

Use of the JAXA mosaic products for forest monitoring at global scale

Project objectives

This study investigates the relevancy of PALSAR sensor onboard the ALOS satellite for regional land cover classification. Our study site is the tropical rainforest in Indonesia, specifically the entire Borneo and Sumatra islands. These islands covering an area of about 1.18 millions km², an adequate methodology should be investigated in order to tackle the radiometric imbalance across tracks but also the intrinsic variability of the imaged natural media. Starting from the orthorectified 50m mosaic products freely available on the Internet (HH and HV channels acquired in 2007, 2008 and 2009), an algorithm based on the Support Vector Machines is implemented and performed in a non-supervised way in the aim to produce a global land cover map across the Indonesian islands.

ALOS PALSAR data used

Dual-polarized (HH/HV) mosaic products freely available on the JAXA's website
Slope Correction: Off
Spacing: 50m
Resampling: Bi-linear
Projection: Geographic Lat/Lon
Multi-temporal information with 2007, 2008 and 2009

Other data sources

DEM SRTM-3

Methodology

In this research, we use the gamma-naught (HH/HV) given by the PALSAR FBD mosaic products in 2007, 2008 and 2009. These 6 layers are used as input of the classifier which is based on the Support Vector Machine approach. First, the classifiers are trained using a ground truth dataset acquired over the Borneo island. Then, the SVM rules are applied in an automatic way not only over the Borneo island but also across Sumatra. A clustering approach is used to aggregate the 50m pixels into homogeneous regions given their SVM-based posterior probabilities. The labeling is finally operated with the help of contextual information provided by the SRTM DEM.

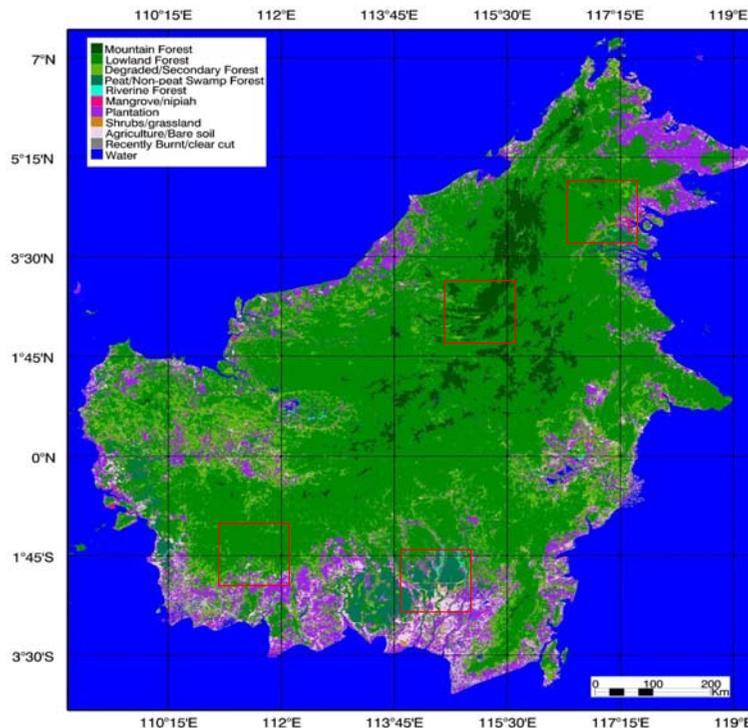
Processing time for the classification

Borneo + Sumatra + Malaysia
about 10 days with a Quad-Core Intel Xeon CPU 2.66GHz
8GB RAM

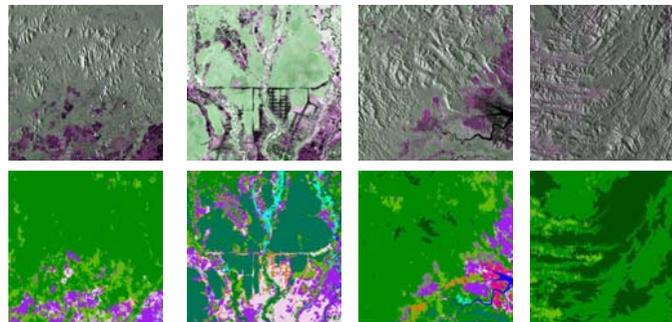
Science Team

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Status as of June 2010

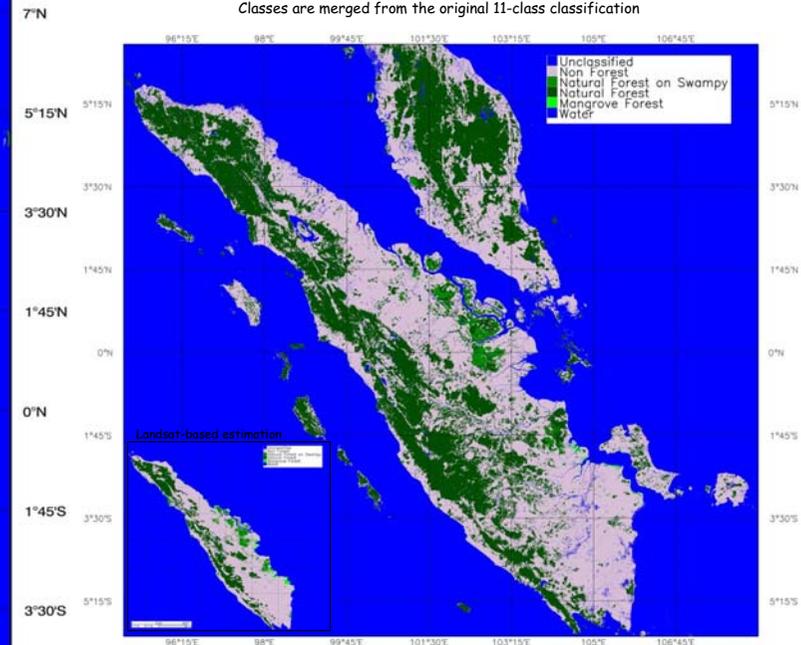
The authors are thankful to the RESTEC engineers for processing the PALSAR mosaic products, especially Hayato Okumura and Takahiro Otake.



Classification across the Borneo island with the 4 GEO-FCT verification sites (top) PALSAR HH/HV (bottom) classification zoom-in



Classification across the Sumatra island and Malaysia using PALSAR data. Classes are merged from the original 11-class classification



Results

The results are compared with the Landsat-based estimation over the entire Sumatra island. At this scale, the validation is a delicate issue since the Landsat-based classification may have a true accuracy of the order of 85-90%.

PALSAR \ Landsat	Non Forest	Natural Forest
Non Forest	95.822.096 79.59 %	6.986.944 13.73 %
Natural Forest	24.577.076 20.41 %	43.910.832 86.27 %

The agreement is equal to 81.57% for the forest/non forest map which is remarkable since this assessment is performed over more than 171 millions pixels at 50m resolution.

Perspective

The algorithm still needs to be further optimized. For example, this version clearly overestimates the natural forest areas over the Sumatra island. Results are very promising and confirm the relevance of PALSAR mosaic products for large-scale forest monitoring. Improvements for speed processing and classification accuracy (tuning SVM internal parameters, features detection at 10m resolution, optimized textural information) will be realized in the coming months ...