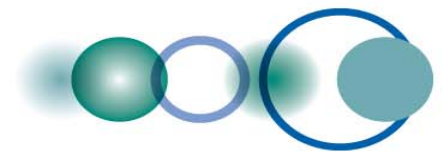


# The GEO Forest Carbon Tracking (FCT) initiative

Towards the Implementation of a global  
Forest Carbon Tracking System

Giovanni Rum,  
GEO Secretariat

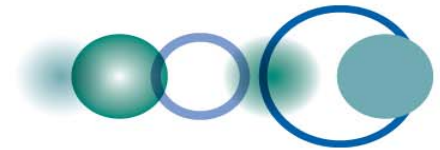




# GEO, the Group on Earth Observations

## An Intergovernmental Organization with 81 Members and 58 Participating Organizations





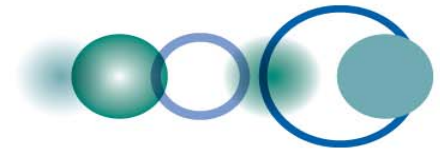
# The Group on Earth Observations

The Group on Earth Observations was established at the EO Ministerial Summit in 2005 in Brussels with one major objective:

**To establish a coordinated and sustained  
Global Earth Observation System of Systems  
GEOSS**

**to enhance informed decision making in  
different areas of the Society.**





## GEO outcomes

- Improve and Coordinate Observation Systems
- Provide Easier & More Open Data Access
- Foster Use (Science, Applications)
- Build Capacity

GEOSS will be built from the expansion and interlinking of existing observation and information systems and the investments of Members and Participating Organizations in new systems.





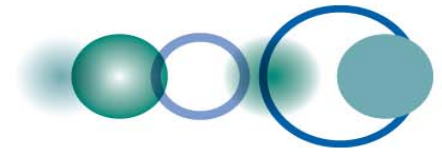
# THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



Forest Carbon Tracking

© GEO Secretariat



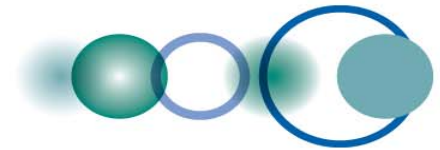


# The Forest Carbon Tracking (FCT) initiative Summary

National bodies, space agencies and research institutions are working together within GEO, to

- facilitate access to satellite, airborne and in situ data,
- establish interoperability standards for the use of different processing and analysis tools and methodologies, and
- create the appropriate framework for the implementation a global forest carbon tracking system, based on a network of national systems



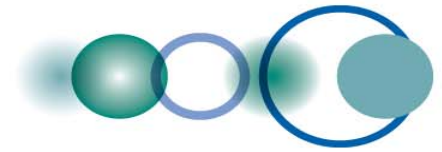


# The need

An operational global forest monitoring system based on a network of national systems is needed, *inter alia*, to support reducing greenhouse gas emissions from deforestation and forest degradation (REDD)

- inclusion of forests in a post-2012 climate agreement is important for many developing countries and this has been fully recognized by COP 15
- Monitoring, Reporting and Verification (MRV) systems will be critical, and require global Earth observation systems

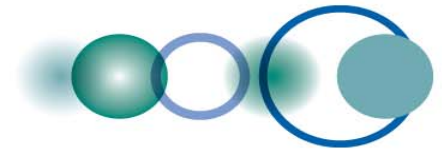




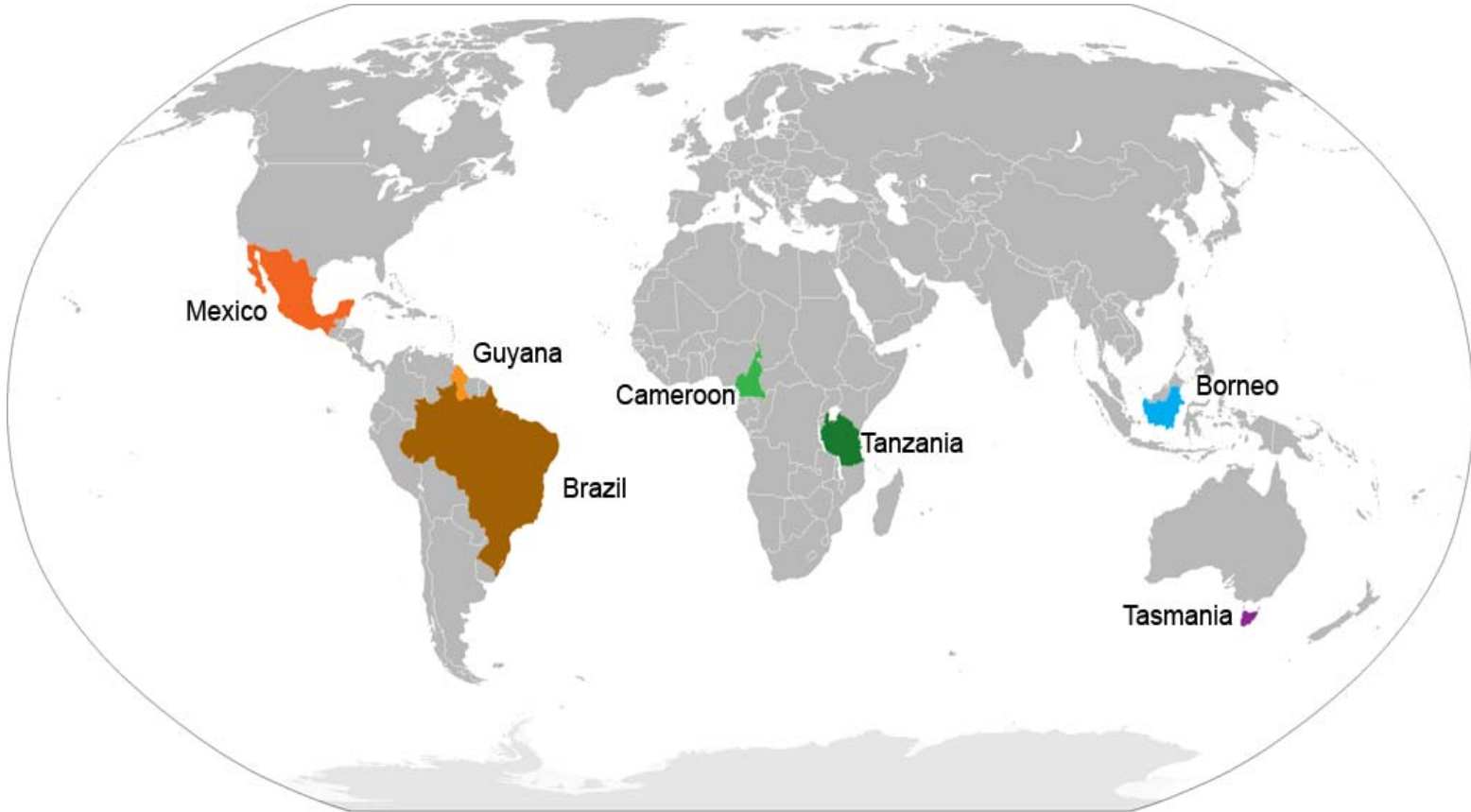
# The GEO FCT Partnership

- Leadership of Australia, Canada, Japan and Norway
- CEOS, the Committee on Earth Observation Satellites, and its members agencies
- FAO, GOFC-GOLD, EC-JRC & research groups
- Google
- Seven 'National Demonstrators' for the project in 2009-2010
  - Australia, Brazil, Cameroon, Guyana, Indonesia, Mexico and Tanzania.



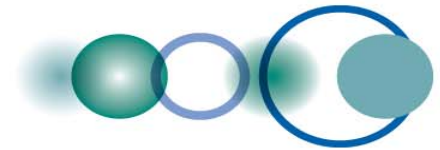


# GEO FCT Partnership: NDs



Growing list of candidates for 2010 participation





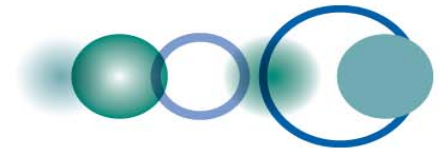
# The GEO FCT initiative

## How is it unique ?

GEO FCT is a framework for coordination among governments, space and forest agencies, research institutions and early adopter countries to:

- Establish National end-to-end demonstrators showing the elements and operations of a global system of systems
- Develop institutional arrangements for secure data access and continuity
- Initiate, validate and promote the standards and the protocols for comparability and interoperability





## The GEO FCT initiative

### What will be made available to Countries ?

GEO FCT developments are aimed at supporting countries establishing national systems for forest carbon tracking by:

- Ensuring access to long-term satellite, airborne and in situ data, and the associated analysis and prediction tools
- creating the framework and technical standards for a global network of national systems
- developing methodologies and products that follow UNFCCC/IPCC guidelines



A yearly, wall-to-wall, medium-resolution monitoring approach has been identified as the best suited to cover a wide range of potential outcomes of the policy-framework negotiations. Two sets of corresponding information products were identified

“Horizon-1” products, addressing IPCC requirements, which have reached a level of processing ‘maturity’, and which can now be potentially produced by different remote sensing teams around the world. These are the highest-priority ‘pre-operational’ products for each FCT National Demonstrator country,

“Horizon-2” products that constitute a range of more specific demonstration products and will gradually complement Horizon-1 products depending on their levels of algorithm development, demonstration results and validation, transferability from country to country, and operational readiness.



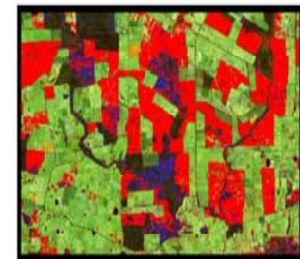
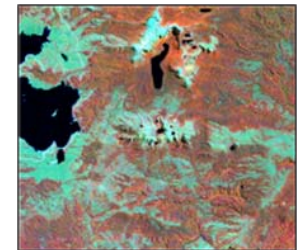


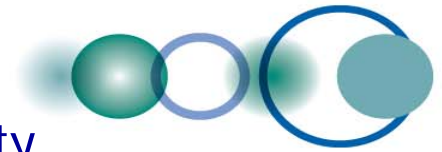
### Horizon 1

- 1a. – Annual, wall-to-wall, Forest Area Change and updated Forest/Non-Forest coverage maps, which can be used for estimation of trends and associated accuracy metrics.
- 1b. – Land-cover/use map (including agriculture, plantations, native forest, grassland)

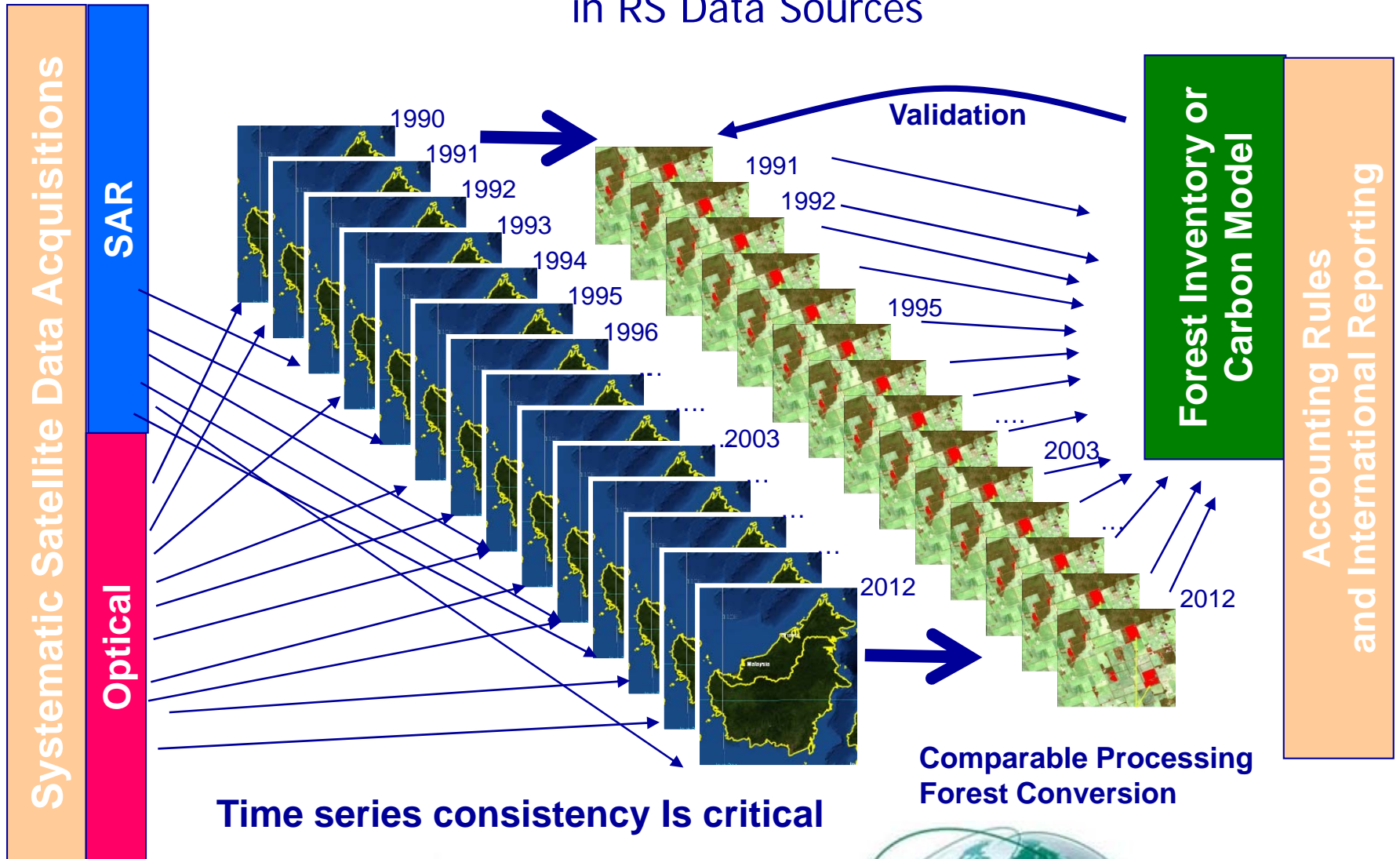
### Horizon-2

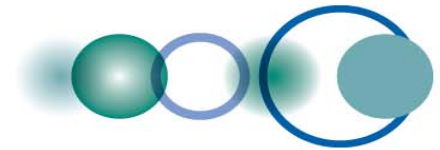
- 2.a - Coarse-resolution, high-frequency forest change detection/ anomalies product (derived from low-resolution, but high frequency satellite sensors such as MODIS (optical) or PALSAR ScanSAR (radar)).
- 2b. - Forest-type : Softwood, hardwood, native, primary, secondary
- 2c. - Forest trends
- 2d. - Sparse woody perennial cover
- 2e.- High-resolution forest change, structure or physiology products (from satellite, airborne systems – eg. lidar, x-band SAR, imaging spectrometers)
- 2f.- Forest Degradation





# Interoperability and complementarity in RS Data Sources





# FCT activities flow

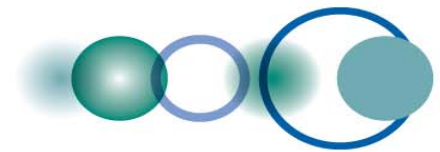
The Task aims at demonstrating this capability, initially via the establishment of robust methodologies, satellite acquisition plans and a series of national demonstration areas (ND – National Demonstrators).

Through a coordinated and iterative process, ND's will provide the elements to define a template for the roll-out of a consistent and reliable global system.

The task therefore includes three main interconnected phases:

- Requirements definition
- Demonstration
- Implementation of the operational system



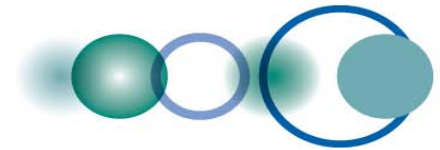


# The Path to Implementation

The GEO FTC initiative will pave the way for countries to establish national MRV systems as part of a global network via eight main actions:

1. A commitment by CEOS members to provide satellite data, tools and training for national wall-to-wall forest carbon tracking.
2. Provide guidance to countries on methods and standards to produce forest information products.
3. Provide guidance on linking ground measured forest inventories, remote-sensing data and carbon models.

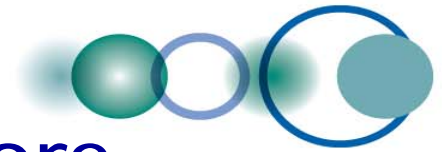




# The Path to Implementation

4. Develop validation and accuracy assessment procedures for forested area and carbon stocks.
5. Grow the network of 'National Demonstrator' countries: Southeast Asia, Africa and South America.
6. Raise awareness of the demonstrations to the UNFCCC and other major fora, showing the policy implications of new capabilities.
7. Create a coordinated network of processing facilities to ensure countries are supported in data processing.
8. Prepare for a transition from demonstration to operation.



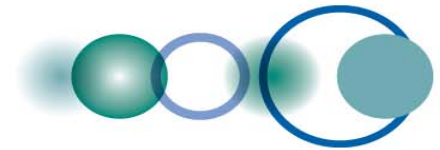


# National Demonstrators

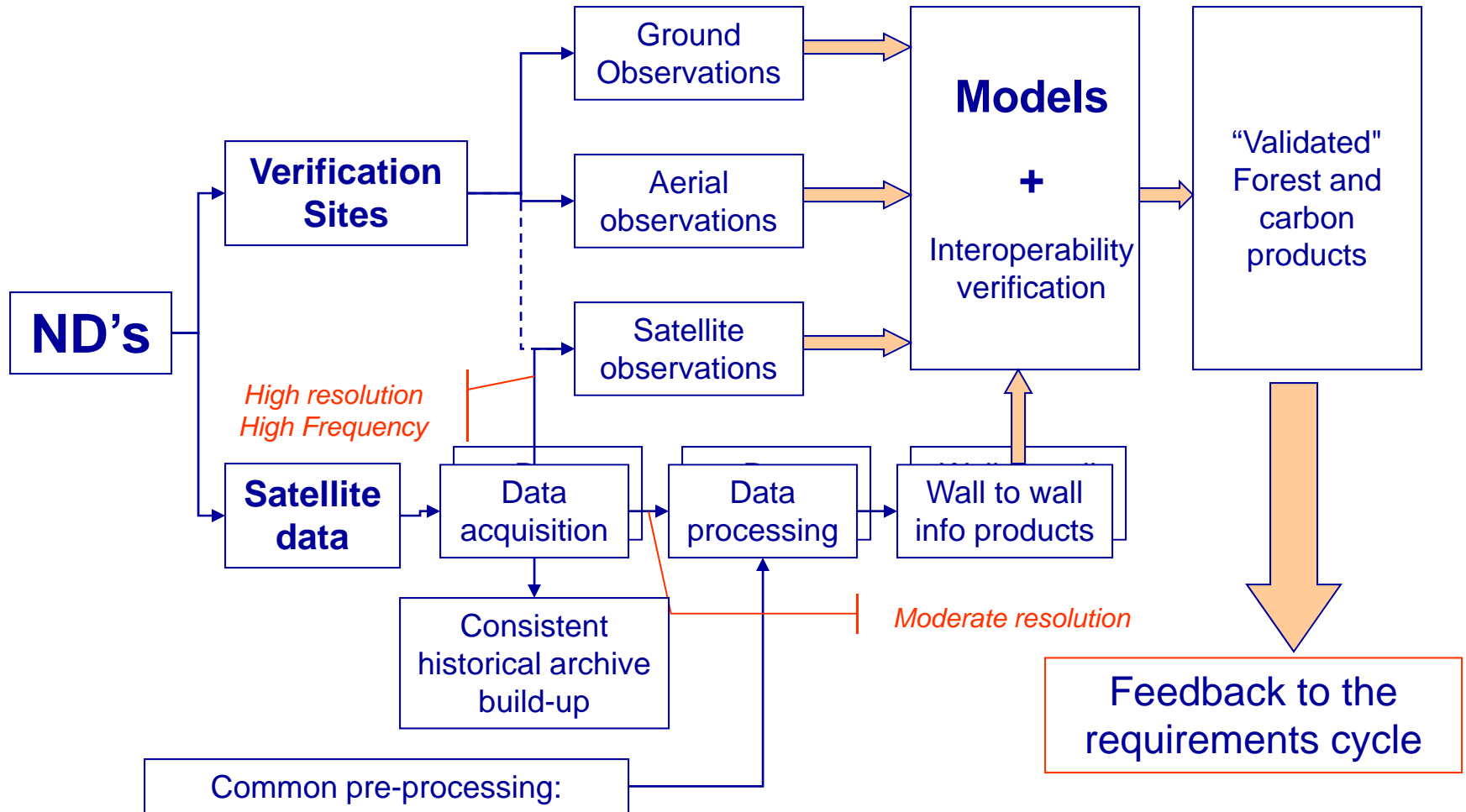
The Task has initially established a number of reference demonstration areas – “National Demonstrators” for developing and testing approaches and methods and demonstrating the use of current Earth observation capabilities for assessing long-term, operational forest-cover change and carbon monitoring.

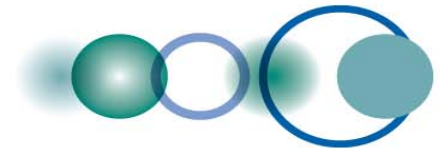
These national demonstrators are defined as areas large enough to demonstrate the wall-to-wall capability and they contain several Verification sites, where the in situ/aerial measurement will take place and higher resolution/higher temporal frequency satellite data will be acquired.





## Demonstration activities simplified flow

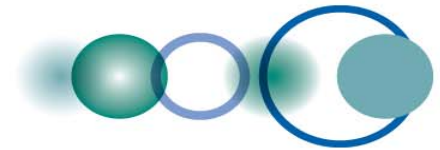




## 2009 progress

- Task Team established, key Technical and Management processes identified and in place. Modular approach ready to include additional contributions and participations
- Satellite data acquire over all ND's (at least one optical and one SAR coverage)
- Network of organizations and institutions ready to support National Demonstrators Countries for 2009 data processing identified
- Coordination with other major initiatives in the domain (such as UN-REDD) active

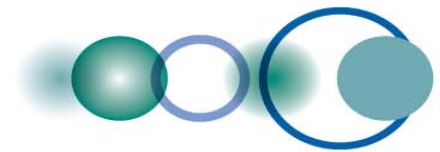




- GEO Forest Carbon Tracking dataset specification, close to conclusion
- Satellite interoperability standards, initiated and progressing
- Standards for in-situ measurement, validation procedures and accuracy assessment for the remote sensing of forested areas and for carbon stock estimates, initiated
- Guidelines for Countries to join the initiative and act as National Demonstrator, drafted

The relevant documents are available on request and will be posted on the web portal once reached a suitable level of maturity.





GEO FCT Prototype Portal launched,  
<http://www.geo-fct.org/>



- [Welcome](#)
- [About](#)
- [Use Guide](#)
- [ND](#)
- [Visualisation](#)
- [Browser](#)
- [FAQ](#)
- [Forest Carbon Tracking](#)
- [Task](#)
- [Organisation](#)
- [National Demonstrators](#)
- [Borneo](#)
- [Brazil](#)
- [Cameroon](#)
- [Guyana](#)
- [Mexico](#)
- [Tasmania](#)
- [Tanzania](#)

## Brazil

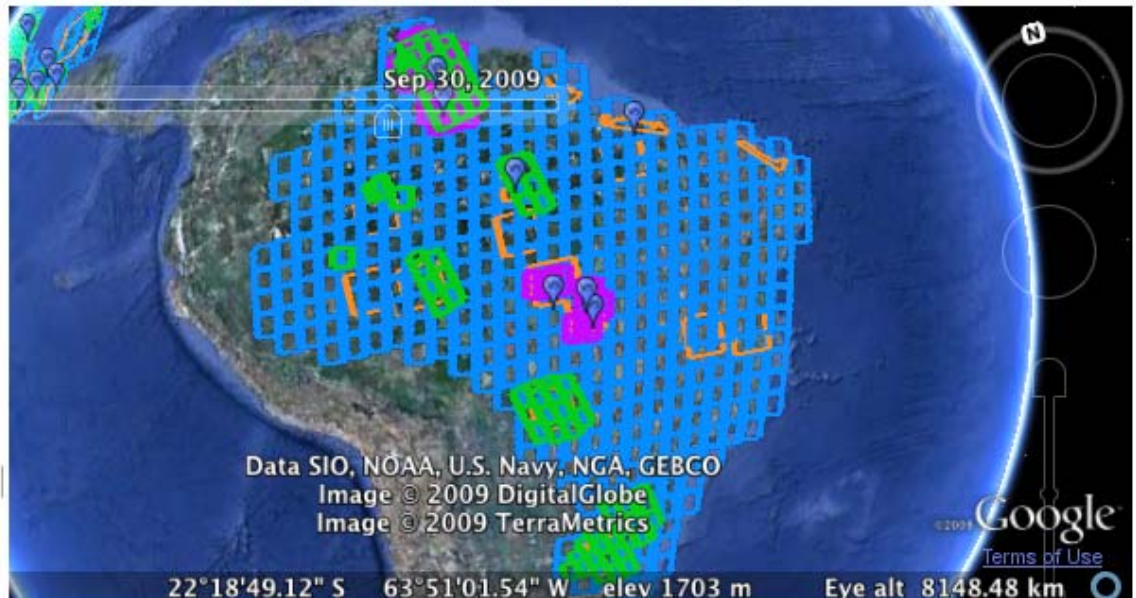
- FCT
  - National Demonstrators
  - Medium Res Sat Cover
    - ASAR
      - 2009: 55
    - LANDSAT
      - 2009: 1888 (301)
    - PALSAR
      - 2009: 2475
    - RADARSAT
      - 2009: 561
  - Sample Map Products



Opacity percent: 100

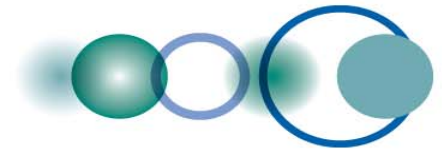
Show borders:

[Brazil](#) [Cameroon](#) [Guyana](#) [Mexico](#) [Tanzania](#) [Tasmania](#)



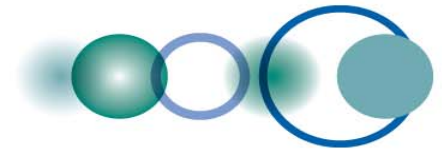
Forest Carbon Tracking

© GEO Secretariat

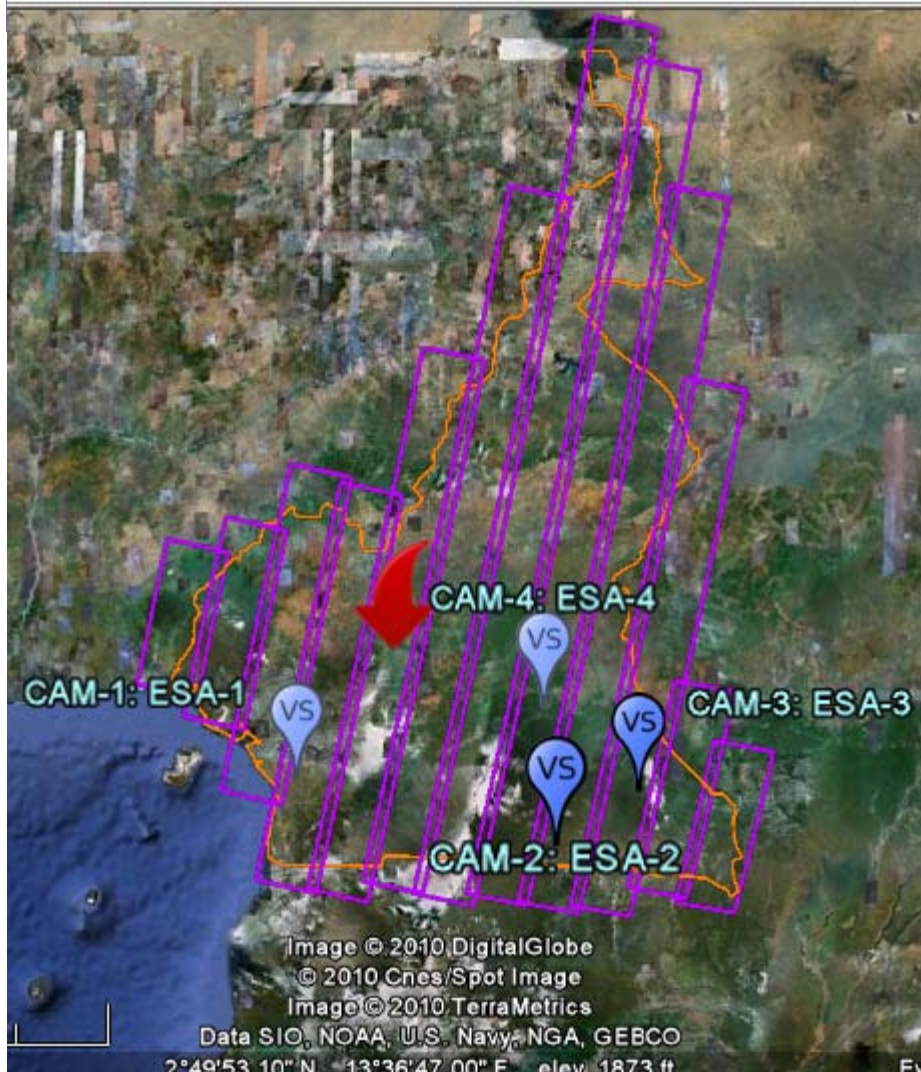


# Africa ND's (with VS's)





ASAR Data

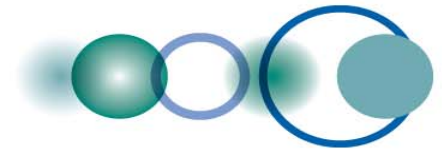


ASAR 2009

	Name	Links	Date	Orbit
1	row-1-34	<a href="#">Outline</a>	2009/08/12	38953

[ESA](#) | [ASAR](#)

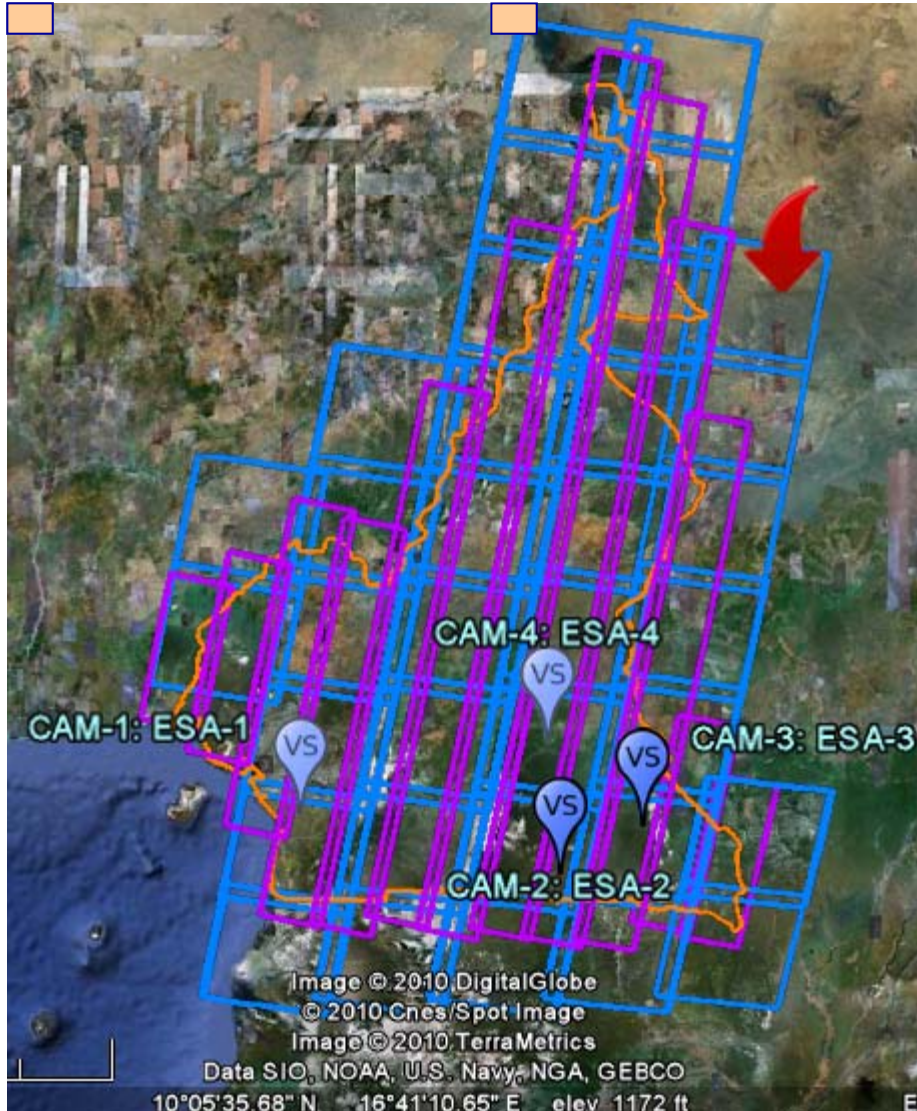




ASAR Data



Landsat Data




ASAR 2009

Name	Links	Date	Orbit
1 row-1-34	<a href="#">Outline</a>	2009/08/12	38953

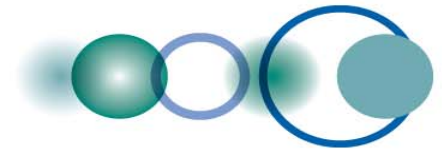
[ESA](#) | [ASAR](#)

LANDSAT 2009

Image	Name	Links	Date	Cloud Cover
	1 <a href="#">LE71830542009133ASN00</a>	<a href="#">Outline</a>   <a href="#">Full metadata</a>	2009/05/13	35.9%

[USGS](#) | [LANDSAT](#) | [Dataset Information](#)





ASAR Data



Landsat Data



PALSAR Data



ASAR 2009

Name	Links	Date	Orbit
1 row-1-34	<a href="#">Outline</a>	2009/08/12	38953

[ESA](#) | [ASAR](#)

LANDSAT 2009

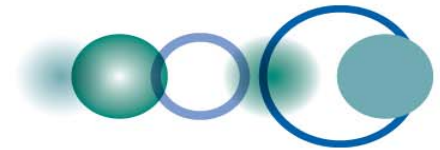
Image	Name	Links	Date	Cloud Cover
	<a href="#">LE71830542009133ASN00</a>	<a href="#">Outline</a>   <a href="#">Full metadata</a>	2009/05/13	35.9%

[USGS](#) | [LANDSAT](#) | [Dataset Information](#)

ASAR 2009    LANDSAT 2009    PALSAR 2009

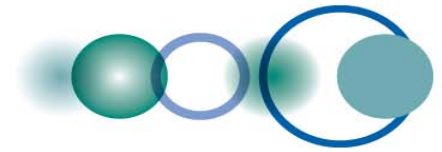
Name	Links	Date	Orbit	Row	Comment
1 ALPSRP195150160	<a href="#">Outline</a>	2009/09/22	648	160	Observation Mode: FBD, 34.3, A





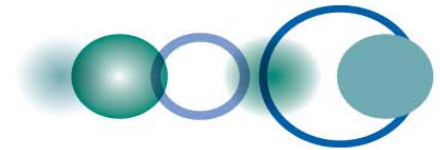
- Produce and promote the 2009 GEO FCT datasets and results
- Perform the 2010 Demonstration campaign repeating annual dataset and results for the existing National Demonstrators plus engagement of additional Countries
  - test satellite data coordination mechanisms
  - test systems, standards and protocols to provide consistent results for multiple circumstances
  - Continue to build-up a consistent historical archive





- Progress and promote key GEO-branded standards and protocols
  - refined as lessons are learned from 2009 & 2010 demonstrations
- Support 'architecture planning' of global system architecture for transition to operations

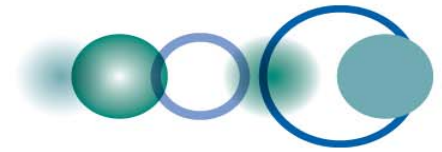




## Concluding remarks

- GEO FCT is well suited to provide the right framework to harmonize/coordinate/integrate different projects and initiatives
- GEO FCT is highly complementary and synergic with UN-REDD action
- Is putting the basis to implement an operational coordination mechanism to make available necessary satellite data to countries (including SAR data)
- Is aiming at comparing, through practical demonstrations, different methodologies, assess their suitability (and accuracy) to derive required information, rather than recommend or prescribe specific solutions to implement national MRV's

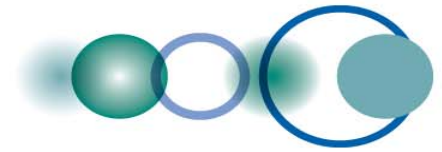




# Thank you

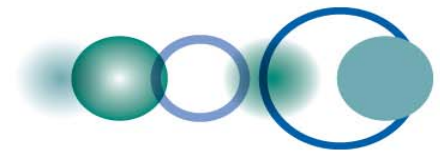
Giovanni Rum  
GEO Secretariat  
[grum@geosec.org](mailto:grum@geosec.org)  
[www.earthobservations.org](http://www.earthobservations.org)





# BACK-UP SLIDES



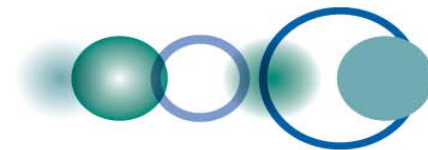


## CEOS Satellite observations 2009

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

## Scenes acquired over the 7 NDs during June-Sept 2009





	<p>Mexico 500.000</p>		<p>Borneo 743.000</p>
	<p>Out of 1.970.000</p>		<p>Tasmania 68.000</p>
	<p>Brazil 1.400.000</p>		<p>Cameroon 475.000</p>
	<p>Out of 8.500.000</p>		<p>Tanzania 945.000</p>
			<p>Guyana 215.000</p>



# 2009-10

## Verification sites



ND	VS	Name	lat	long
Brazil	BRA-1	INPE_IFT	S3.74	W48.34
	BRA-2	INPE_Tapajos	S3.20	W55.50
	BRA-3	INPE_Marcelandia	S11.30	W54.75
	BRA-4	INPE_Braganca	S0.85	W46.65
	BRA-5	WHRC_Xingu-1	S11.91	W52.58
	BRA-6	WHRC_Xingu-2	S13.06	W52.38
Guyana	GUY-1	WUR_FRASAR-1	N5.00	W59.00
	GUY-2	WUR_FRASAR-2	N3.00	W59.00
Mexico	MEX-1	Chiapas-1	N17.00	W93.55
	MEX-2	Chiapas-2	N16.33	W90.65
	MEX-3	Campeche	N18.52	W92.25
	MEX-4	Oaxaca	N17.58	W96.46
	MEX-5	Hidalgo	N20.62	W98.62
	MEX-6	Nuevo León	N25.43	W98.52
	MEX-7	Michoacán	N19.57	W101.18
Cameroon	CAM-1	ESA-1	N4.03	E10.23
	CAM-2	ESA-2	N3.22	E13.68
	CAM-3	ESA-3	N3.87	E14.78
	CAM-4	ESA-4	N5.00	E13.51
Tanzania	TNZ-1	FAO_FRA-1	S4.00	E32.00
	TNZ-2	FAO_FRA-2	S10.00	E36.00
	TNZ-3	FAO_FRA-3	S10.00	E38.00
	TNZ-4	Nilo Forest Reserve	S4.92	E38.66
Borneo	BOR-1	WUR_E-Kalim/Sbh	N4.33	E117.01
	BOR-2	WUR_SW-Kalimantan	S1.82	E111.61
	BOR-3	WUR_SE-Kalimantan	S2.24	E114.41
	BOR-4	WUR_C-Kalim/Srwk	N2.55	E115.08
Tasmania	AU-1	Mathinna	S41.37	E147.76
	AU-2	Takone	S41.19	E145.60
	AU-3	Warra	S43.11	E146.90

