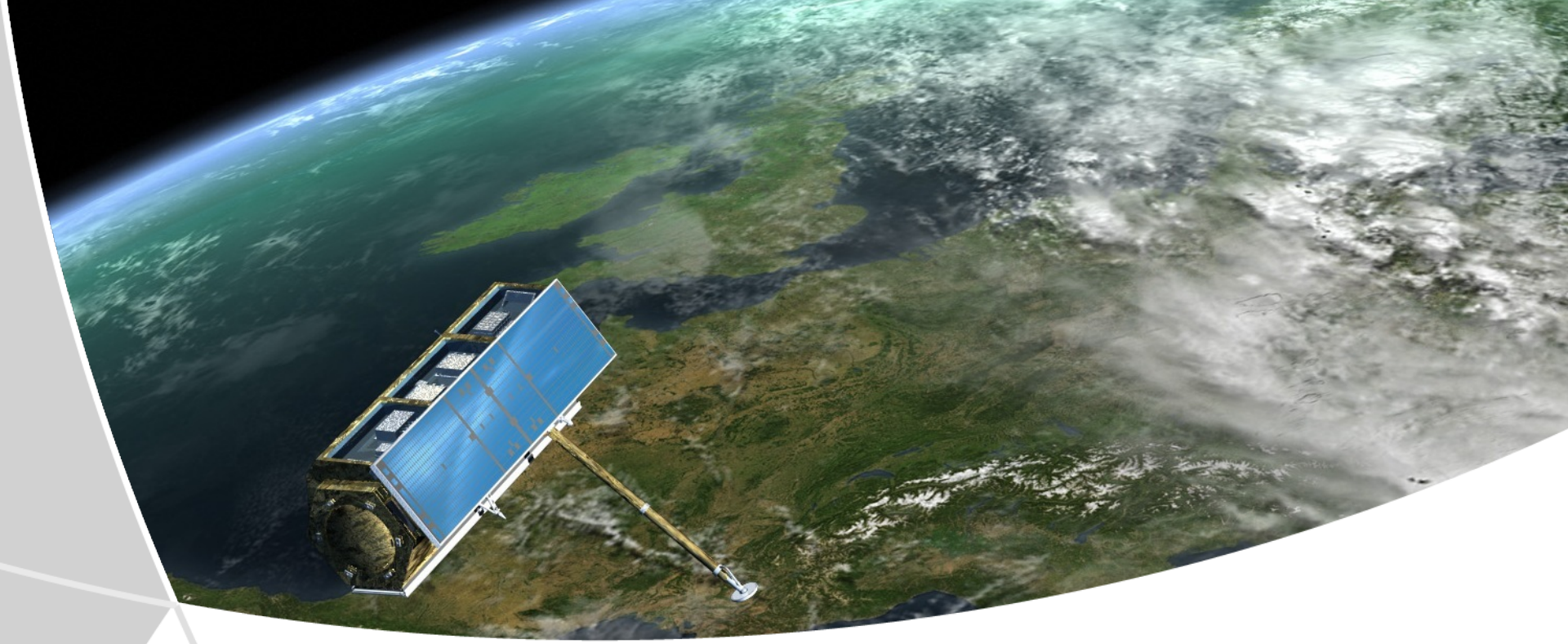


GEO Forest Carbon Tracking and Global Forest Observation Initiative

DLR contribution and perspectives

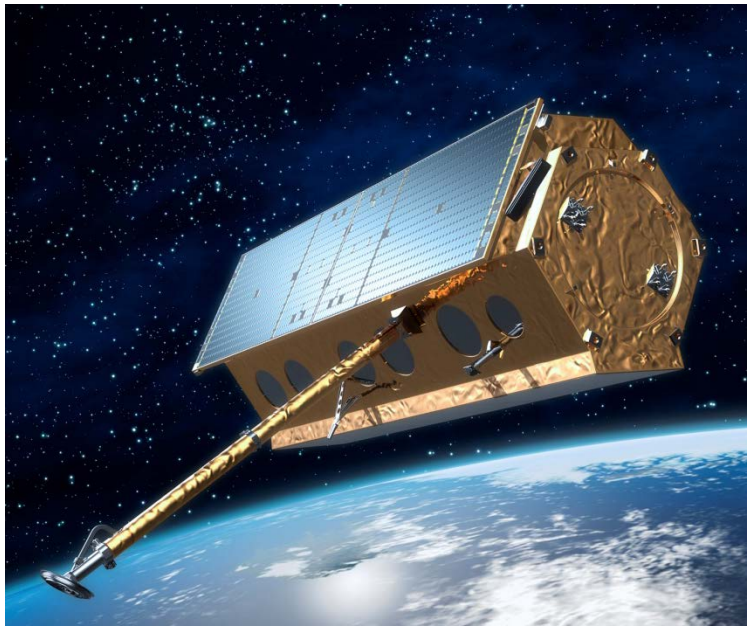
Deutsches Zentrum
für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

Objectives of DLR participation in the GFOI SDCG

- Inform SDCG on status and access to data of German missions with respect to GEO FCT and GFOI
- Optimise DLR contribution: TerraSAR-X/TanDEM-X **and** RapidEye data and related scientific exploitation
- Contribute to optimise globally coordinated data coverage and access
- Inform SDCG on German REDD priorities
- Provide feedback to commercial actors in Germany
- Contribute to commercial data access scheme for GFOI

TerraSAR-X and TanDEM-X (1)

- TerraSAR-X
  - Launch: June 2007
  - National x-band radar mission
  - High-resolution radar data for scientific and commercial use
  - Public Private Partnership between DLR and EADS Astrium



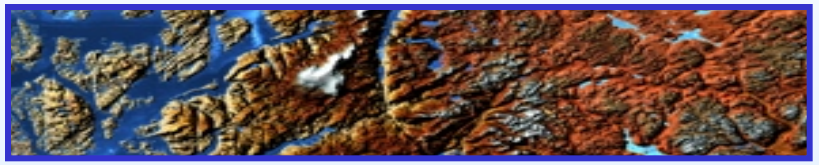
TerraSAR-X and TanDEM-X (2)

Stripmap Mode
- **30 km swath width**
- **3 m resolution**
- **multi-polarimetric**

ScanSAR Mode
- **100 km swath width**
- **16 m resolution**
- **multi-polarimetric**

HR Spotlight Mode
- **5 km x 10 km scene**
- **1 m resolution**

Stripmap

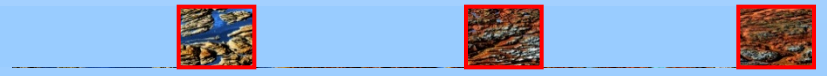


Moderate resolution and swath width

ScanSAR

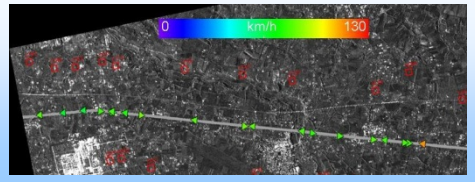
Low resolution

Spotlight



Small, discontinuous scenes

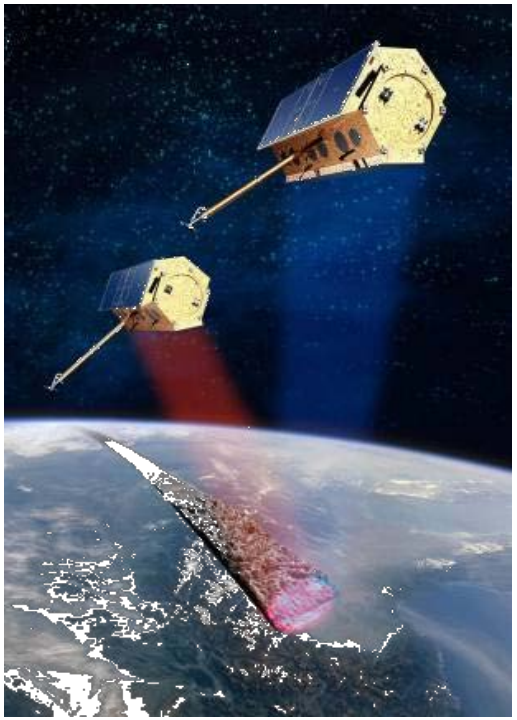
- Dual Receive Antenna Mode
  - **Along-Track Interferometry, Moving Target Identification**



TerraSAR-X and TanDEM-X (3)

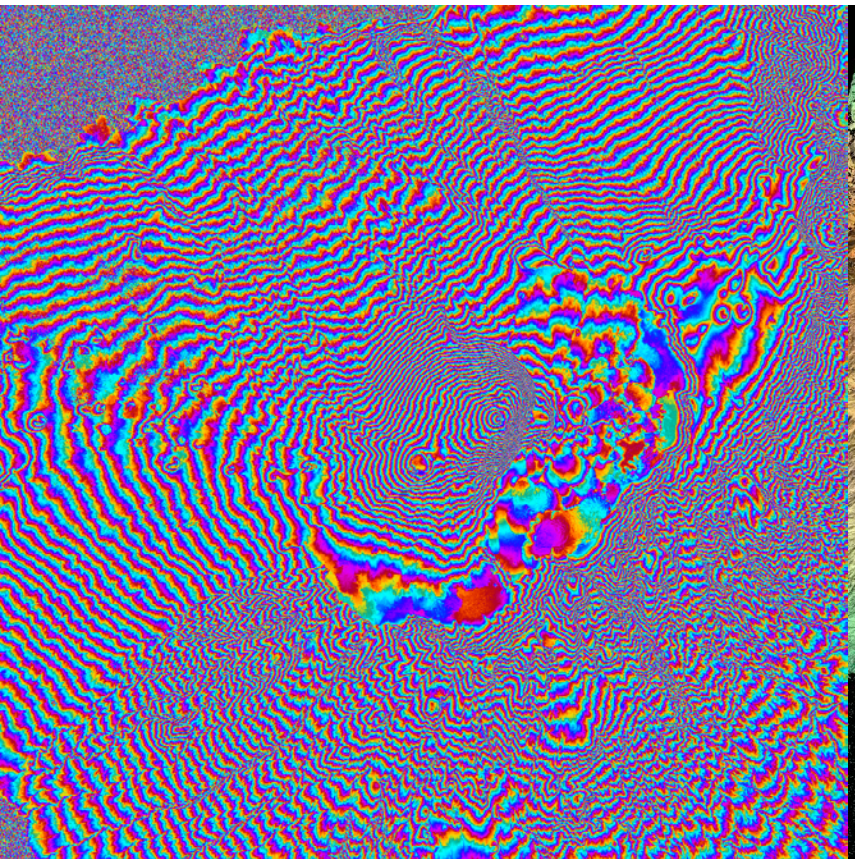
TanDEM-X – a second TerraSAR-X

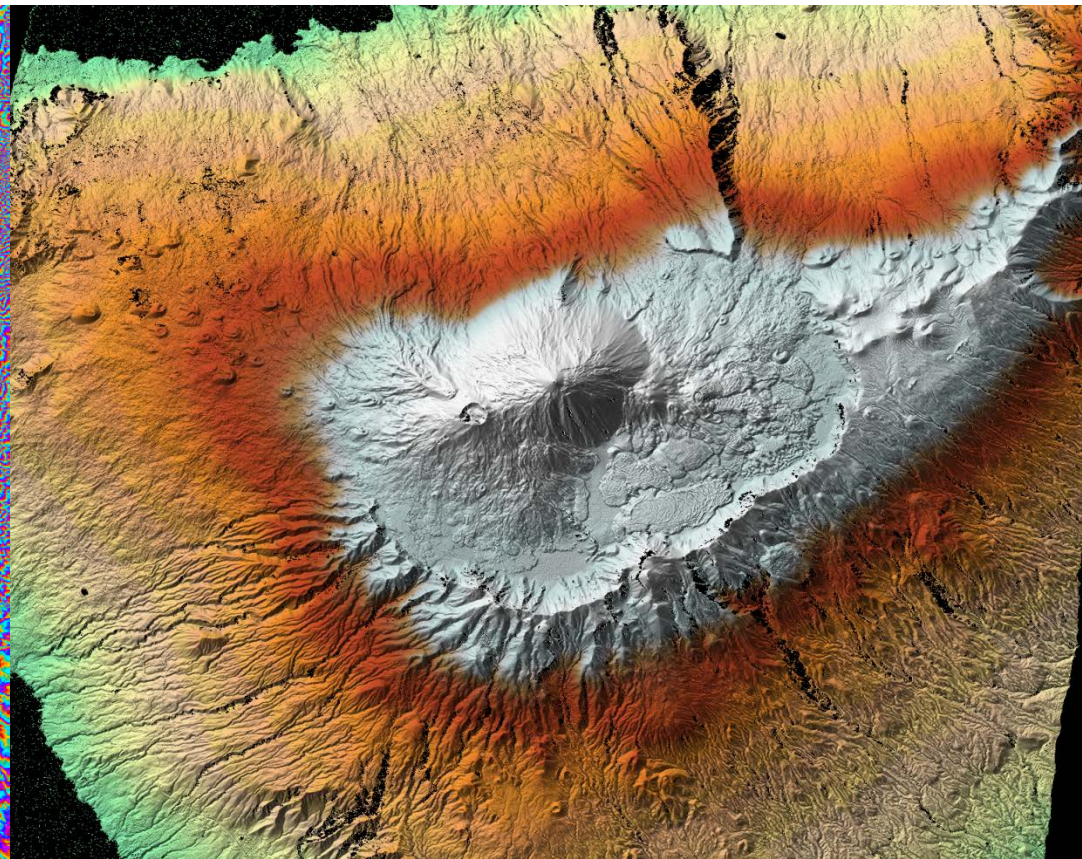
- Launch: June 2010
- National SAR Interferometry Mission
- Extension of Public Private Partnership between DLR and EADS Astrium
- Primary mission goal: global high-resolution Digital Elevation Modell
- First full global coverage completed – necessary multiple coverages expected to be completed by mid 2013



TerraSAR-X and TanDEM-X (4)

It is intended to offer a global TanDEM-X DEM at a resolution of 90 m to scientific exploitation. Scientists are required to register to order this DEM.





TerraSAR-X and TanDEM-X (5)

Public Private Partnership between DLR and EADS Astrium Germany

DLR

- Project & Mission Management
- G/S Development & Ops
- System Engineering Support
- Science Coordination/Exploitation

Astrium Geo-Information Services

- Service Infrastructure
- Information Products
- Commercial Exploitation

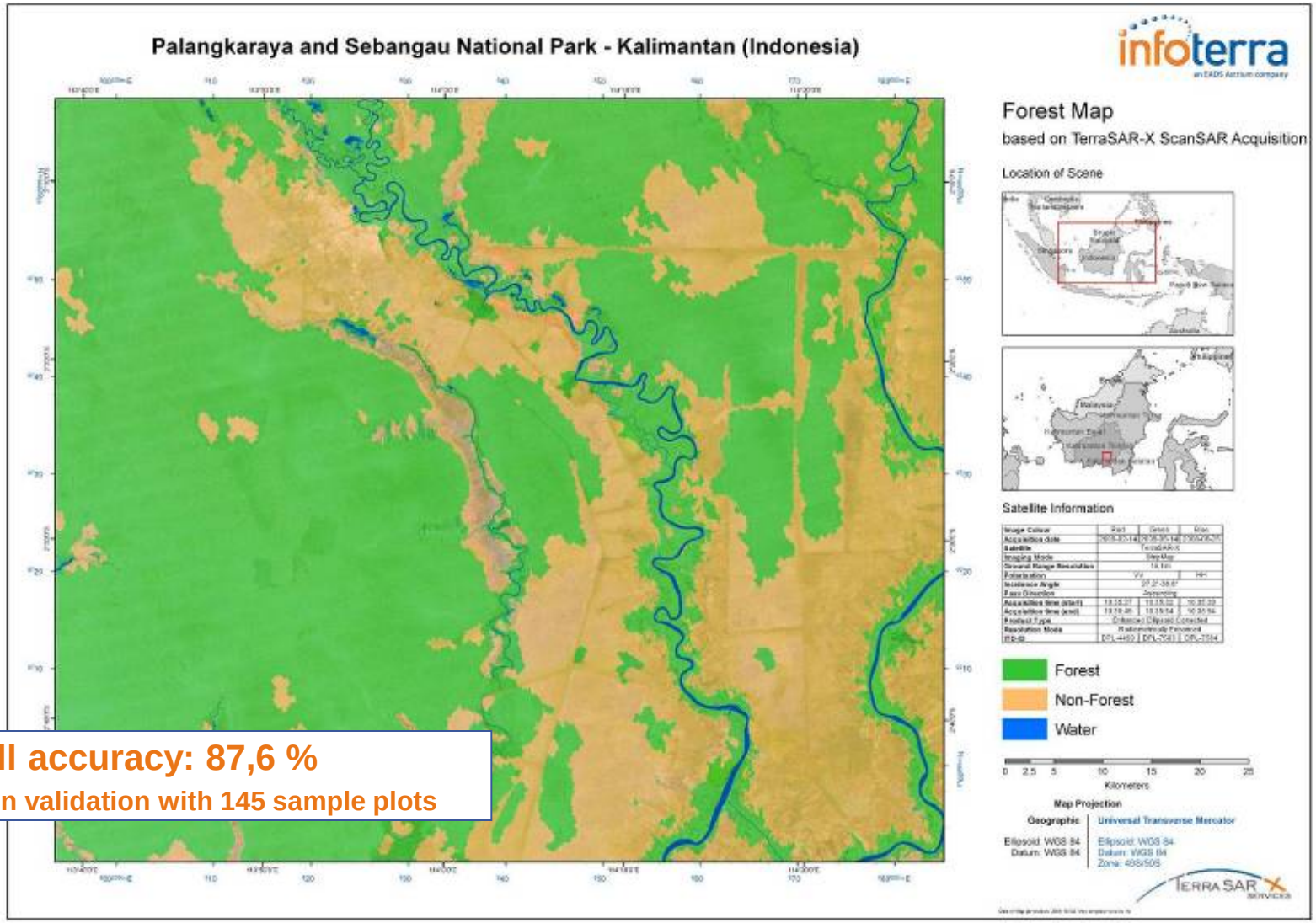
Actual contribution to GEO-FCT

- FCT Validation sites are established as background mission
- Data access along DLR procedures

Potential contribution to GFOI

- Framework to be developed

Indonesia / Kalimantan - TerraSAR-X based Forest Mapping

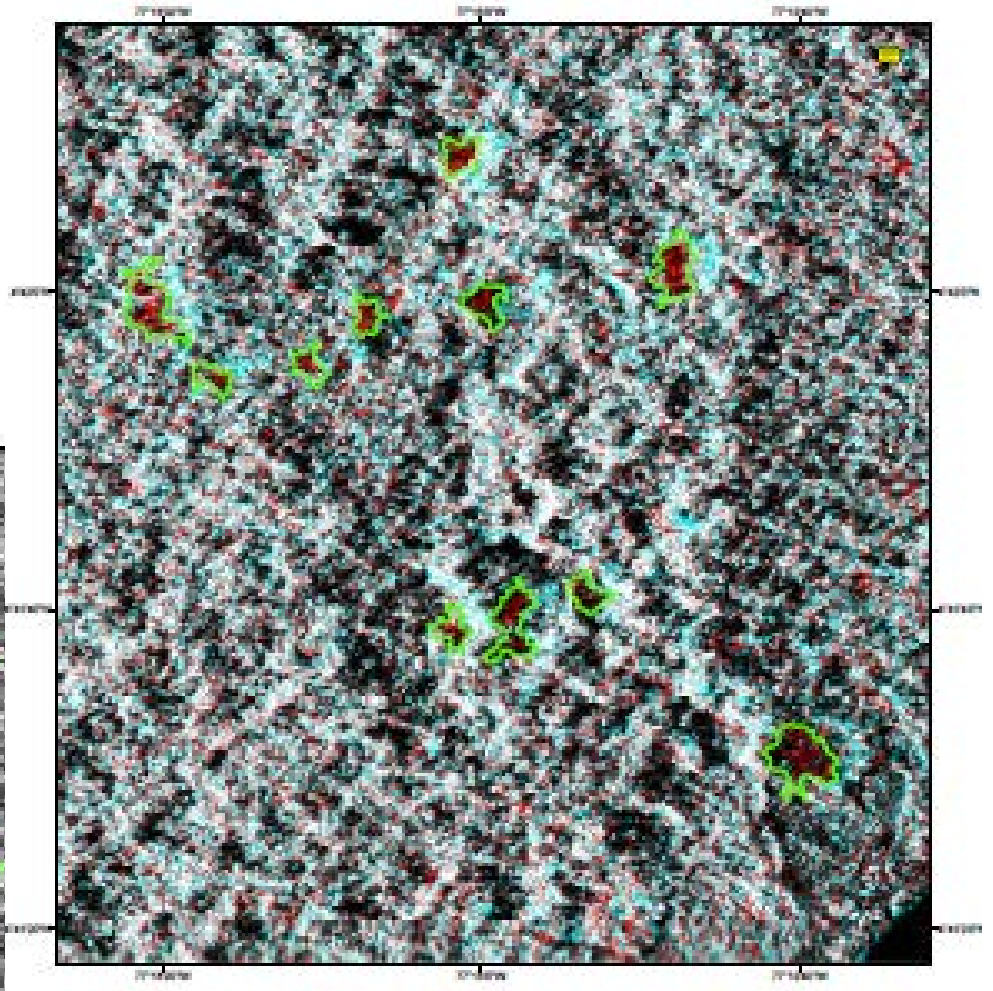


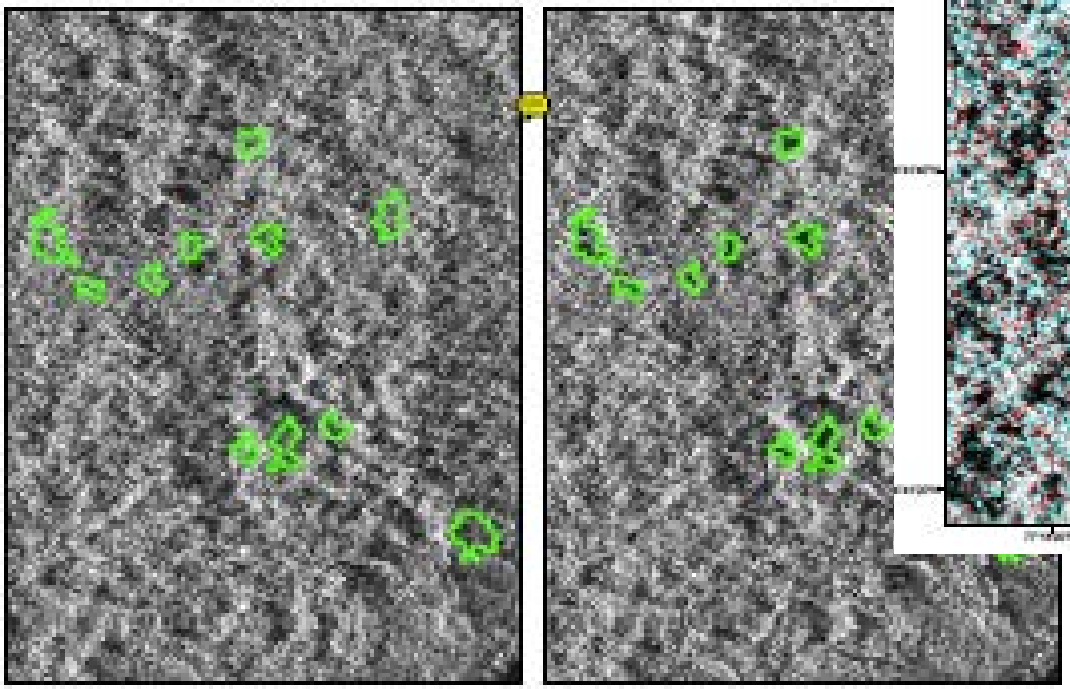
Overall accuracy: 87,6 %

Based on validation with 145 sample plots

Colombia - TS-X based Identification of single tree crowns disappearing between 2008 & 2010

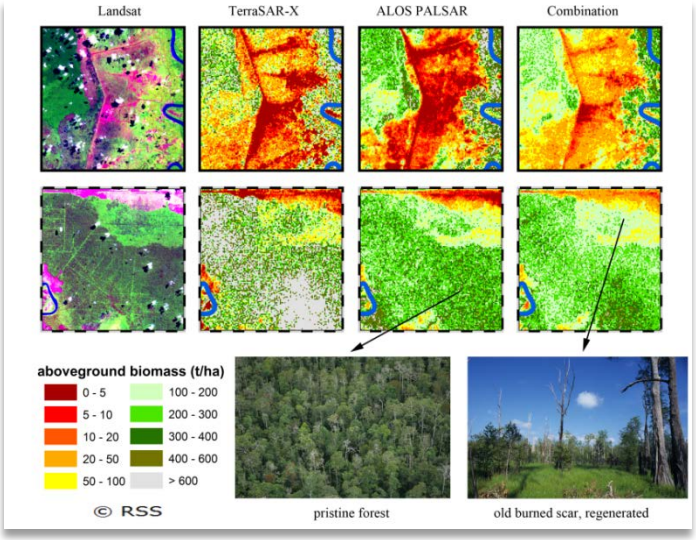
→ monitoring of selective logging

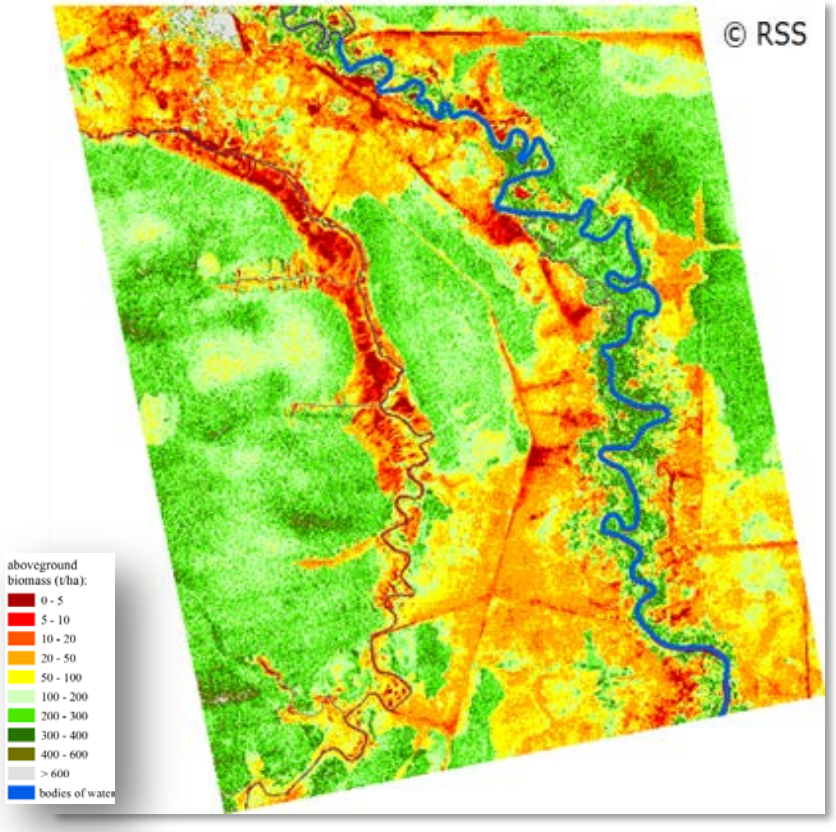




Direct forest biomass estimation using TerraSAR-X and ALOS PalSAR

- Combination of two SAR instruments (TerraSAR-X and ALOS Palsar) allows a improved estimation of forest biomass up to 300 t/ha
- Calibration/validation of the model using forest inventory data and LIDAR based biomass estimates
- Published: Englhart et al. 2011, Remote Sensing of Environment





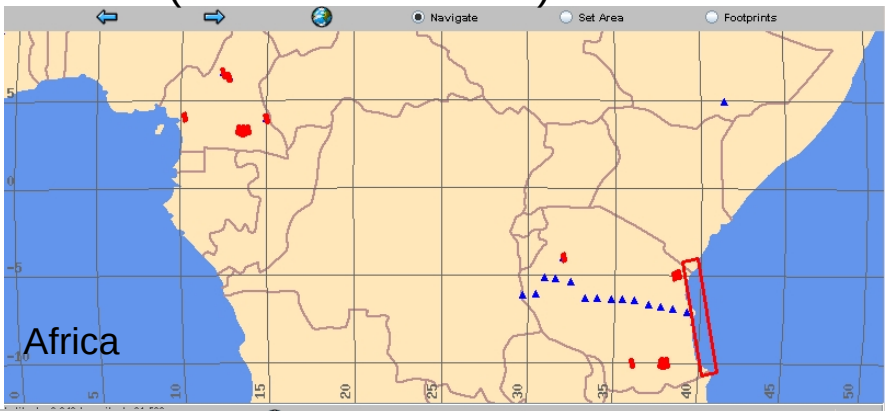
Funded by: DLR/BMBF FZK: 50EE0705

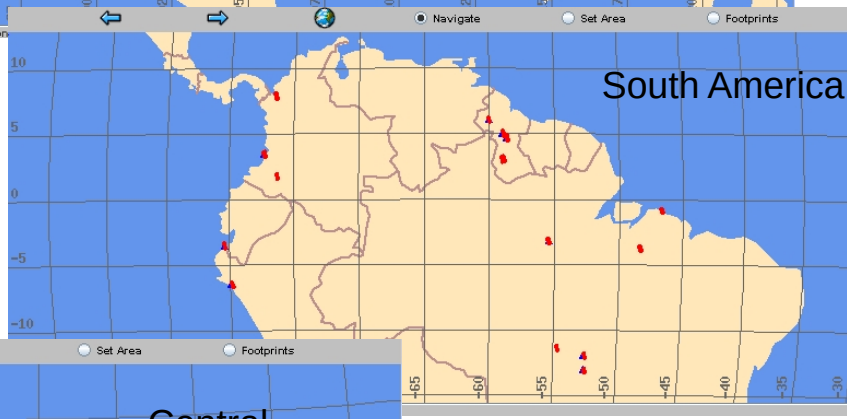
Biomass map, Sebangau catchment Central Kalimantan, Borneo

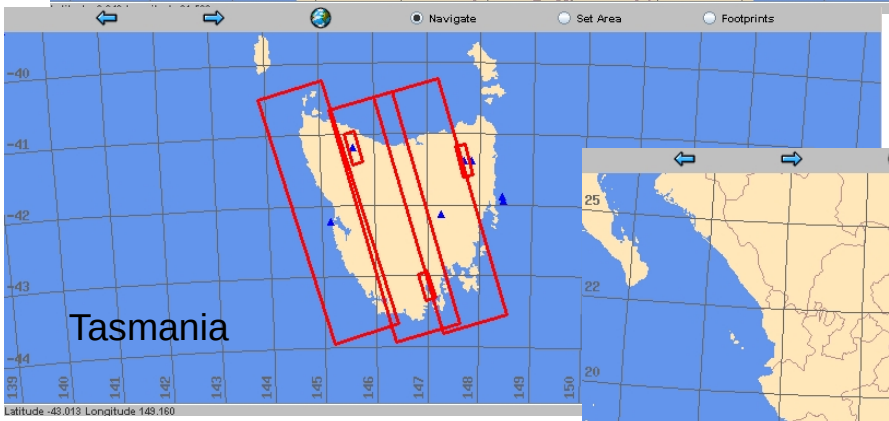
TerraSAR-X Coverage of FCT Sites

45 sites observed

157 data takes available in the DLR archive. StripMap Mode, dual polarized (HH/HV and VV/VH)







TerraSAR-X and TanDEM-X (5)

Health Status

Both satellites – TerraSAR-X and TanDEM-X – are in very good health

Acquisitions

Acquisition over validation sites

- High frequency acquisition in dual pol pairs over priority VS
- Dual pol over other VS

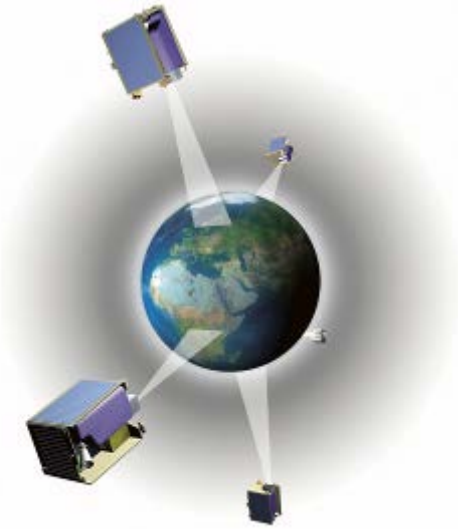
Future

- Continue/optimize acquisition over validation sites (constrains with respect to TanDEM-X)
- support scientific exploitation of data
- continuity (TerraSAR-X NG) planned

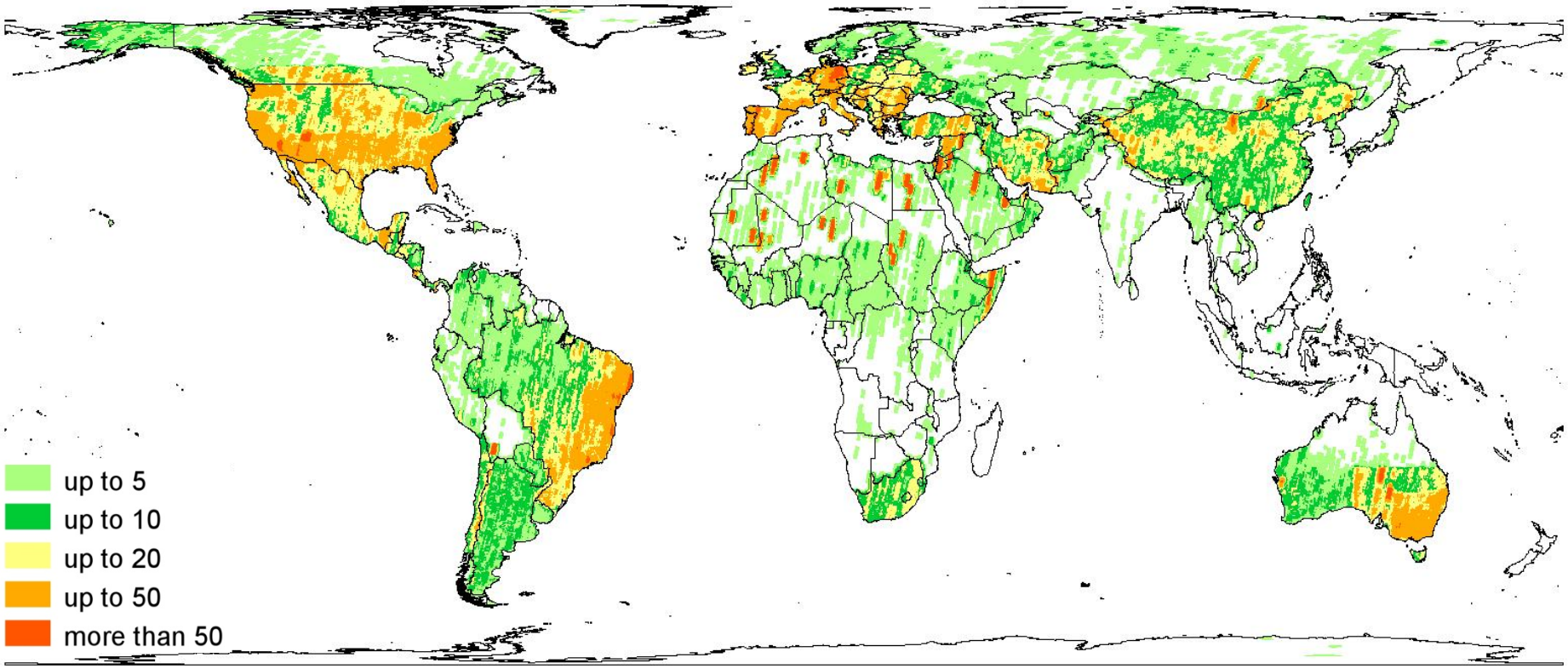
RapidEye (1)

RapidEye
Delivering the World

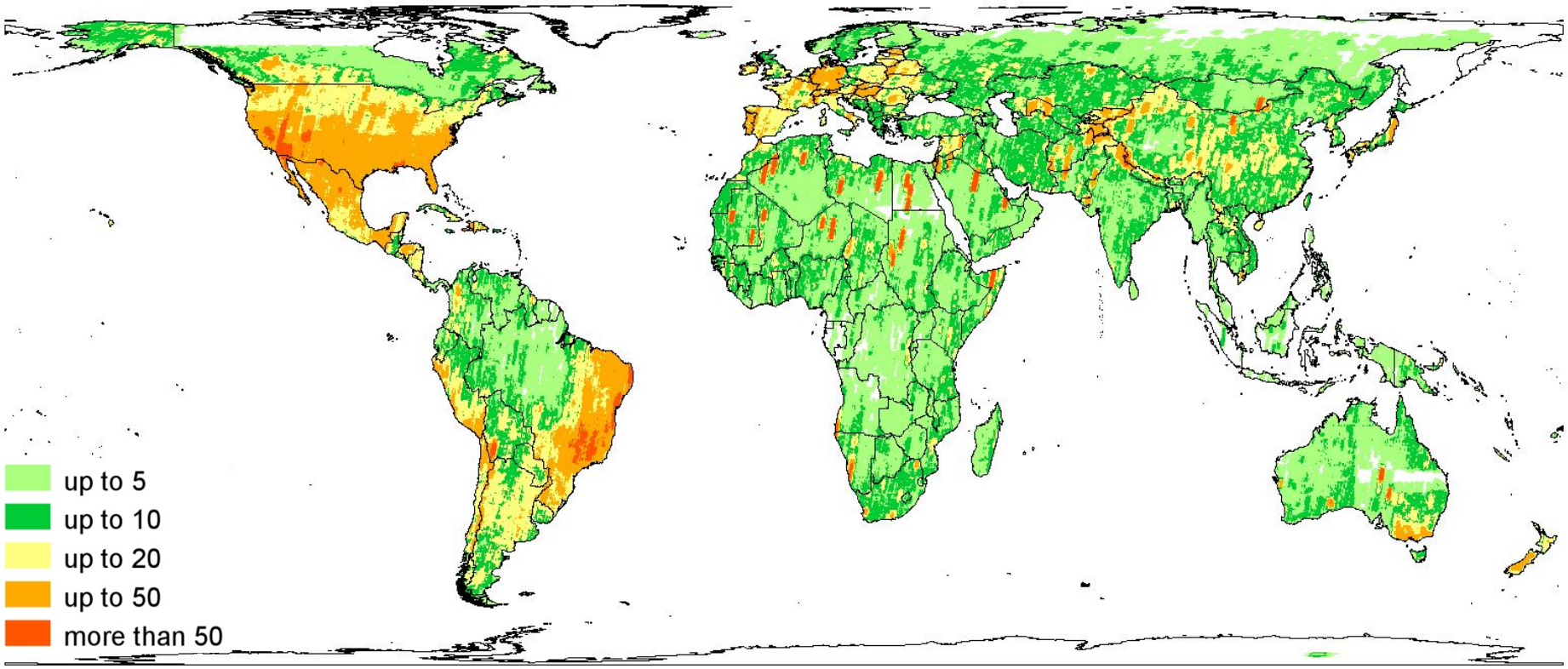
- Commercial initiative with DLR share
  - Five identical small satellites in one orbital plane
  - Nominal revisit time: 1 day
  - 5 spectral bands (Vis – NIR)
  - Spatial resol.: 6.5 m, Swath width: 78 km
  - Launch: 08/2008, operational since 02/2009
  - Nominal life-time: 7 yrs, good health status
  - Forest Monitoring among priorities of RapidEye
  - Data provision for scientific exploitation by DLR
    - Limited data volume
    - To be continued with new RapidEye
  - Coverage of FCT Demonstrators to be checked



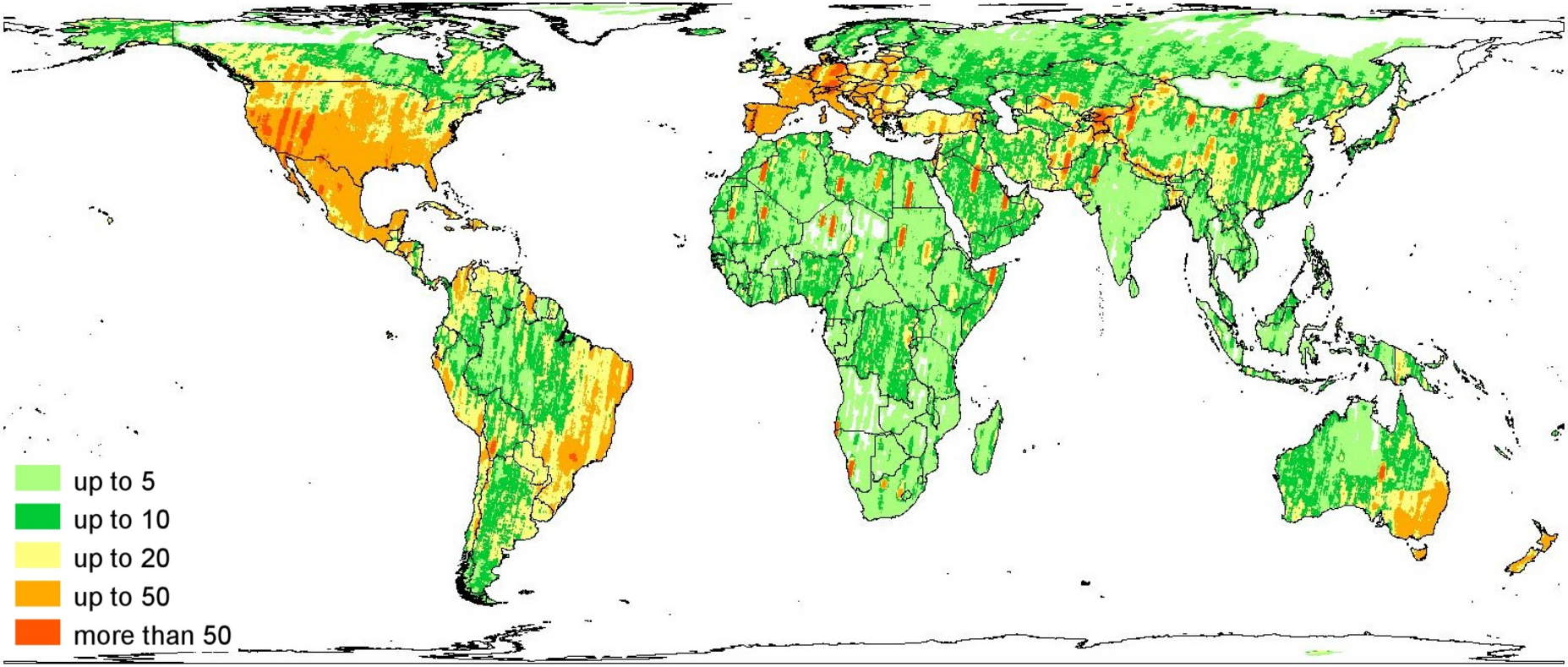
RapidEye Global Coverage 2009



RapidEye Global Coverage 2010



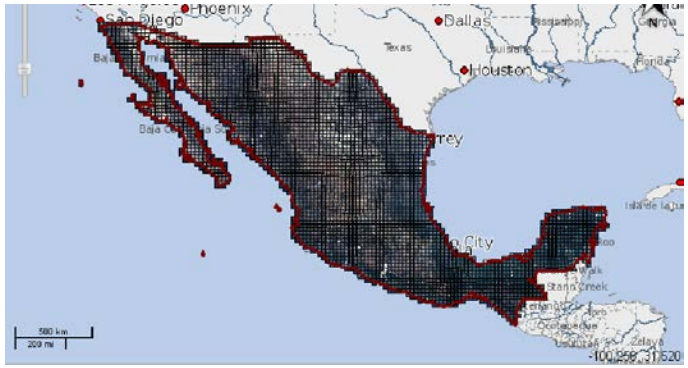
RapidEye Global Coverage 2011

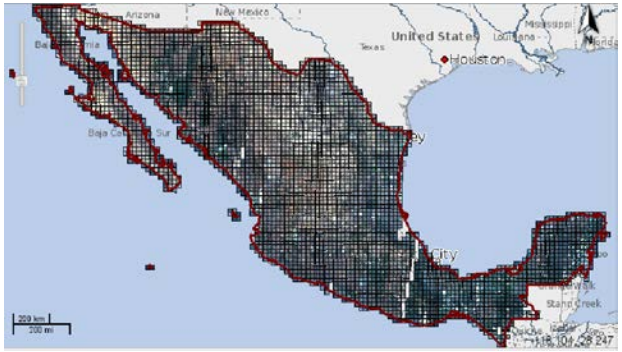


RapidEye Acquisition examples

- Africa coverage 09/10-02/11
  - More than 4200 scenes, 107 Mio sqkm, 25 weeks

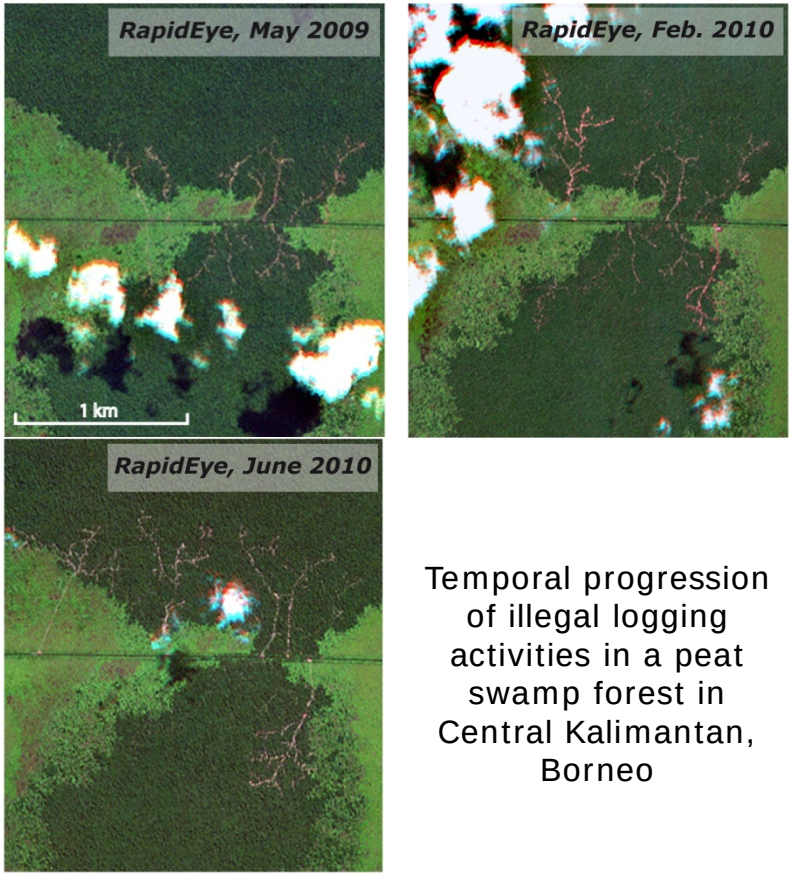
- Mexico coverage
  - 2 full coverages in 2011
  - Jan-Mar, Apr-Aug



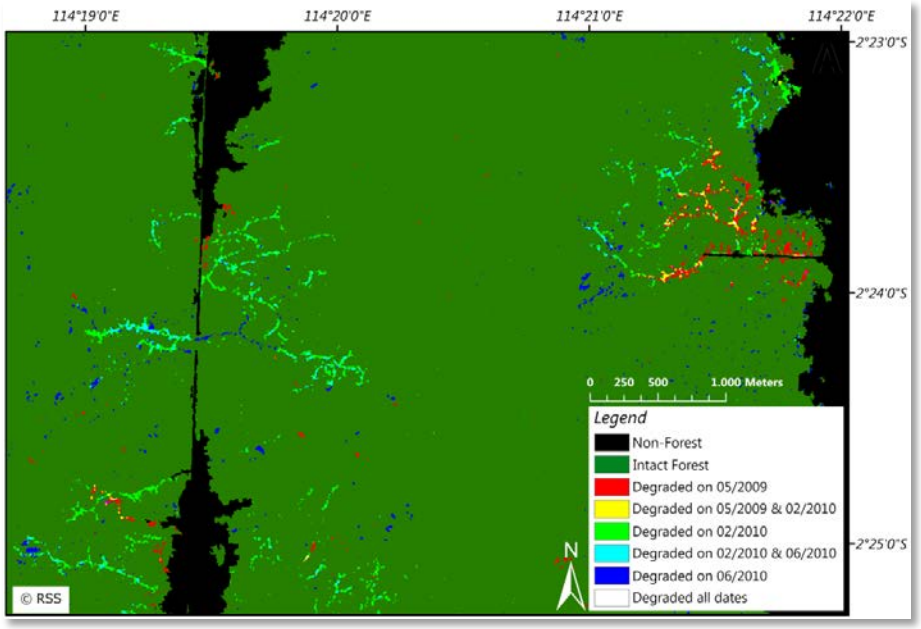


RapidEye: Monitoring forest degradation and illegal logging

- Improved monitoring of forest degradation due to the very high temporal and spatial resolution of the RapidEye System



Temporal progression of illegal logging activities in a peat swamp forest in Central Kalimantan, Borneo



Multitemporal assessment of illegal logging and forest degradation in Central Kalimantan, Borneo using RapidEye data

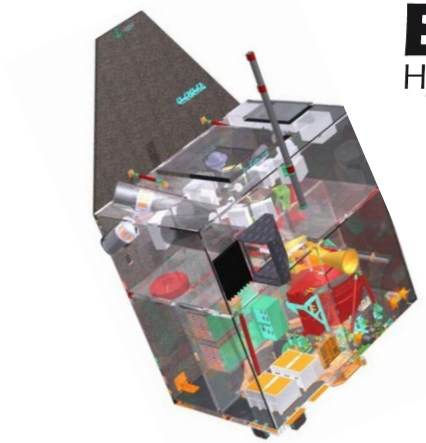
Funded by: DLR/RESA: 267

Data access for scientific purposes

- TerraSAR-X: DLR Science Service Seg.: http://sss.terrasar-x.dlr.de/
  - Scientific proposals/proposer needed, usual COFUR waived, coverage limited
  - Currently 3 FCT science proposals (D. Hoekman/Wageningen, J. Kellndorfer/Woodshole, A. Milne/Australian Department of Climate Change)
  - 2 further FCT related requests submitted => data provision through Astrium
- TanDEM-X (DEM) data access: https://tandemx-science.dlr.de/
- RapidEye: DLR RapidEye Science Archive: http://resaweb.dlr.de/
  - Scientific proposals/proposer needed, no costs, coverage limited
  - Currently only in German, German PI needed. DLR can make contacts.
  - DLR works on dedicated procedure for REDD. Target: 1 August 2012
  - Data soon also available through ESA Third Party Programme

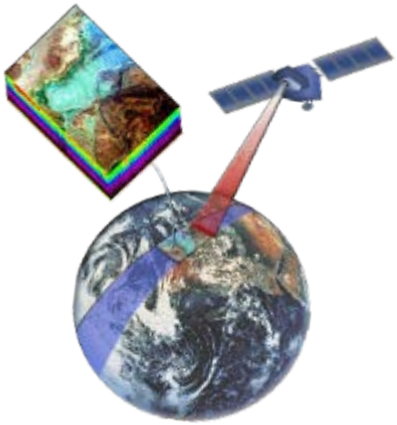
EnMAP

- National Science Mission
- Mission objective: Research on ecosystem parameters (Vegetation, Geology, Water…)
- Cutting-edge Hyperspectral Imager, > 200 Channels, Vis/NIR & SWIR
- 30 m x 30 m spatial resolution
- Launch in 2015

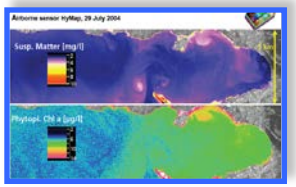


EnMAP
Hyperspectral Imager

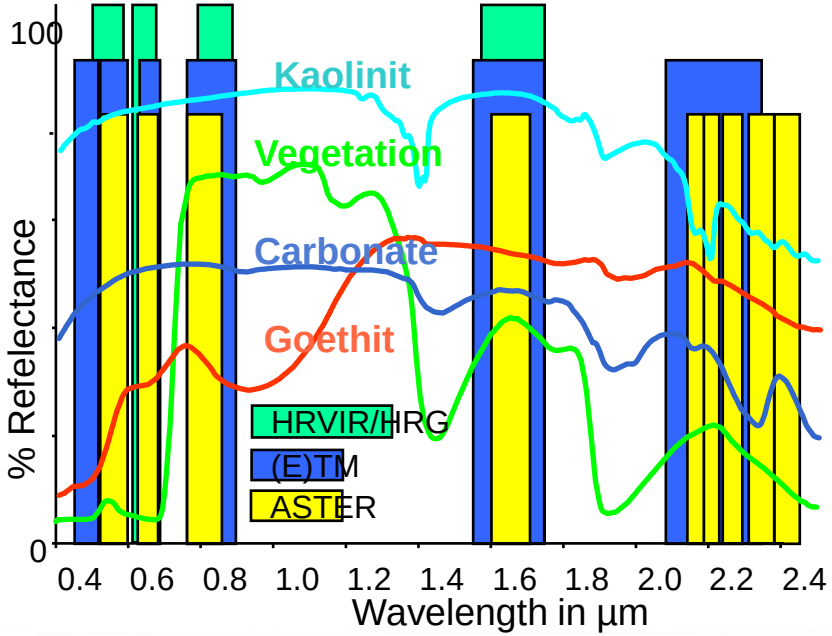
KAYSER-THREDE



Geology



Water quality



Data access for scientific purposes: Challenges

- Clear communication of FCT as scientific demonstration programme (vs. operational GFOI), and identification of proposer as part of FCT community
  - Role of CEOS, GEO?
- Increase and broaden scientific exploitation
  - Idea: CEOS coordinated FCT call for proposals
- Optimisation of Coverage
  - New/additional requirements coming up through SDCG can – in principle - be incorporated for TerraSAR and RapidEye. Both DLR and commercial operators are interested
  - Need to be clarified in detail

German REDD+ development cooperation

- Significant contributor to multilateral REDD frameworks (Worldbank FCPF, REDD+ Partnership)
- Numerous bilateral activities (new MRV projects in SADC and Ghana)
- Discussion on TerraSAR-X and RapidEye bulk data buy for GFOI from national REDD+ funding
- National meeting planned for May/June timeframe