Desert Theme Results

Synergetic Use of
Multi-temporal ALOS PALSAR and ENVISAT ASAR data
for Digital Elevation Model Generation, Land Cover and Land Cover Change Mapping & Environmental Monitoring

Francesco Holecz

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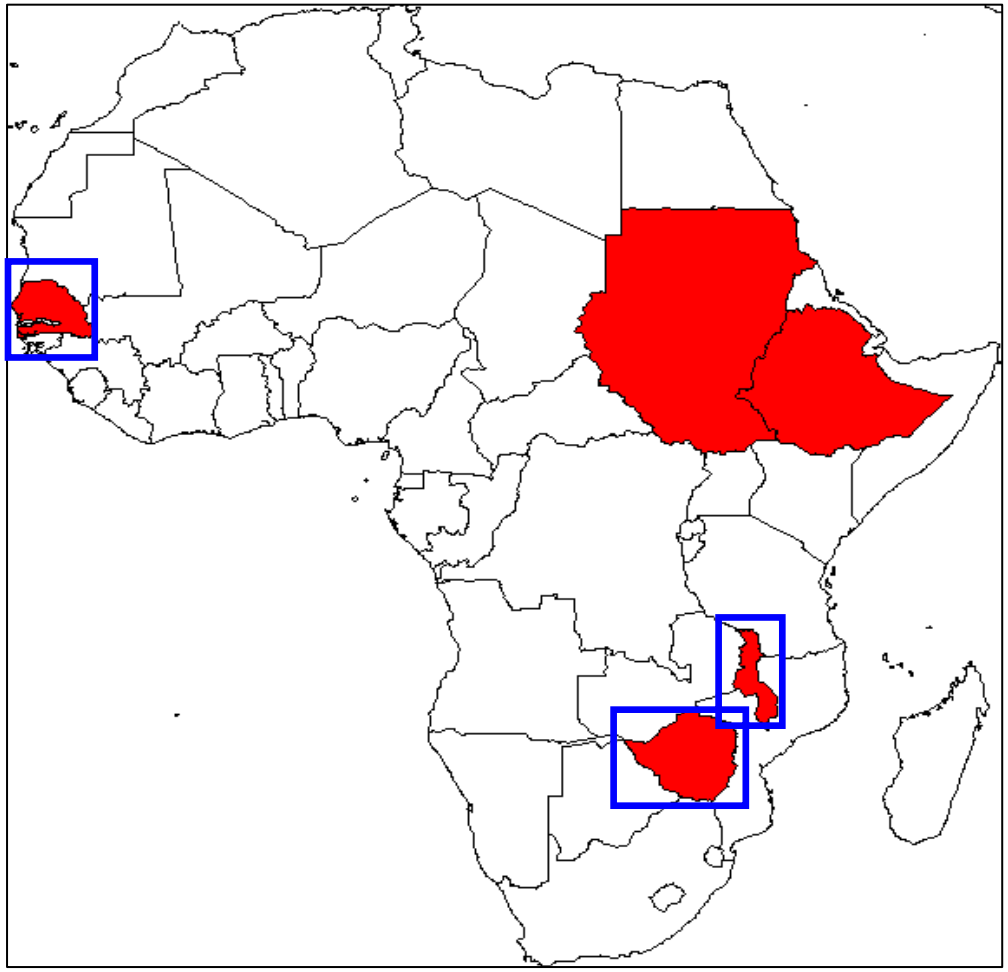
Objective and Products

To develop a methodology - based on EO data fusion - for land cover mapping and environmental monitoring purposes .

Following products are generated:

- **Land cover map (main classes), in particular crop and forest**
- **Land cover change map (main changes)**
- **Digital Elevation Model**

Sites



GMFS sites

K&C sites

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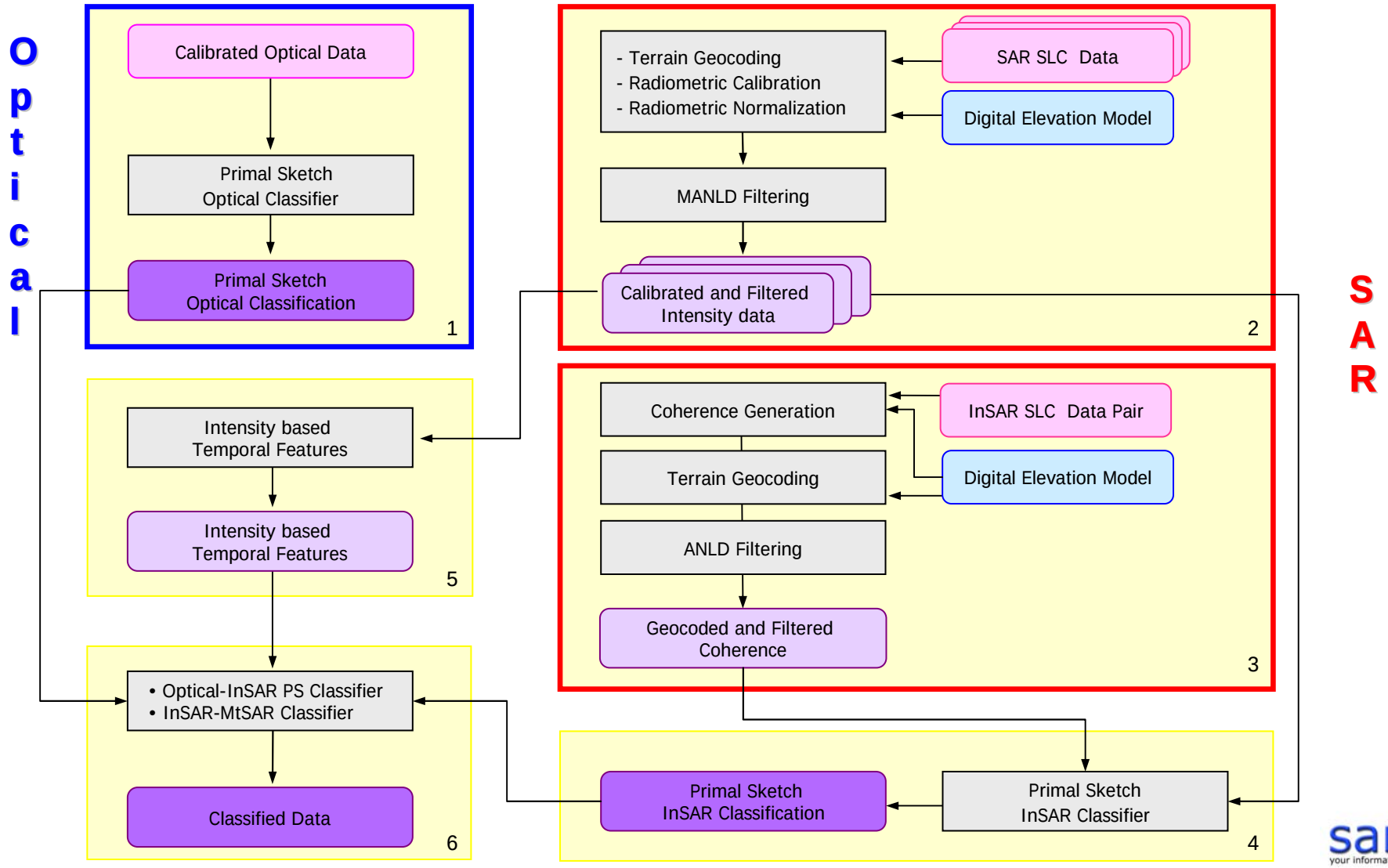
Workflow



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Malawi - Data Set

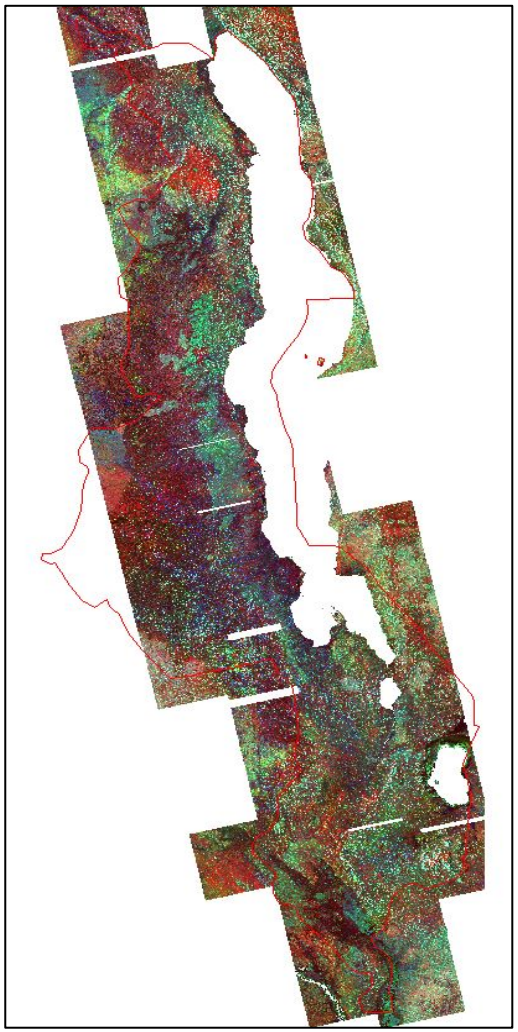
- **ALOS PALSAR FBS (10m)**
  - 20 November 2007
  - 05 January 2008
  - 20 February 2008
- **ENVISAT ASAR AP (15m)**
  - 23 July 2007
  - 27 August 2007
  - 01 October 2007
  - 05 November 2007
  - 18 November 2007
  - 10 December 2007
  - 14 January 2008
  - 18 February 2008
- **Cosmo-Skymed 1-2-3 (3m)**
  - Starting from March 2009

ALOS

K&C Initiative

An international science collaboration led by JAXA

Malawi - PALSAR Color Composite



This product includes around 70 **PALSAR interferometric image pairs** (15 meters) processed in a fully automated way.

Area: 100,000 sqkm

Coherence

Mean Intensity

Intensity Difference

January -February 2008

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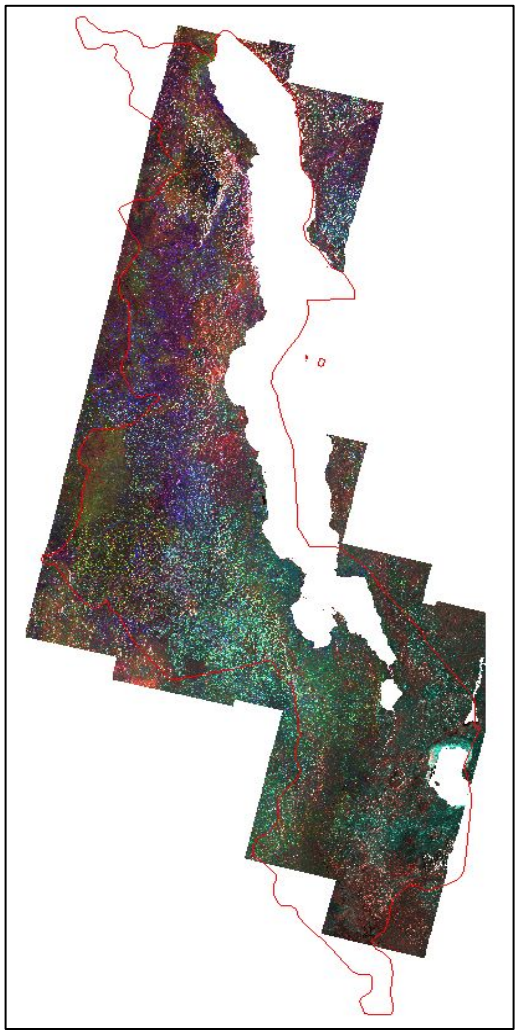
Malawi - ASAR IM Color Composite



This product includes around 150 **multi-temporal ASAR images** (15 meters) processed in a fully automated way.

Area: 100,000 sqkm

Intensity in October
Intensity in December
Intensity in January

October 2007 - January 2008

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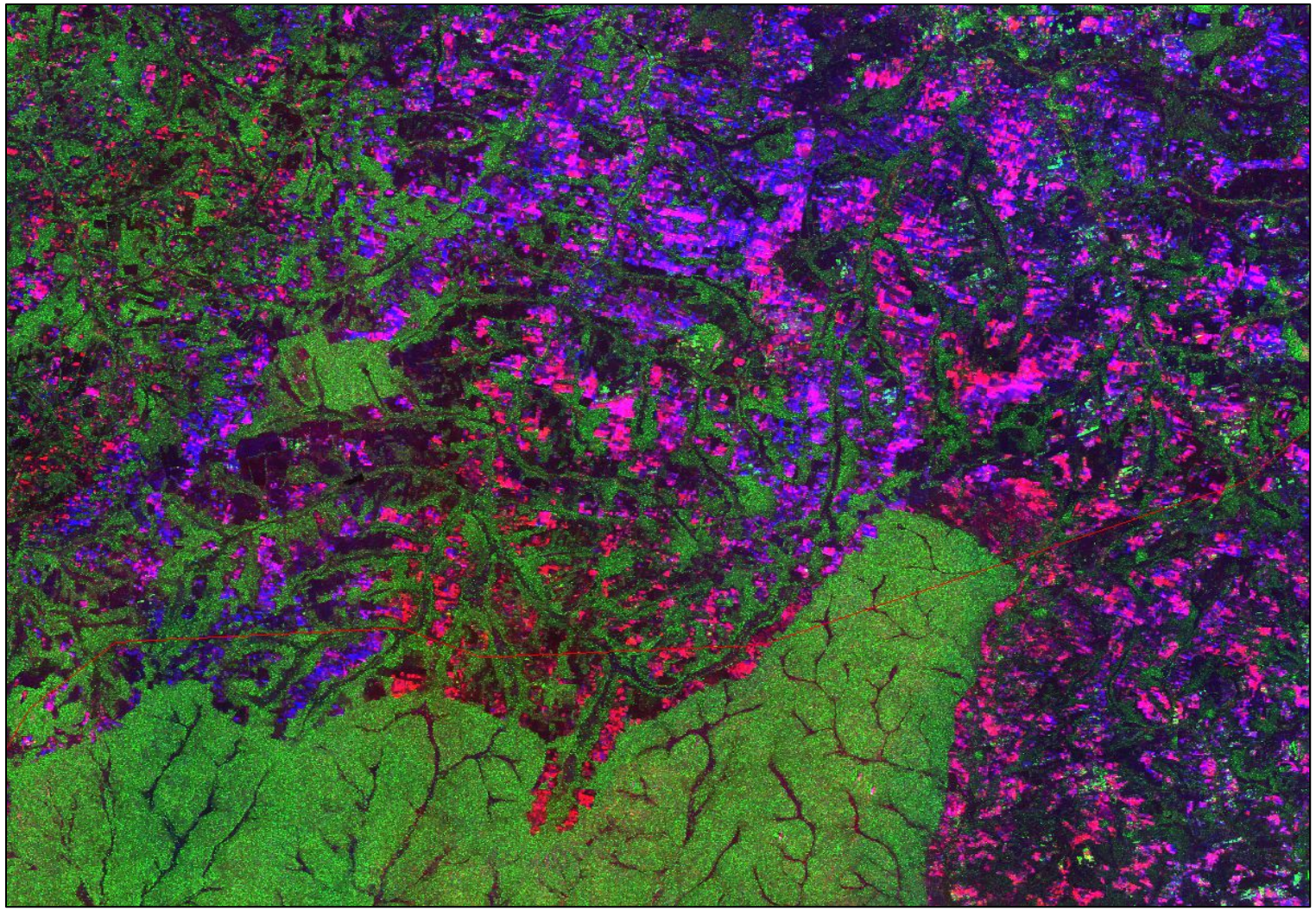
Malawi - ASAR-PALSAR Color Composite



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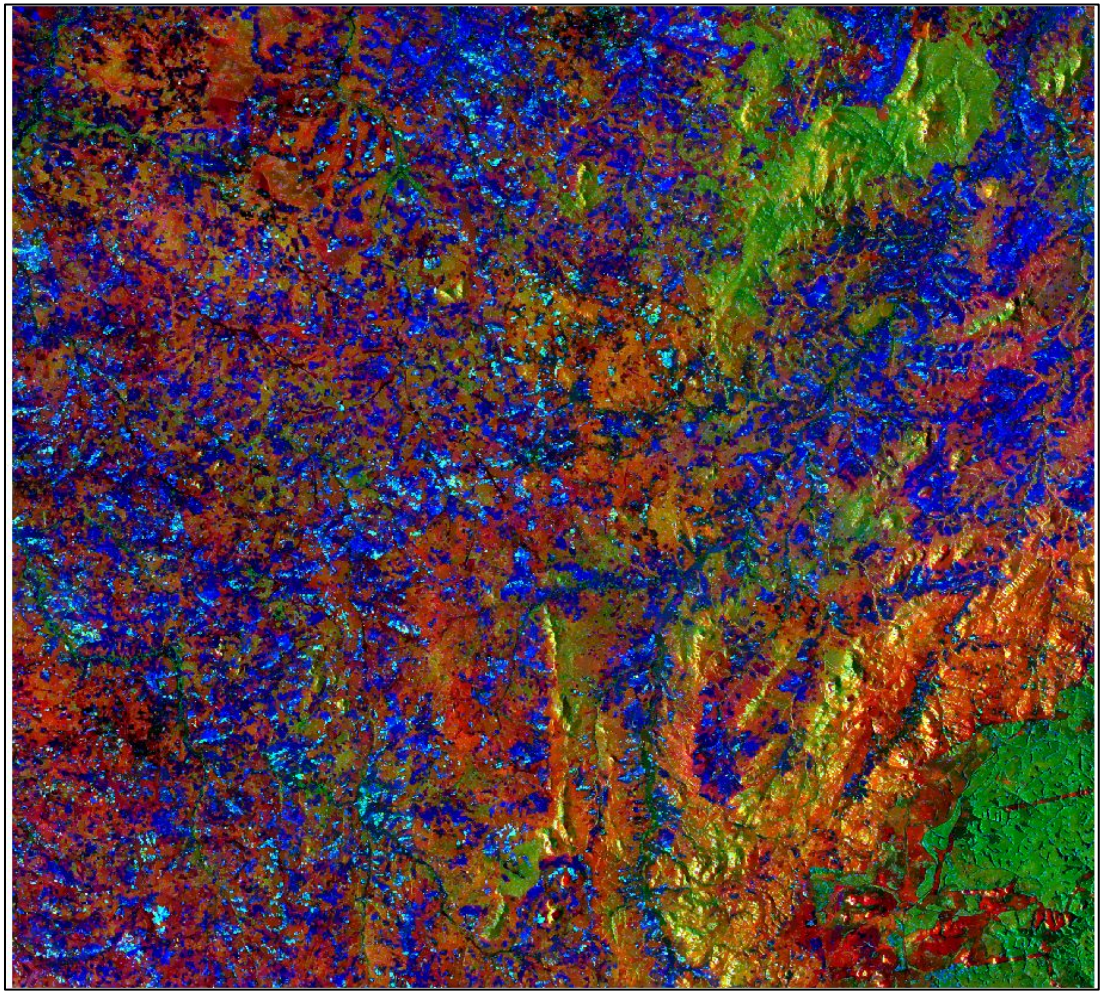
Malawi - PALSAR Color Composite, Detail



Coherence

Mean Intensity

Intensity Difference

ALOS PALSAR, Jan-Feb 2008

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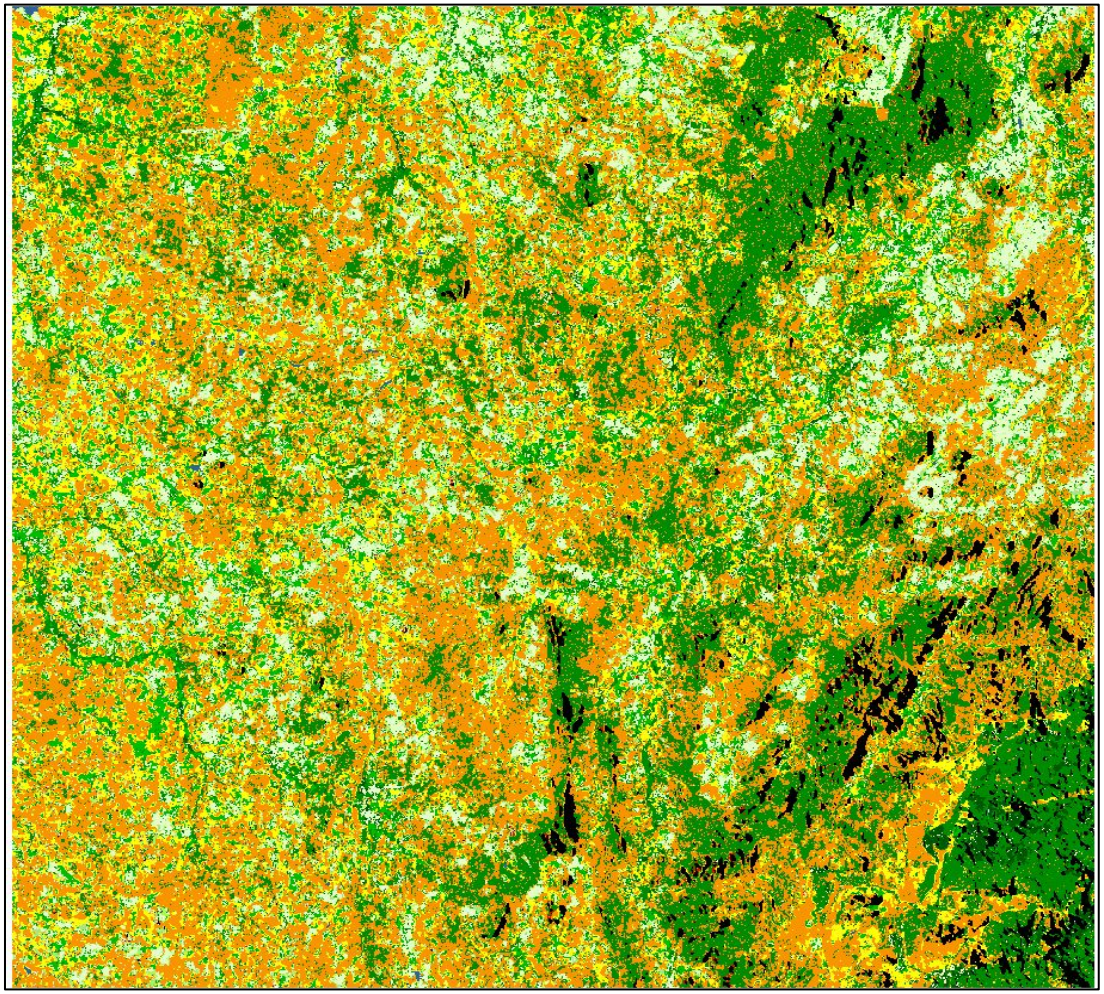
Malawi - Land Cover Map, Detail



Legend of main classes

- Thick forest
- Sparse forest
- Bare soil
- Short dry vegetation
- Short vegetation change
- River
- Settlements / Rocks
- Unclassified

ALOS PALSAR, Jan-Feb 2008

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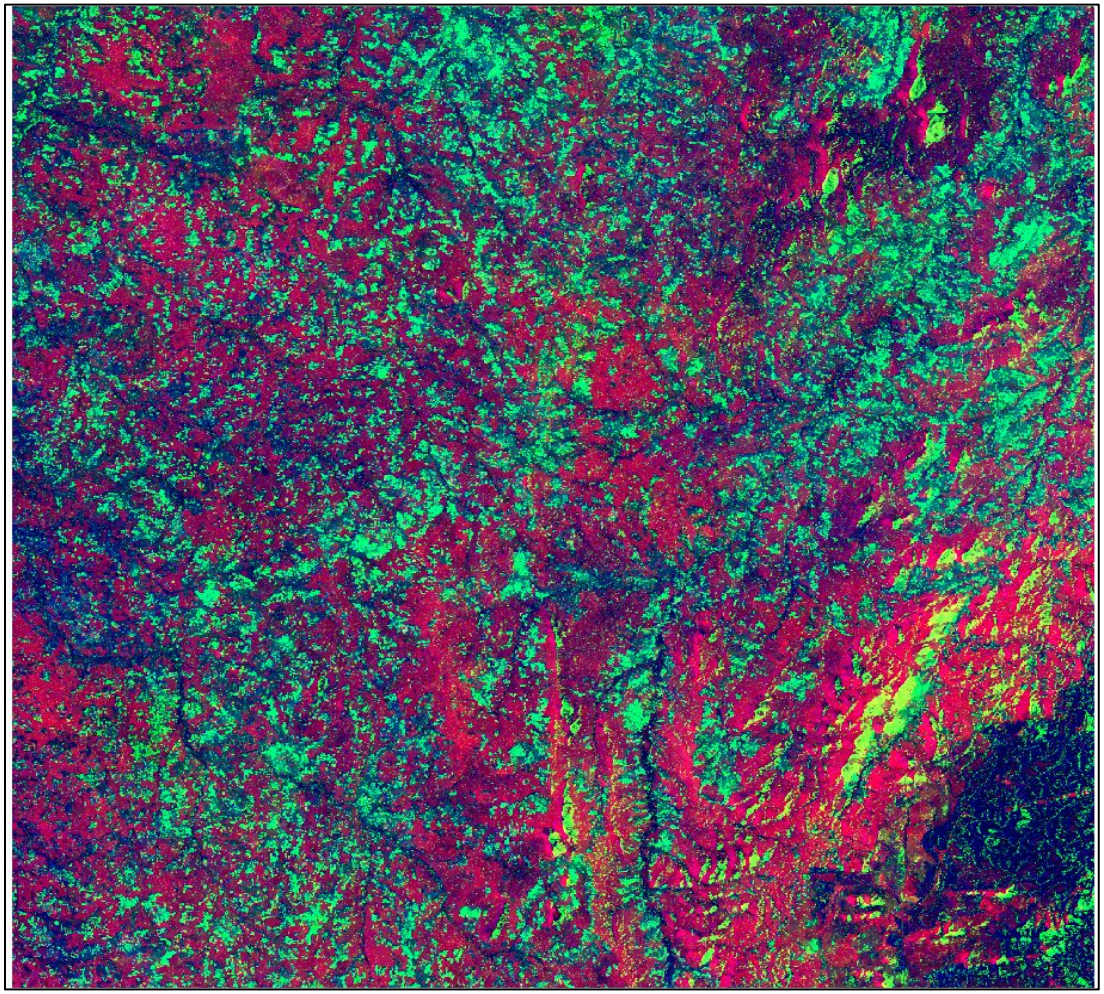
Malawi - PALSAR-ASAR Color Composite, Detail



Coherence PALSAR

Temporal feature ASAR

Intensity Difference PALSAR

ALOS PALSAR, Jan-Feb 2008

ASAR, July 2007 to February 2008

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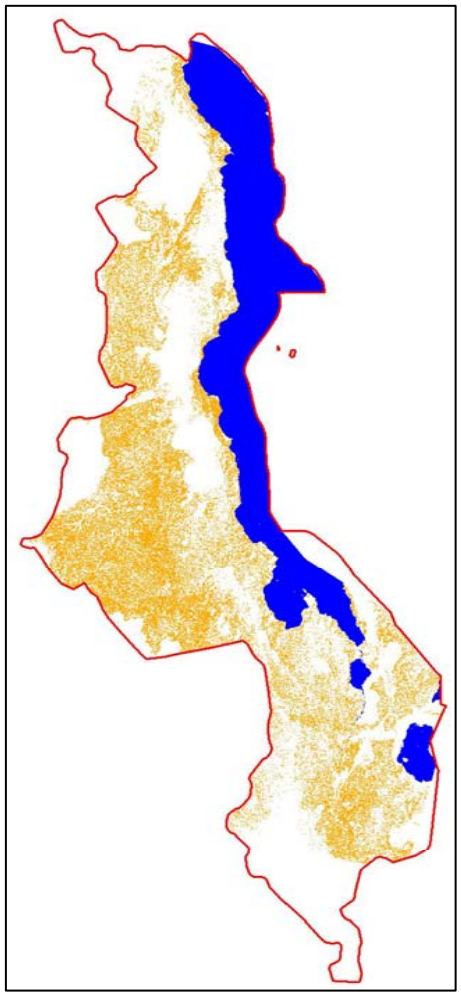
Malawi - Cultivated Area



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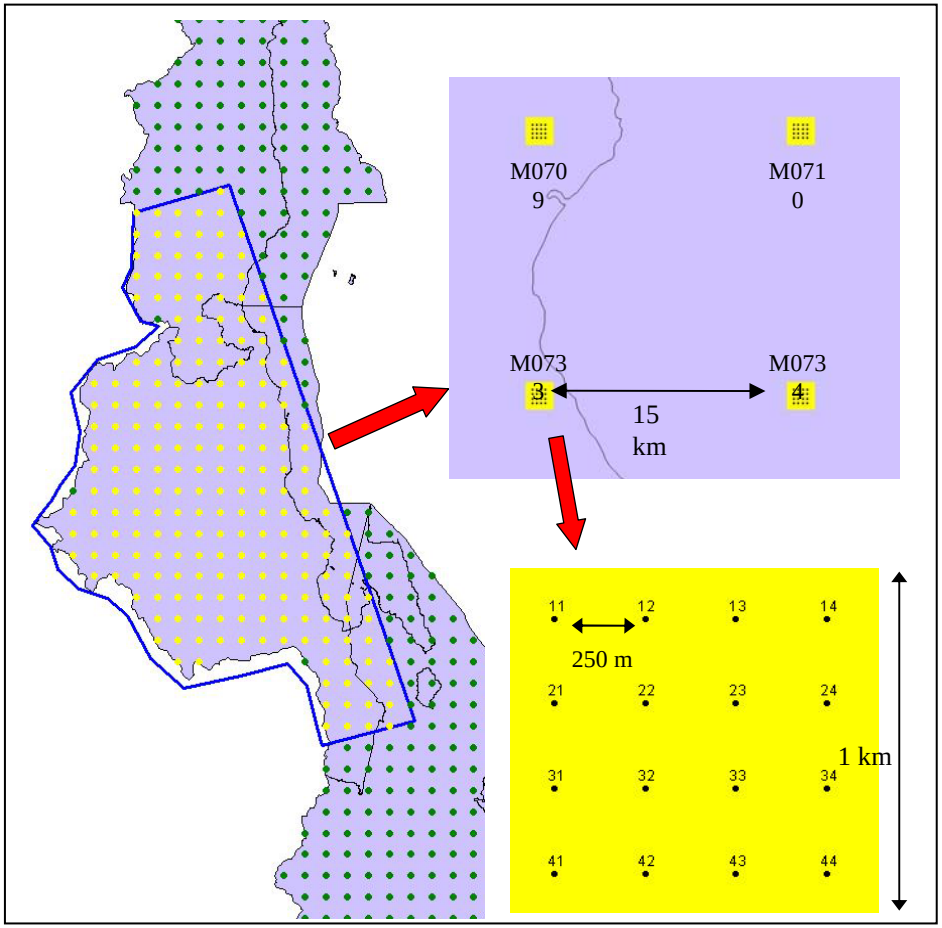
Fieldwork

Sampling units: Points

Systematic grid: Representative and well distributed samples for any kind of application

Clustering: Reduced travelling time and costs



Parameters

- Distance between clusters (15km)
- Number of points per cluster (16)
- Distance between points within a cluster (250m)

Criteria

- Budget
- AOI size and shape
- Pixel resolution of the products
- Logistics (survey at least a complete cluster in a day)
- Average field size

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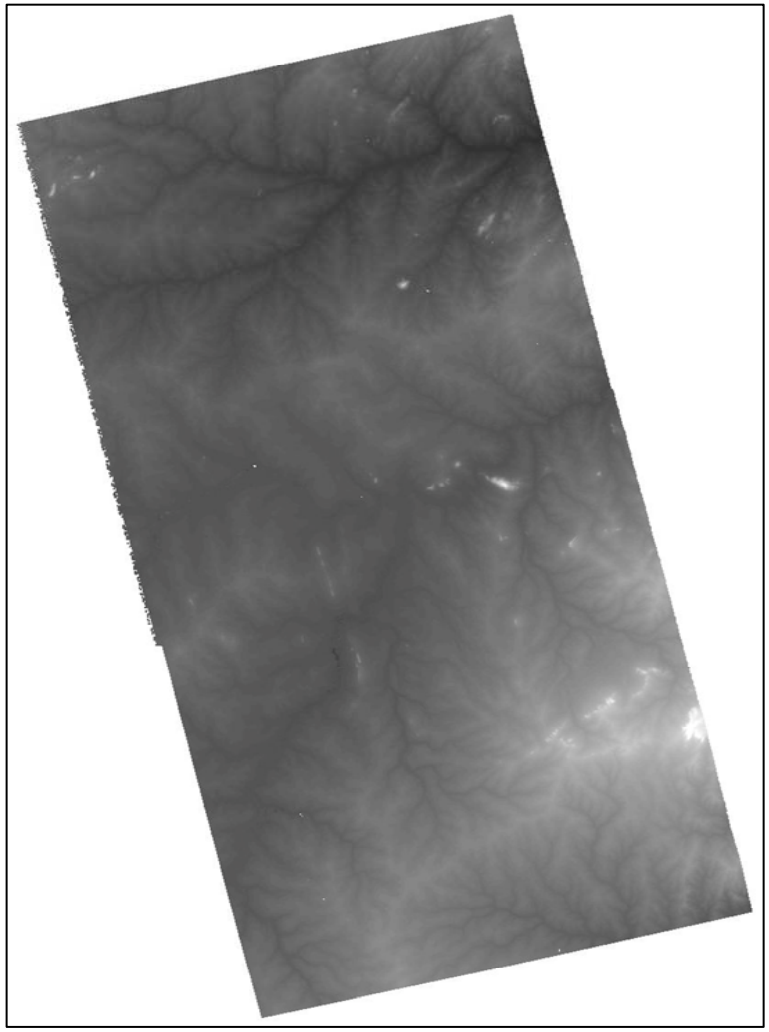
Malawi - PALSAR InSAR Digital Elevation Model, Detail



10 m grid spacing

UTM projection

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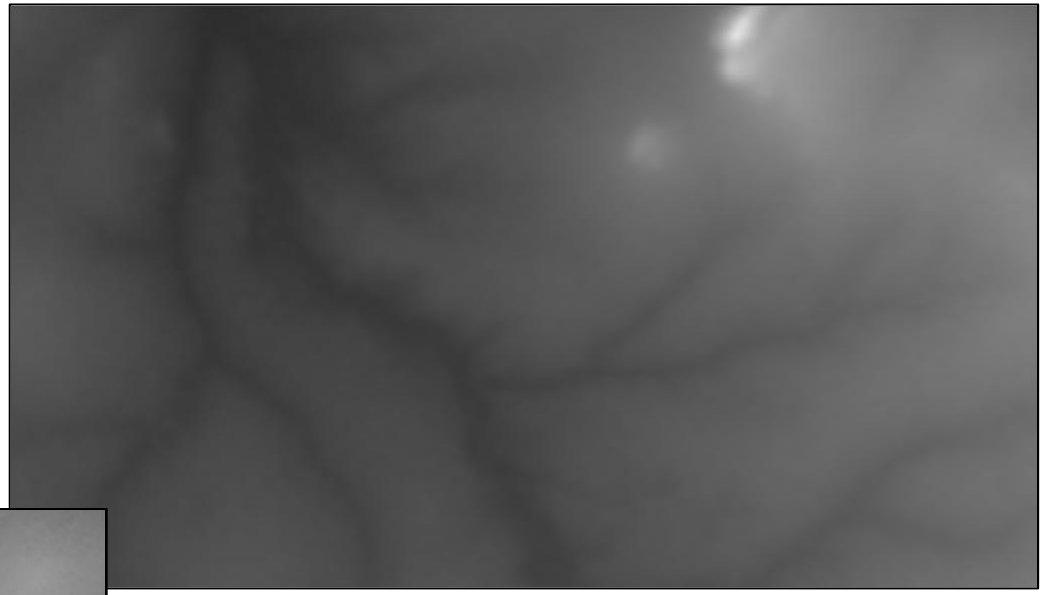
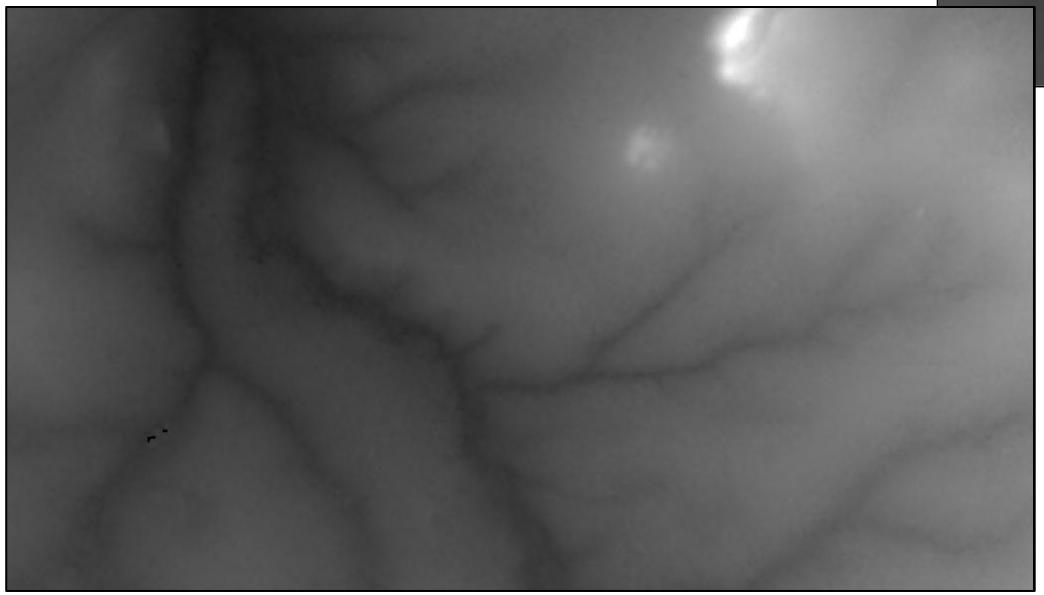
Malawi - SRTM vs. PALSAR InSAR Digital Elevation Model, Detail

SRTM DEM

90 m grid spacing





PALSAR DEM

10 m grid spacing

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Brazil Data Set

- **Landsat-5 Thematic Mapper (30m)**
  - **June 1986**

- **ALOS PALSAR Fine Beam Dual (15m)**
  - **June 2007**
  - **August 2007**

Brazil - Landsat-5 Thematic Mapper colour composite

Band 7
Band 5
Band 2

Landsat-5 TM, 1986

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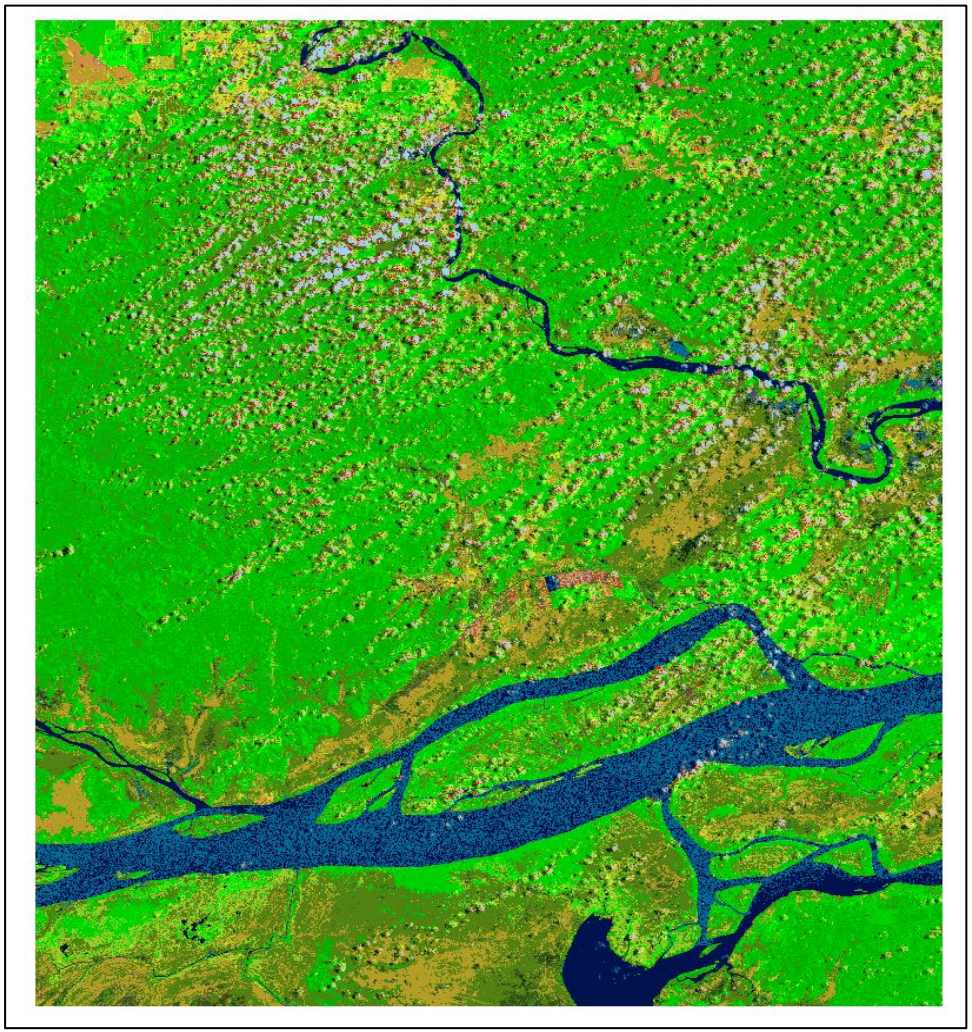
Brazil - Land Cover Map



Legend of Pseudocolors (Main Classes)

- Vegetation
- Herbaceous rangeland
- Bare soil
- Water
- Unclassified
- Clouds

The land cover map has been generated using the automated prior spectral knowledge-based classifier for optical data developed by Baraldi (IEEE TGRS, Sept. 2006).

Landsat-5 TM, 1986

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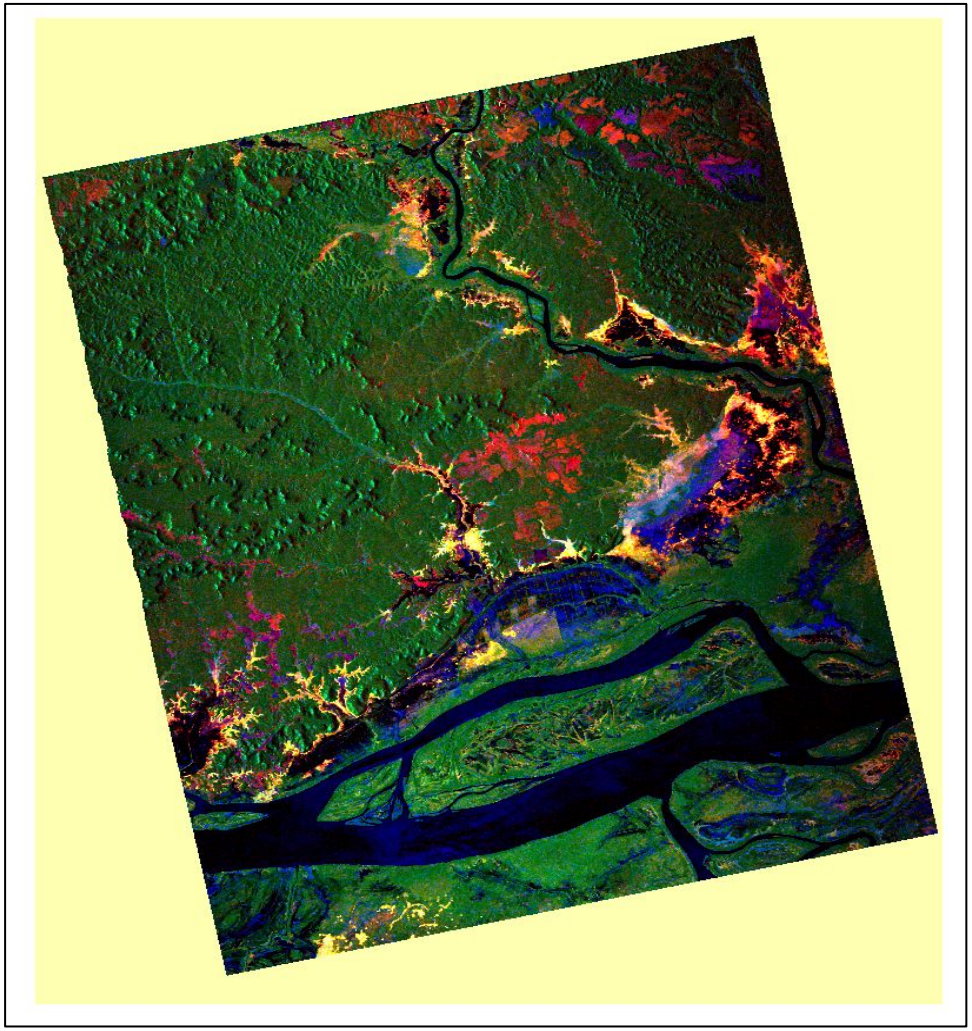
Brazil - Interferometric PALSAR colour composite



Coherence
Mean intensity
Intensity change

ALOS PALSAR FBD, June-August 2007

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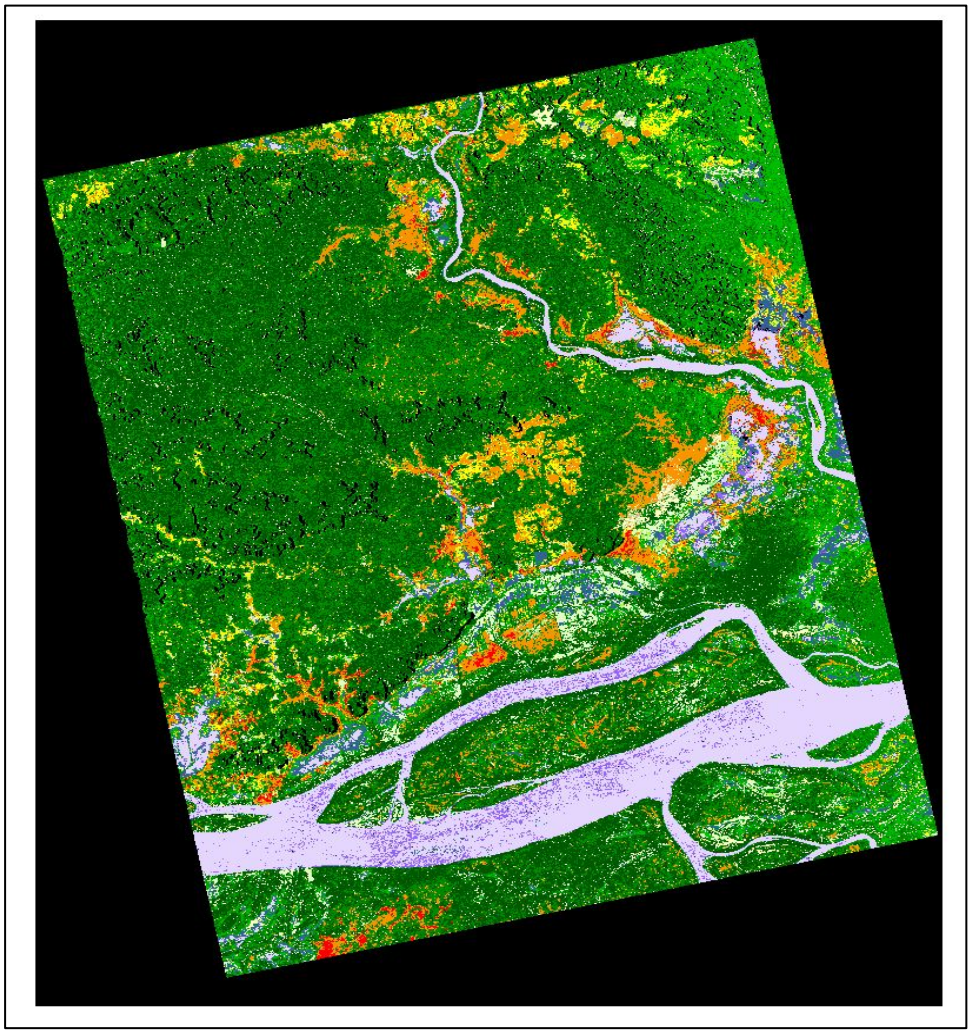
Brazil - Land Cover Map



Legend of Pseudocolors (Main classes)

- Tick forest
- Sparse forest
- Bare soil
- Short dry vegetation
- Short vegetation change
- River
- Settlements / Rocks
- Unclassified

The land cover map has been generated using the prior knowledge-based classifier for InSAR data.

ALOS PALSAR FBD, June-August 2007

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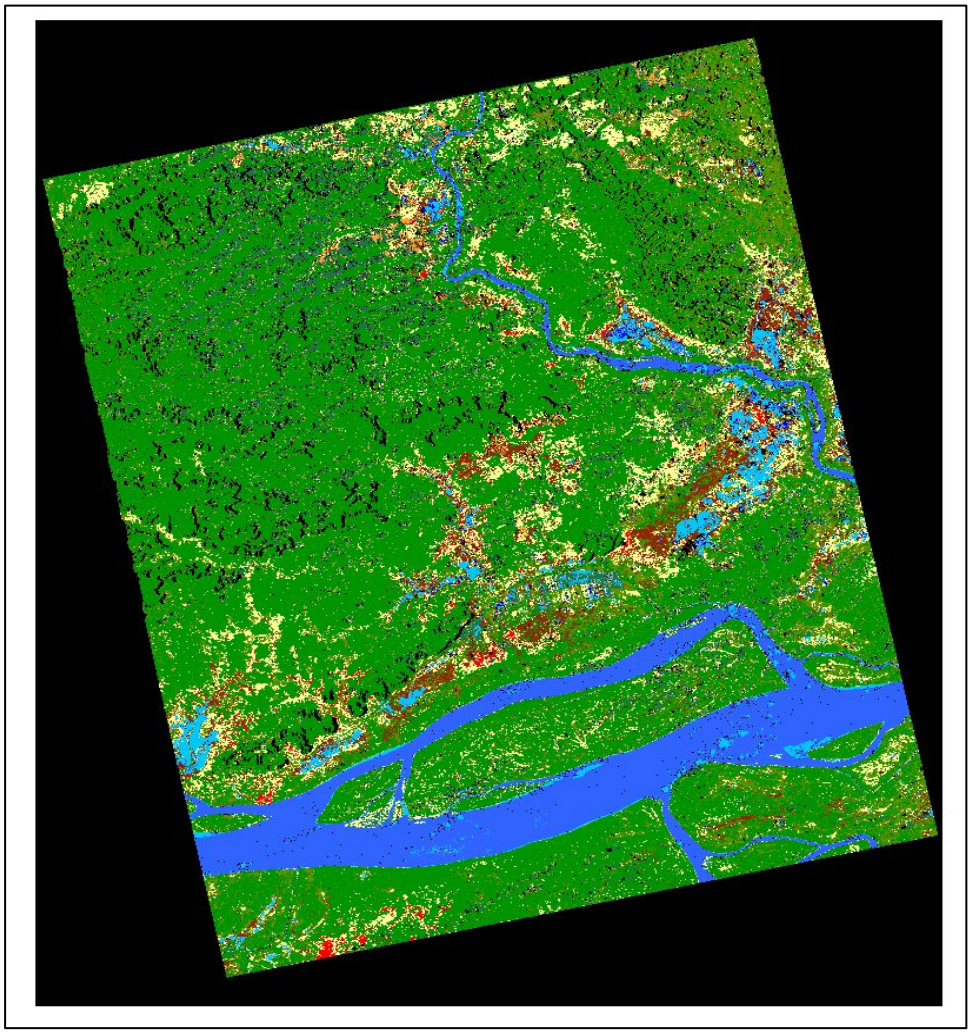
Brazil - Long term land cover changes 1986-2007



Legend of Pseudocolors

- Unclassified
- Not applicable
- Water
- Snow / Snowfall
- Swamp / Wetlands
- Forest
- Grassland
- Bare soil
- Urban/Rock

No Land Cover change

- Inundated / Irrigated areas
- Deforestation / Vegetation loss
- Afforestation / Vegetation increase
- Agricultural area
- Potential agricultural area
- New settlements / Soil degradation
- Water body / Wet area loss

Land Cover change through time

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Dulcis in fundus ...

on-going additional works based on ALOS

- PALSAR
- PRISM
- AVNIR

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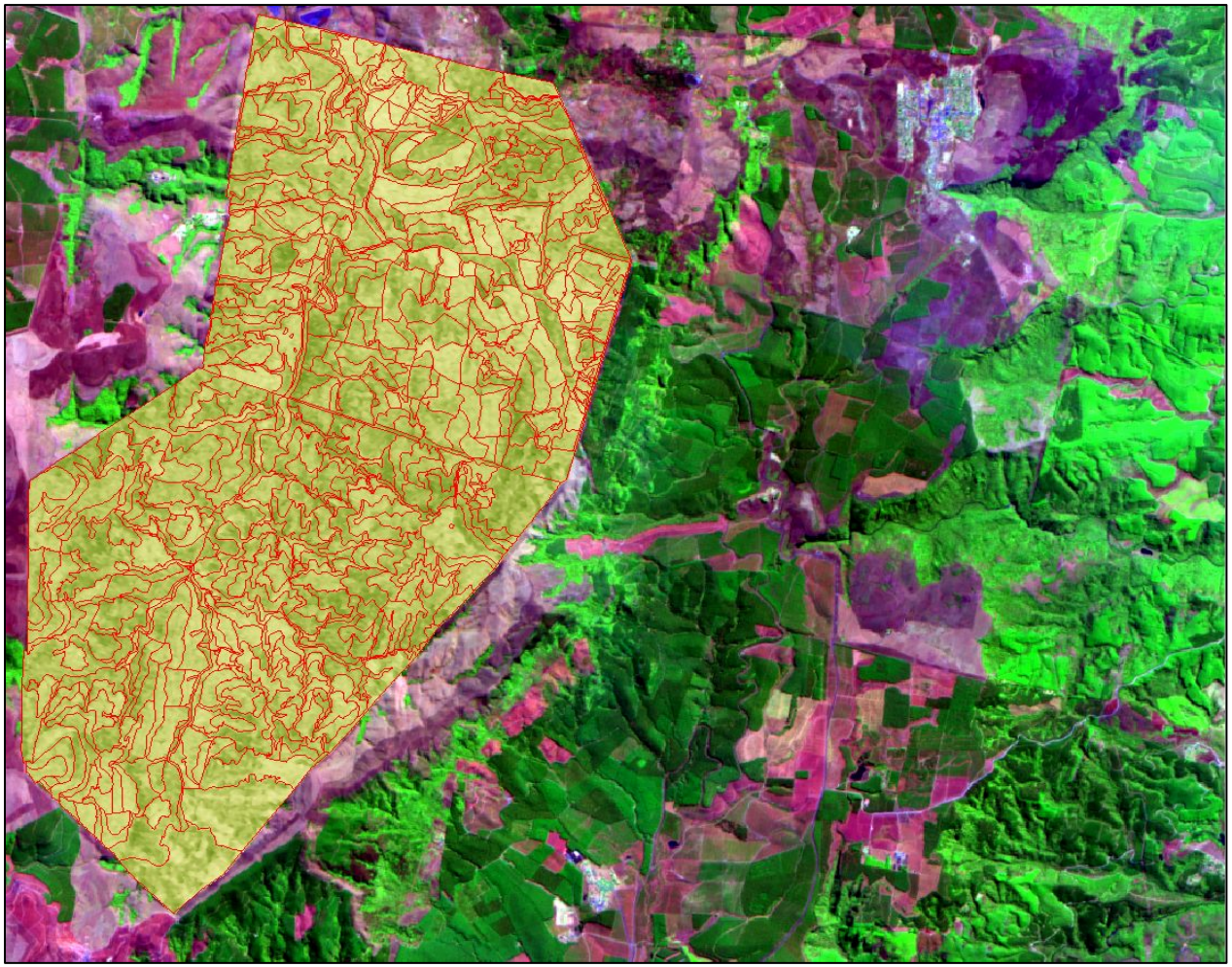
PALSAR - Estimated Tree Height in Forest Plantation

In collaboration with Forest Stewardship Council



0 48 m

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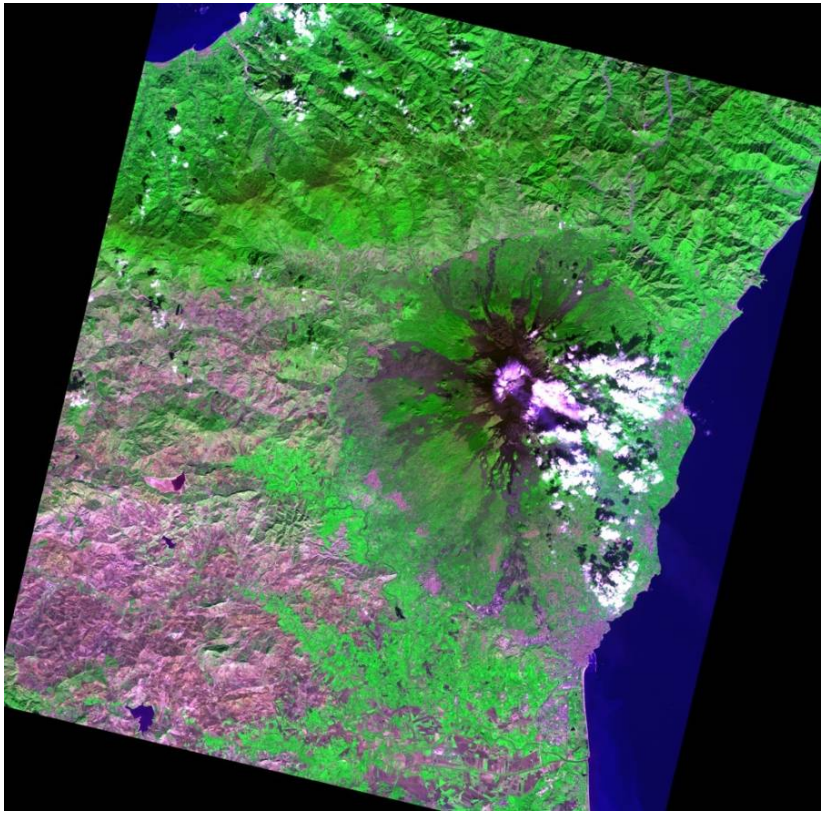
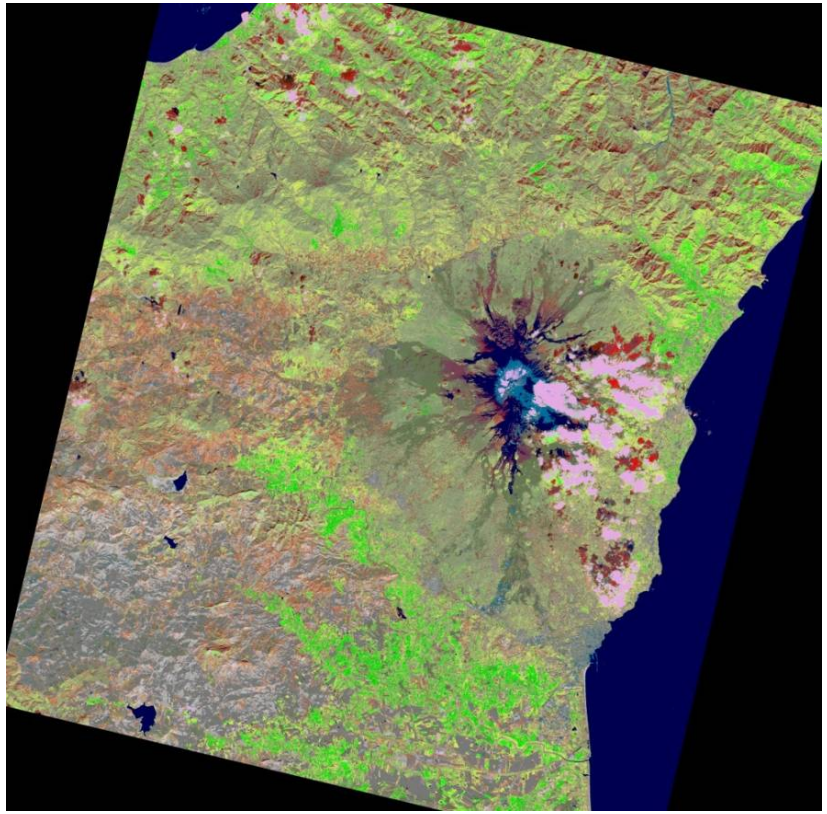
AVNIR - Prior Spectral Knowledge-based Classification

Baraldi, IEEE TGRS 2006



Band 3
Band 4
Band 1



Green tones: vegetation and rangeland
Brown and grey color shades: barren land and built-up areas
Blue tones: water types

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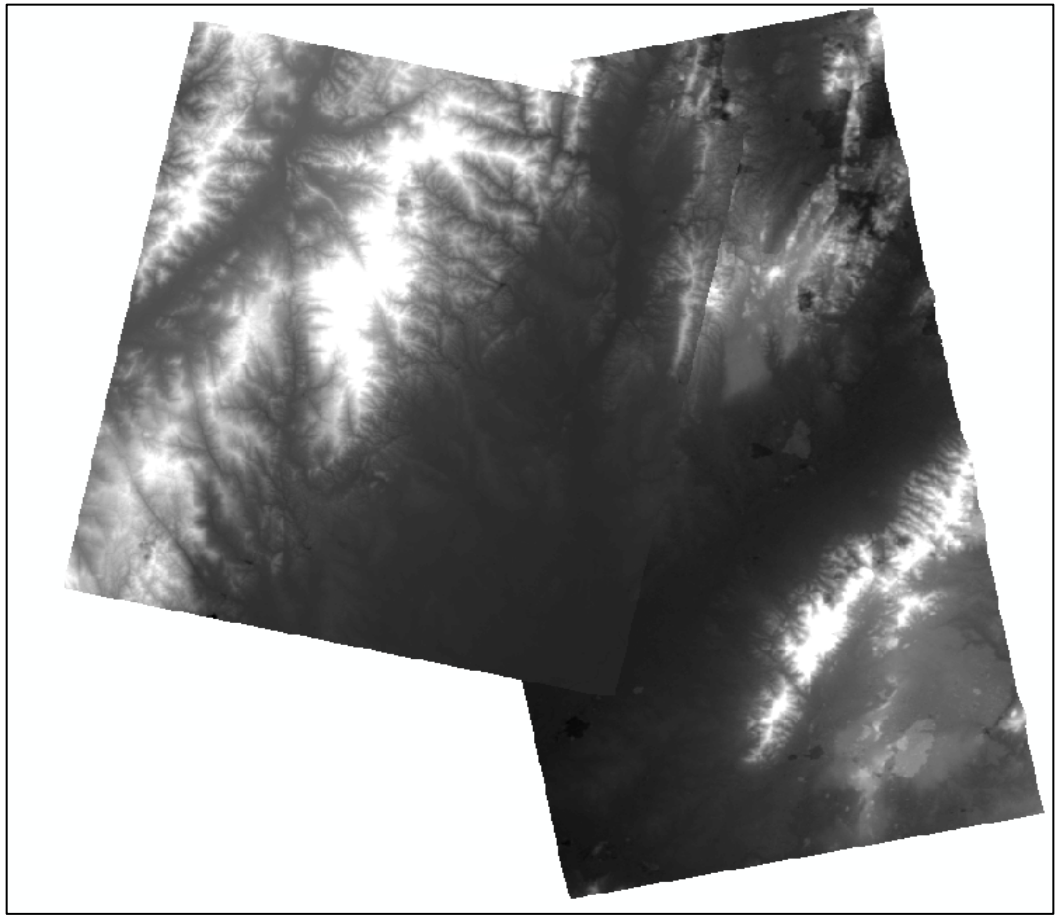
Generation and Fusion of DEMs based on PRISM with PALSAR data

In collaboration with ETHZ, Switzerland



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Thank you for your Attention