Status of CEOS commitments to GEO FCT on 2009 Data Requirement and 2010 Data Acquisition

Frank Martin Seifert (ESA)

CEOS PoC for GEO FCT

GROUP ON EARTH OBSERVATIONS | Forest Carbon Tracking

Outlook

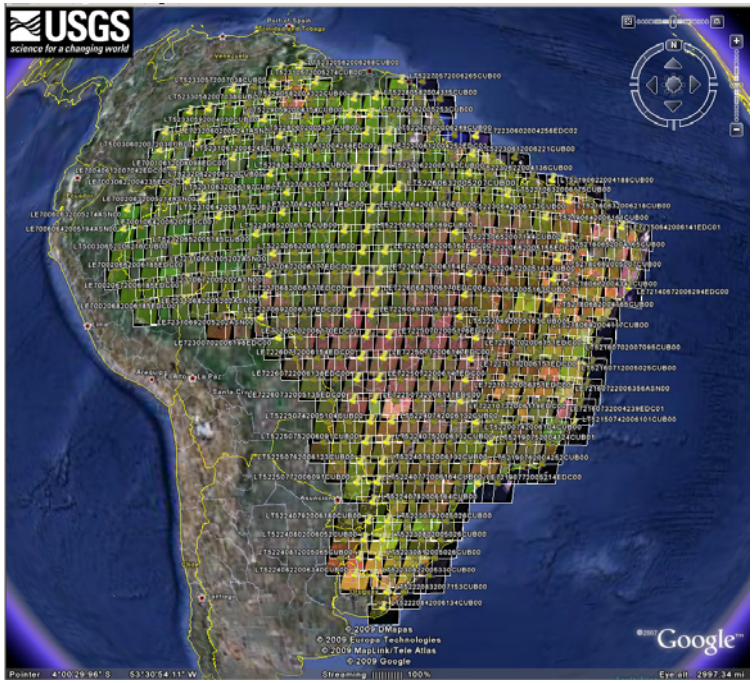
- Satellite data requirements and acquisitions by CEOS agencies for FCT in 2010
- CEOS response to the 2010 FCT Data Requirements
- Expansion of National Demonstrators
- Future FCT Events
- Summary

Optical Satellites

Satellite	Spectral Bands	Geometric Resolution	Swath Width	Repeat Cycle
Landsat 5, 7	VNIR, SWIR, TIR	30 m / 120 m (TIR)	185 km	16 days
IRS: AWiFS	VNIR, SWIR	56 m	740 km	4 days
IRS: LISS-III	VNIR, SWIR	23 m	140 km	24 days
CBERS 2b: CCD	VNIR	20 m	114 km	26 days
AVNIR-2	VNIR	10 m	70 km	46 days
SPOT 4, 5	VNIR, SWIR	20 m / 10 m	60 km	26 days
Kompsat-2	VNIR	1 m / 4 m	15 km	28 days

Requirements for Optical Satellites

- Acquisition preferably close to nadir
- Cloud free observations (< 20% cloud coverage for individual scenes – total cloud removal by multiple scenes)
- All available spectral bands
- Time window – yearly during dry season
- Level-1 processing



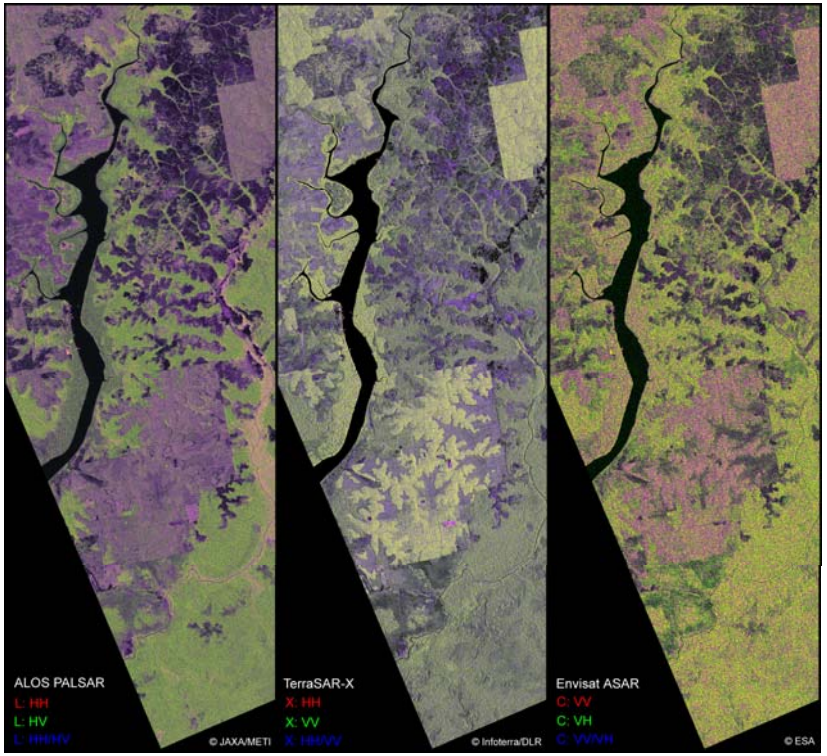
GLS 2005: 423 TM Scenes in USGS Archive

SAR Satellites

Satellite	Frequency / Polarisation	Geometric Resolution	Swath Width	Repeat Cycle
ALOS PALSAR	L-band (23.6 cm) / full pol	7 m – 154 m	30 – 360 km	46 days
RADARSAT-1	C-band (5.6 cm) / HH	9 m – 100 m	45 - 500 km	24 days
RADARSAT-2	C-band (5.6 cm) / full pol	3 m – 100 m	20 - 500 km	24 days
ENVISAT ASAR	C-band (5.6 cm) / dual pol	30 m – 150 m	56 - 400 km	35 days
TerraSAR-X	X-band (3.1 cm) / full pol	1 m – 16 m	5 - 100 km	11 days
COSMO-SkyMed	C-band (3.1 cm) / full pol	1 m – 100 m	10 - 100 km	16 days

Requirements for SAR Satellites

- Spatial and temporal consistency
- Fixed single observation mode
- Level-1 processing (calibrated)
  - SLC
  - Multi-look



Polarimetric composites in L-, X- and C-band by ALOS PALSAR, TerraSAR-X and Envisat ASAR

Summary of EO Data Acquisitions over NDs in 2009

Sensor	Brazil	Guyana	Mexico	Cameroon	Tanzania	Borneo	Tasmania
ALOS PALSAR	4541	159	375	116	405	507	86
RADARSAT-2	126	41	243	acquisition by ENVISAT	acquisition by ENVISAT	161	24
ENVISAT ASAR	303	67	acquisition by RADARSAT	107	182	acquisition by RADARSAT	25
Landsat 5 & 7	1665 (+ 3500 INPE)	107 (+ 88 INPE)	484	115	115	173	41
CBERS-2B: CCD	3500	80	N/A	N/A	N/A	N/A	N/A

CEOS response to the 2010 FCT Data Requirements

GROUP ON EARTH OBSERVATIONS | Forest Carbon Tracking

CEOS – FCT Co-operation

- CEOS coordination role to guarantee consistent global data acquisition is essential.
- Improved interaction between CEOS and FCT
  - FCT 2010 acquisition requirements presented at CEOS Plenary in November 2009
  - Detailed FCT 2010 Data Requirement document v1.0 in December 2009
  - Discussion on support of CEOS WGCV to GEO FCT initiated
- Response of CEOS to FCT Requirements in preparation (release April 2010)

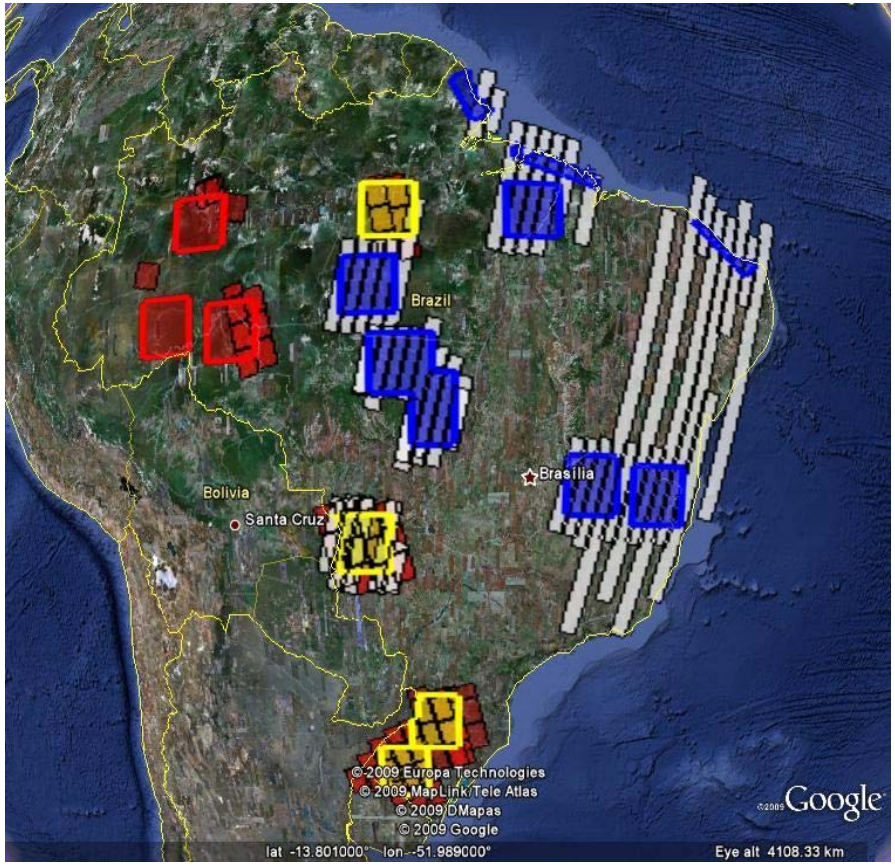
GEO FCT 2010 Space Data Requirements - National Demonstrators

SAR:

- Jan-March 2010 second ND coordinated acquisition campaign
  - Objective: Provision of dual-season data for semi-annual time-series analysis and improved thematic interpretation
  - Defined in detail in **2010 Data Requirement document v1.0 [Dec. 2009]**

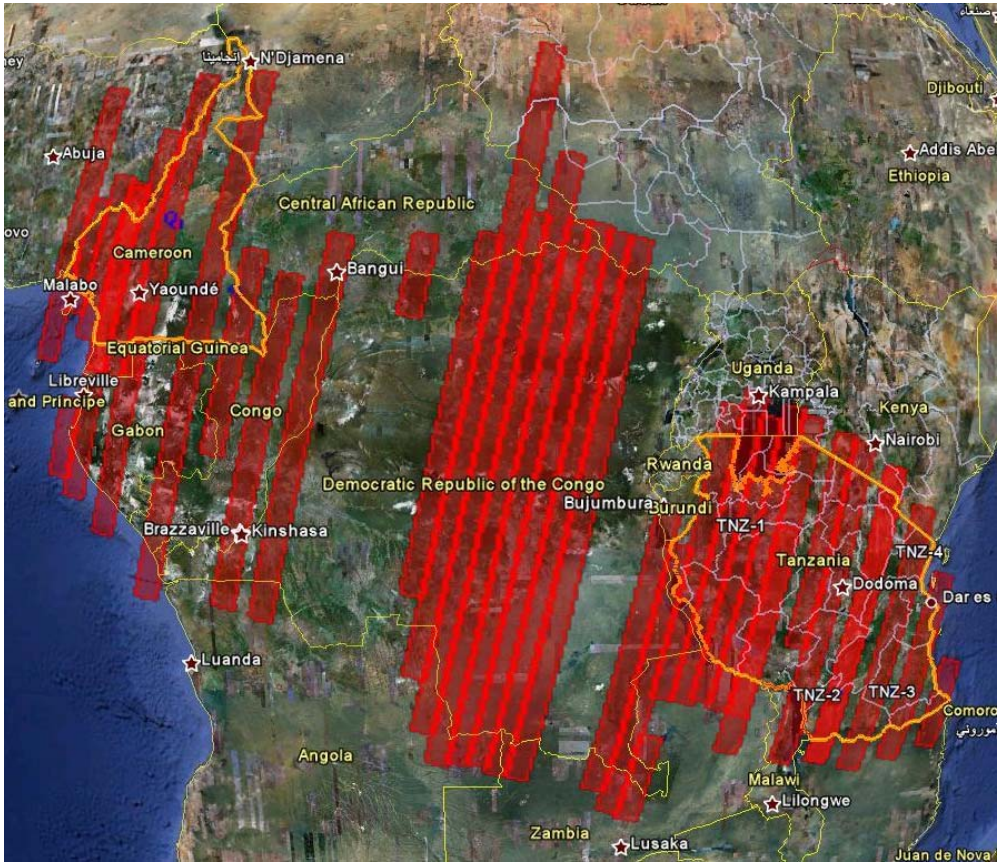
- Jun/Aug 2010 third ND coverage
  - Objective: Building an archive of time-series over all National Demonstrators
  - Defined in detail in **2010 Data Requirement document v2.0 [May 2010]**

SAR C-Band Acquisitions



CSA-ESA Coordination over Brazil and Guyana

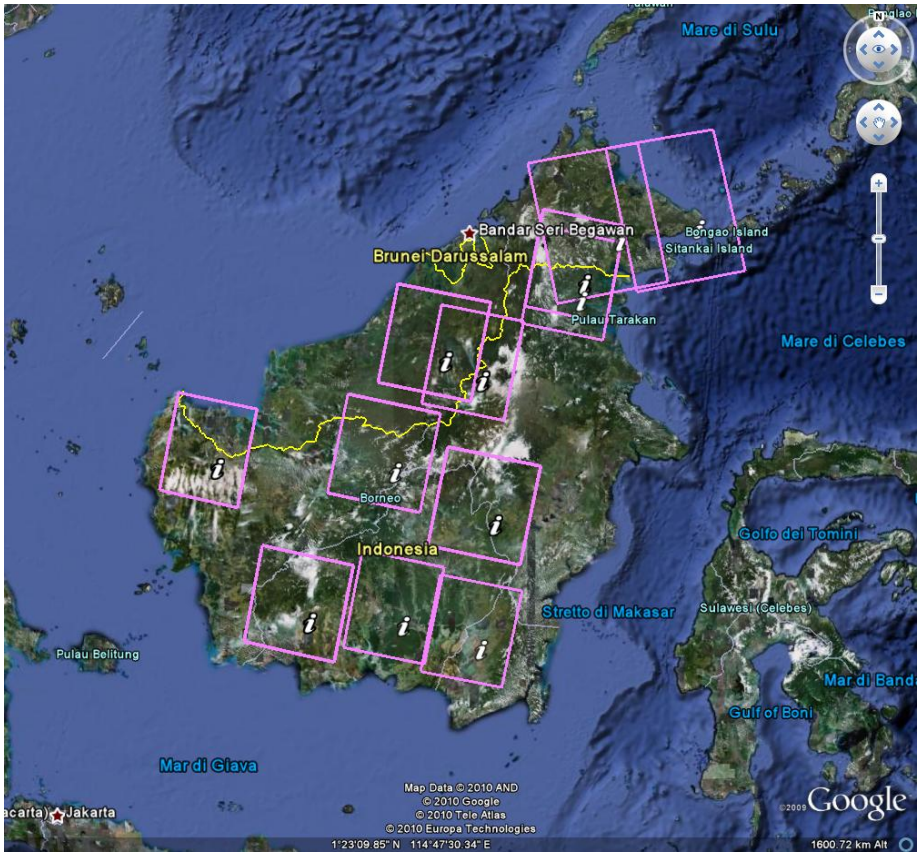
Radarsat ASAR



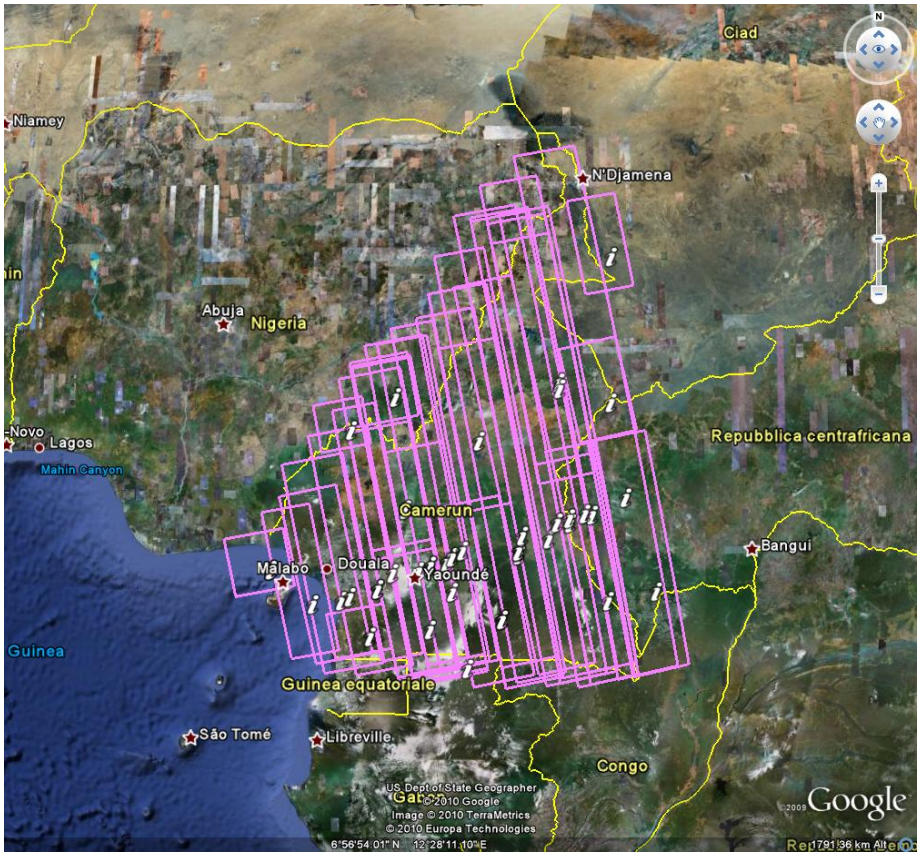
Africa: ASAR coverage of Congo Basin and Tanzania with IS4 in Alternate Polarization

GROUP ON EARTH OBSERVATIONS | Forest Carbon Tracking

Cosmo-SkyMed – X-band acquisitions since July 2009



Borneo: 51 acquisition HR over the validation sites



Cameroon: 42 acquisition WR over the whole area

GROUP ON EARTH OBSERVATIONS | Forest Carbon Tracking

GEO FCT 2010 Space Data Requirements - National Demonstrators

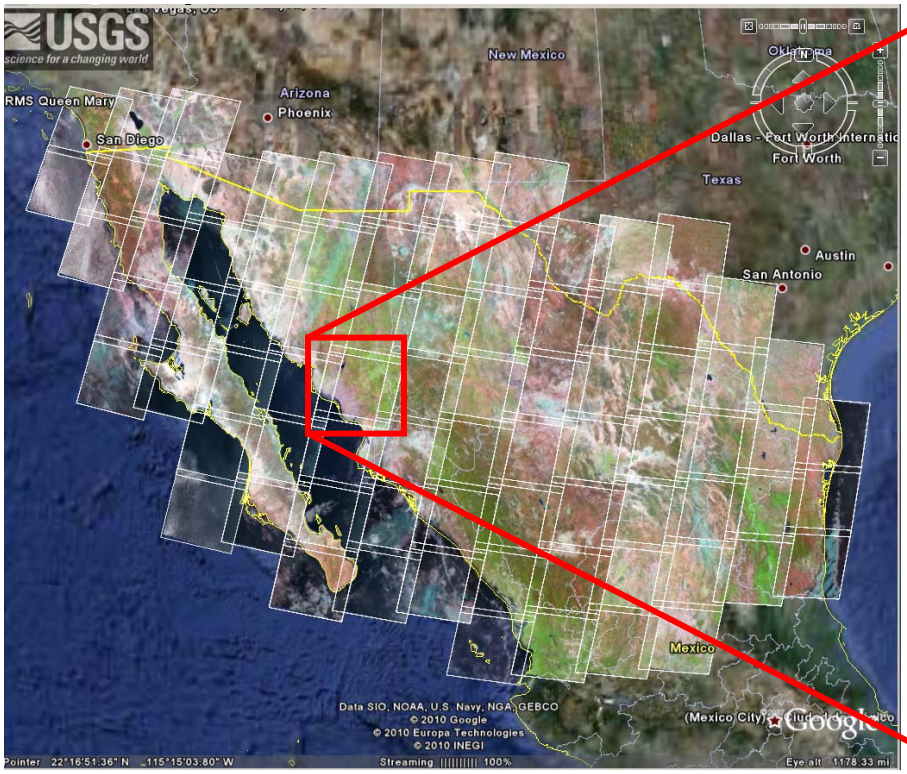
Optical:

- Preferred time window: July/Aug 2010 – but window open the whole year to mitigate cloud cover impact and acquire during dry season

National Demonstrator	Dry Seasons
Brazil	none in the Amazon basin, June - September in the Brazilian Plateau
Guyana	February - March and August - November
Mexico	November - April
Cameroon	November - March and additionally in the South from June - August
Tanzania	June - October
Borneo	June - September, but strong variations over the island
Tasmania	June - November (cool temperate climate)

  - Objective: Annual minimum-cloud composite coverage of all ND
  - Defined in detail in **2010 Data Requirement document v1.0 [Dec. 2009]**

Landsat – Example Mexico



Mexico: 549 Landsat TM scenes over the validation sites

Mexico: Example Landsat TM browse

GROUP ON EARTH OBSERVATIONS | Forest Carbon Tracking

Summary Table of Acquisitions in 2010 over NDs and VS

Area	Brazil (parts)	Guyana	Mexico	Cameroon	Tanzania	Borneo	Tasmania
ALOS - PALSAR	full coverage	full coverage	full coverage	full coverage	full coverage	full coverage	full coverage
Radarsat-2	368	72	641	acquisitions by Envisat	acquisitions by Envisat	132	65
Envisat ASAR	704	17	405	71	151	50	21
COSMO - Skymed	not planed	24	not planed	42	not planed	101	16
TerraSAR-X	54	18	72	21	24	30	24
Landsat	2443	173	1732	230	253	320	129
SPOT	TPM by ESA, but restrictions related to repatriation			Congo Basin 2010		TPM by ESA, but restrictions related to repatriation	
CBERS	full coverage	full coverage					
IRS	acquired at INPE	acquired at INPE					

o.k.	not feasible
some restrictions	under discussion

Expansion of National Demonstrators

National Demonstrators

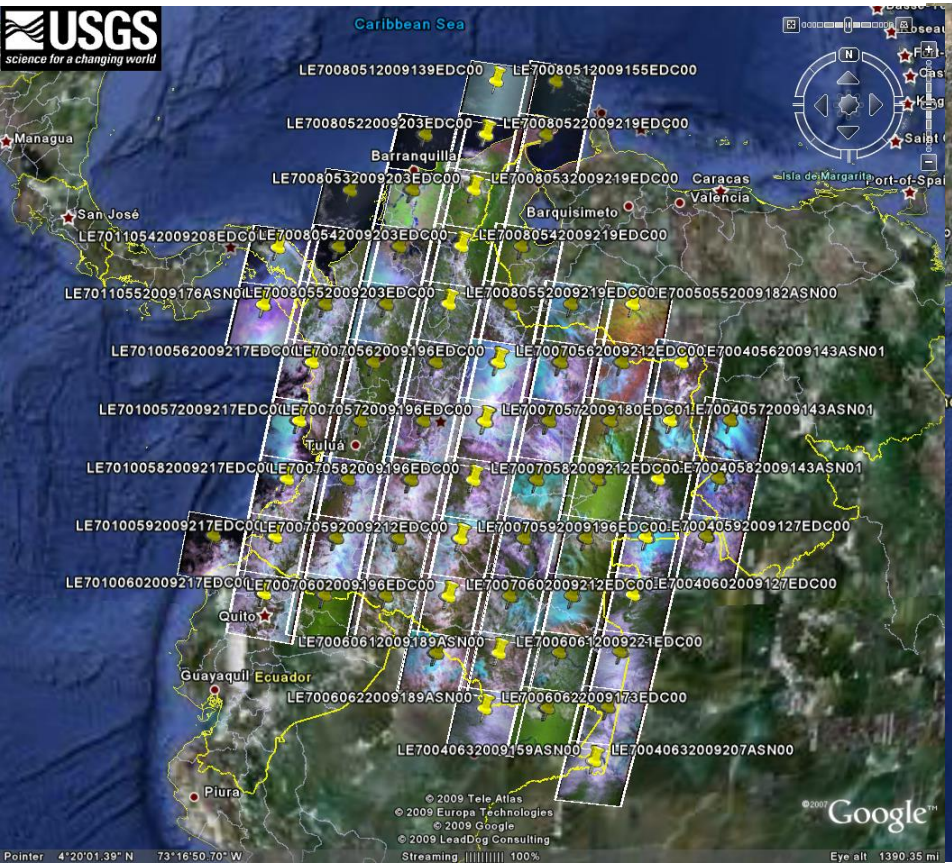
- Initially 7 National Demonstrators selected
- Acquisition time windows: June - September 2009 and January - March 2010

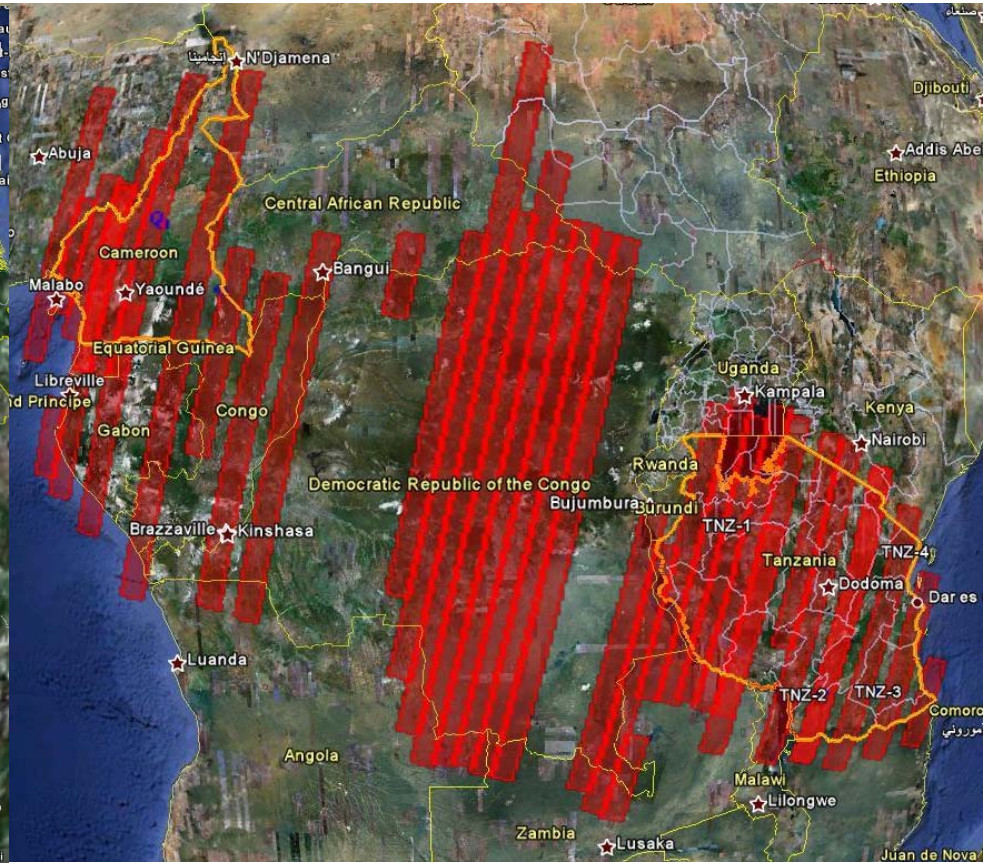
Challenge of Expansion

- Enlarging area of current National Demonstrators
  e.g. add **Sumatra (Indonesia)**
- Adding more countries with commitment
  e.g. **Peru, Colombia, D.R. of Congo** towards full satellite coverage of the UN-REDD and Worldbank's FCPF countries by end 2011

  ➔ double the area by end of 2010
- Deepen current progress towards integration
  e.g. move from **remote sensing products to emissions products** by integration of in-situ and remote sensing observations with carbon and emissions models

Pro-active





USGS analysis of Landsat coverage over Columbia in 2009

Africa: ASAR coverage of Congo Basin and Tanzania with IS4 in Alternate Polarization

GROUP ON EARTH OBSERVATIONS | Forest Carbon Tracking

Future Data Contribution Models

Free and open data policy

- National / international missions e.g. Landsat (USGS), CBERS (INPE), future Sentinels (ESA), …

  ➔ **most likely the work horses**

Commercial data provision

- Private companies and PPP missions e.g. Spot (Spotimage), TerraSAR-X (DLR/Infoterra), Radarsat-2 (CSA/MDA), …

  ➔ **bulk data order by governments/donors** e.g. France with Spot coverage over the Congo Basin

FCT EO Data Considerations

- Currently FCT deals with a magnitude of different data agreements – suboptimal and time consuming!
- FCT takes aging of satellites (e.g. Landsat, Envisat, Spot, ...) into account for long term strategy
- GEO FCT encourages free and open data policy
- Data grants to FCT should be without restrictions – today they are not!
- Need for VHR data for validation – mainly from commercial providers

Future Co-operations and Events

Cooperations

- **UN-REDD** with 9 pilot countries
  - UN-REDD/GEO Symposium in Mexico

- World bank's **Forest Carbon Partnership Facility (FCPF)** with 37 REDD country participants
  - Future expansion countries
  - Challenge to cover them from end 2011 onwards …

FCT Events in the near Future

- **First FCT Science and Data Summit**, Woods Hole (USA), 11-12 May 2010
- **3rd FCT Space Data Coordination Meeting**, Woods Hole (USA), 13-14 May 2010
- **FCT side event at UNFCCC SBSTA**, Bonn (Germany), 3rd June 2010
- **MRV Workshop** by **NFC / UN-REDD / GEO**, Guadalajara, Jalisco, México, 22-24 June 2010
- **FCT session** at **ESA's Living Planet Symposium,** Bergen, Norway, 28 June 2010

Summary CEOS Committments

- CEOS coordination role to guarantee consistent global data acquisition is essential.
  - Great common and coordinated effort of involved space agencies
  - Internal reporting can still be improved
- Improved interaction between CEOS and FCT
- Discussion on support of CEOS WGCV to GEO FCT initiated
- Response of CEOS to FCT Requirements in preparation (release April 2010)

Not the end of the story …

GEO FCT asks CEOS for further support:

- Continuation to acquire satellite data over FCT National Demonstrators and Verification Sites
- Expansion to larger areas
- Access to archive and repatriation of data
- Contribution and participation at FCT events