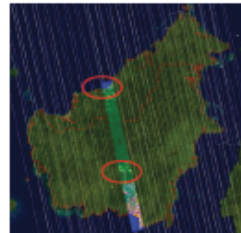# Borneo Land Cover Map, Consistent time series

Project objectives

Monitoring annual land cover change requires consistent year-to-year mapping. This implies that the effects of environmental factors on the backscatter level (such as El Niño drought) and variation due to observation dates/cycles have to be accounted for strip by strip.

The classification of (L-band) radar images is difficult in comparison to optical images. The radar return signal not only depends on the upper canopy or bare soil characteristics (like in optical systems) but is also sensitive to bio-physical characteristics such as biomass, flooding under a closed canopy, and soil moisture. The latter two can change dramatically in short periods. The sensitivity to a larger number of environmental parameters gives rise to more ambiguities in the interpretation of radar images.
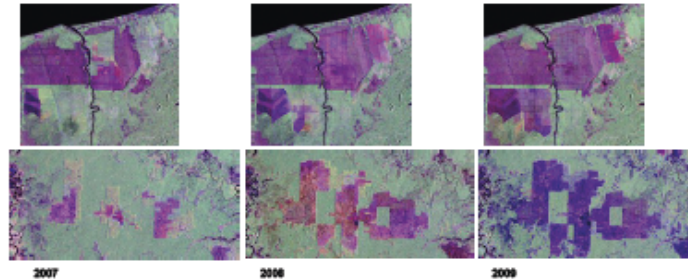
Methodology

The methodology is based on "Base radar signatures" and the (automated) assessment of "differential radar signatures" which underlined automatically adjust the radar signatures in space (i.e. each strip, divided in zones) and time (i.e. each strip, each year, divided in FBS and FBD observations).
Further improvement of time-consistency is achieved by subsequent application of Markov chains.
Though the library is stored at 50m (and can be created by K&C strip data) products can be generated using SLC data at 25 m or better, the main limitation being the quality of the DEM.

Challenge/Opportunity: Technique works at the level of wide-area time-series data.
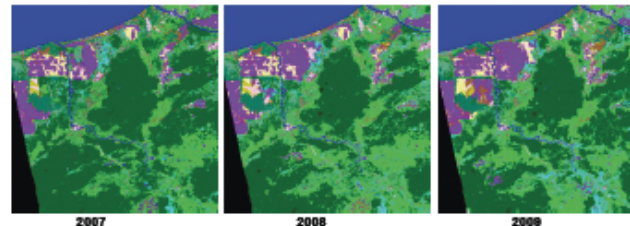

RSP 422

Oil palm plantation development areas in Sarawak (North) and in Central Kalimantan (South) within ALOS PALSAR K&C strip 422:

2007   2008   2009

Oil palm development area in Sarawak (top, 25 x 22 km) and in Central Kalimantan (bottom, 36 x 17 km). Colour scheme: FBS-HH, FBD-HH, FBD-HV. Though all data originate from the same strip (RSP 422) the plantations in Sarawak maintain fairly stable backscatter levels, while in Central Kalimantan they seem to vary from year to year. The latter is partly related to the 2009 El Niño drought.

ALOS PALSAR data used:
FBD and FBS strip data of 2007, 2008 and 2009; RSP 410 until RSP431

ALOS PALSAR 2007 LULC classification Borneo (shaded relief version) Ref: IEEE-JSTARS

Operational processing chain for systematic mapping of: Forest - non-forest and Land cover (LCCS) using ALOS PALSAR FBS and FBD strip data

Operational processing chain is under development for systematic mapping of consistent time-series: Forest - non-forest (Horizon-1) and Land cover (LCCS) (Horizon 2) using ALOS PALSAR FBS and FBD strip data (50 m) and SLC (≤ 25m) data

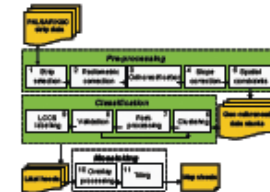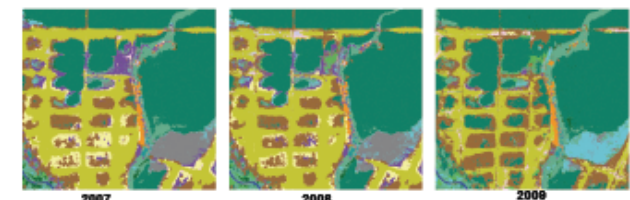2007   2008   2009

Results: Sarawak RSP 422

The fast development in this oil palm plantation area is clearly visible. New plantation areas (in purple) appear in areas which were grass (yellow) or forest (green) in previous years. This succession consistency is better as compared to the case where the maps of individual years are classified separately.

2007   2008   2009

Results: GEO FCT validation site BOR-3, RSP 421&422

This area is covered with regenerating peat swamp forest. Two cases of consistent succession stages can be observed. In the left the area of ferns (olive green) reduces; grass (yellow) is replaced by high shrubs (brown) and high shrubs by peat swamp forest (blue green). In the bottom left a (seasonally flooded) area of burnt peat swamp forest (grey) changes into riverine shrubs (cyan).

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