ALOS

K&C Initiative

An international science collaboration led by JAXA

A preliminary study on deforestation monitoring in Sumatra Island using PALSAR (II)

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1. Objectives

✓ to develop a **semi-automatic deforestation monitoring system** by using ALOS/PALSAR data based on **WWF (World Wide Fund for Nature) Riau GIS Land Cover Database.**

✓ to study the possibility of identification of forest & deforested areas by PALSAR

2. Data

2.1 ALOS PALSAR data

✓**FBD** data, paths 444-445, frames 7180-7190, observed **from 2007 to 2009.**

2.2 Ground truth

✓WWF Riau GIS Land Cover Database 2007 and 2009, which are compiled by Kokok Yulianto <kkkyulianto@yahoo.com> and Yumiko Uryu yumuryu@yahoo.com based on LANDSAT and field survey.

✓Aerial photos taken by WWW in September 2009.

Fig. 1 Color composite of the K&C mosaic around Riau, where studied area is shown with an orange frame.

WWF forest change map

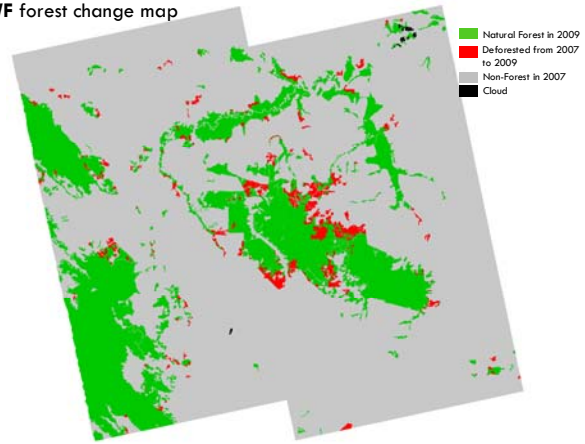

Fig. 2 Natural forest change map from 2007 to 2009 based on WWW Riau GLS Land Cover Database.

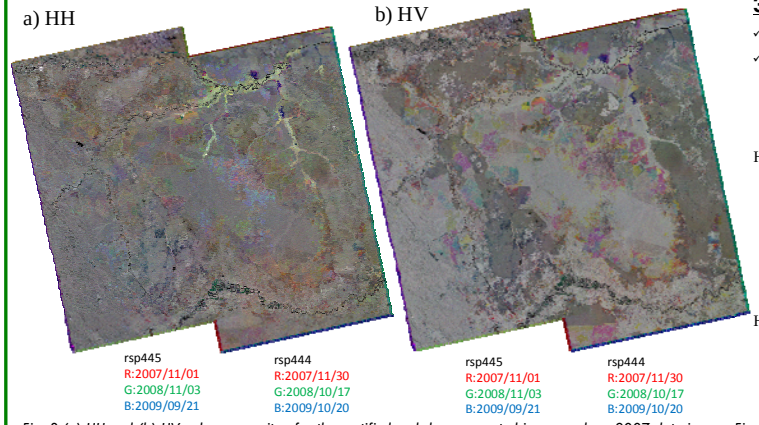

Fig. 3 (a) HH and (b) HV color composite of ortho-rectified and slope-corrected images, where 2007 data is assigned in red, 2008 one in Green, and 2009 one in Blue.

3. NRCS change for deforestation

✓ **HH:** no significant change (~0.25dB decrease)

✓ **HV:** ~1dB decrease

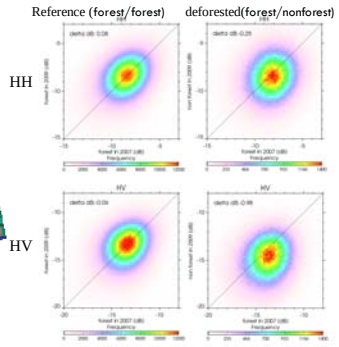

Fig. 4 Scatter plots of NRCS changes for (left) forest and (right) deforestation. X-axis shows those in 2007 and Y-axis in 2009.

4. Preprocessing

✓ 1) Time-series of co-located, **ortho-rectified, and slope-corrected** images by **Σ -SAR**

✓ 2) **Filtering** with an **anisotropic multi-temporal nonlinear diffusion process**

✓ 3) **Segmentation** with region growing process

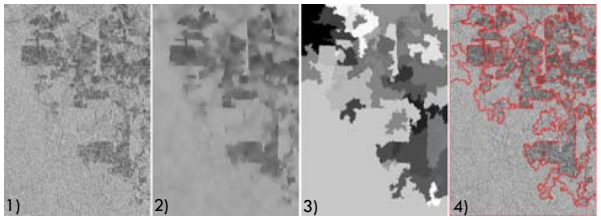

Fig. 5 Example of preprocessing process. 1) original orthorectified and slope-corrected ?) filtered one, 3) segmentation result, and 4) original image with segmentation.

5. Results

PALSAR forest change map

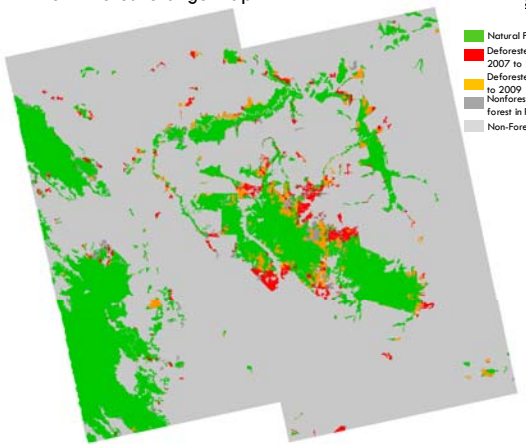

Fig. 6 Natural forest change map from 2007 to 2009 by PALSAR.

5.1 Detection

✓ A criterion

Deforested area: $\overline{\Delta\sigma_{oHV}} < -0.7dB$

5.2 Statistics

Table 1 Statistics of comparison between WWF map and PALSAR one (unit:pixel)

result		WWF		
		deforested	forest	
PALSAR	deforested	a) 305503	b) 435977	c) 742409
	forest	d) 181513	e) 4377324	f) 4558837
		g) 487016	h) 4813301	i) 5300317

a/g:	62.7%
a/c:	41.2%
(a+e)/i:	88.3%

5.3 Comparison with aerial photos

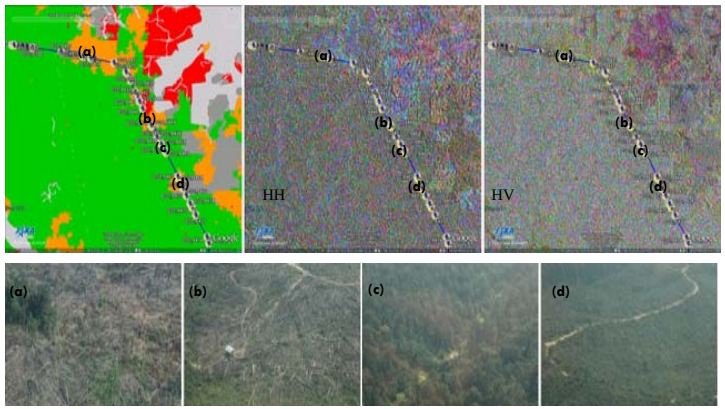

Table 2 Characteristics of NRCS change for deforestation.

		HH	HV
(a) & (b)	Recent deforestation Fallen trees remain	up	down
(d)	(older) deforestation	down	down
(c)	Forest	-	-

6. Next step

✓ Improving **segmentation** method.

✓ Determining an **optimal criterion.**

✓ Detection over **whole Sumatra Island.**