JJ-FAST: JAXA-JICA Near-Real Time Deforestation Warning

~ Contents of the data ~

Manabu Watanabe[1], Masato Hayashi[2]

[1]Tokyo Denki University, [2]JAXA

About deforestation detection algorithm

	Visual inspection	Core algorithm	Advanced algorithm
Who	Operators	Program	
Process	Semi-automatic	Automatic	
Data used	Two data (before and after the deforestation) HV polalization		**Time series analysis** **HH & HV polalization**
Note		• Use the image segmentation • Use the optimal thresholding	• **Combined with the core algorithm** • **Precipitation considered** • **Texture may be used.**

Tokyo Denki University

Two interesting topics

1. **Deforestation detection timing**
2. **Polarimetric characteristics for the early-stage deforestation area**

(Details will be presented in IGARSS2017.)

About data

Test site

Ucayali/Peru (a hot deforestation spot)

Data

PALSAR-2/ScanSAR (Descending)
PALSAR-2/Polarimetry (Ascending)

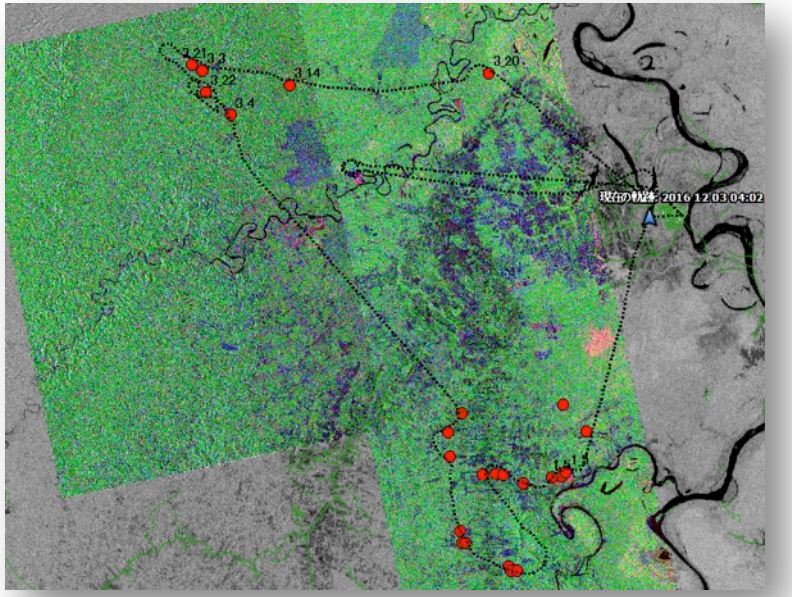
Observation date

ScanSAR : All data taken by 2016
(Cycle 39, 42, 45, 53, 56, 59, 62)
Polarimetry : Beginning of dry season
(May 5, 19, 2016)
End of dry season.
(Nov. 17, Dec. 1, 2016)

Field experiment

Ground : Nov. 30 to Dec. 2, 2016
Airplane : Dec. 3, 2016

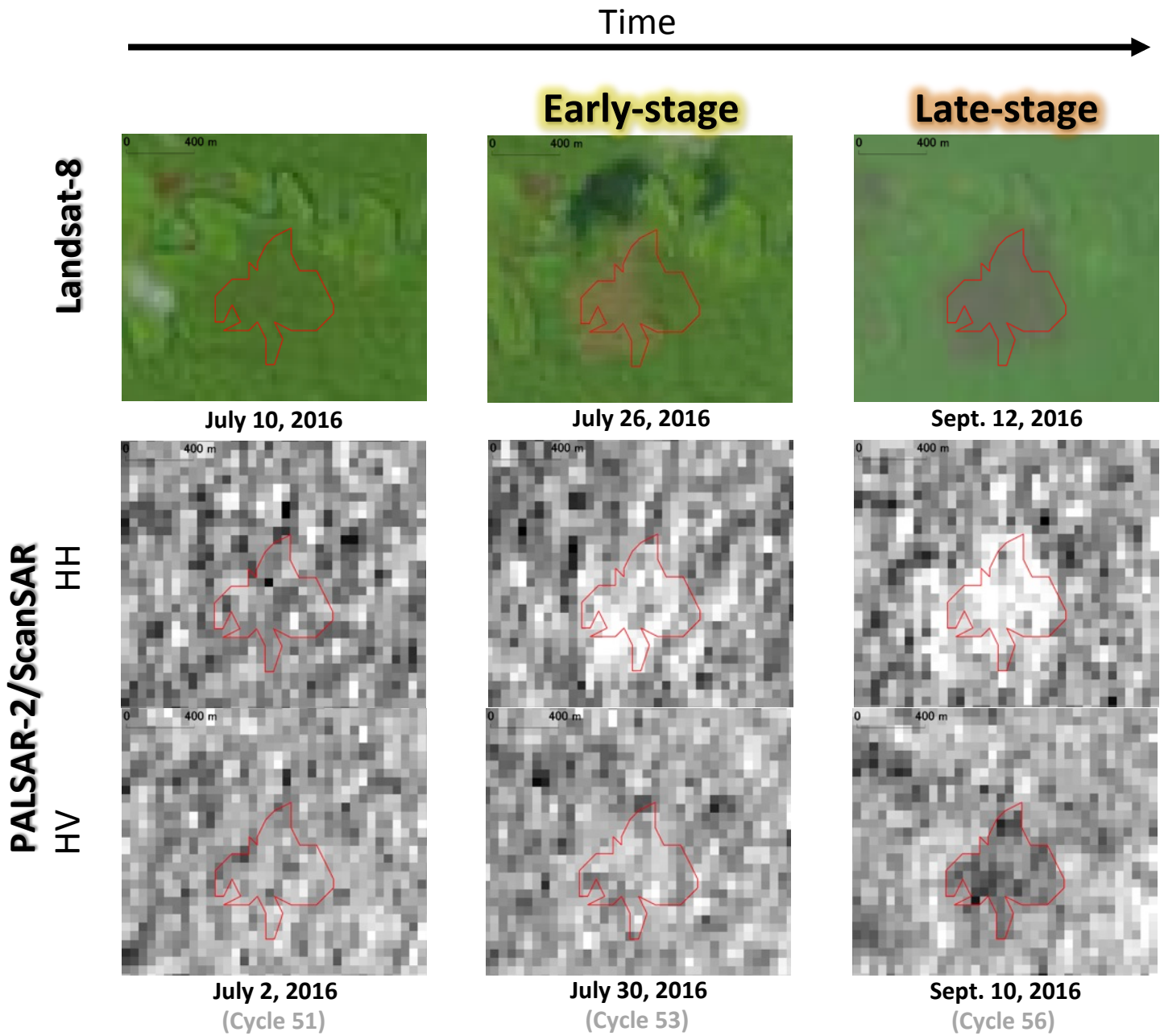
ScanSAR image



Four component decomposition image

(R: Double G: Volume B: Surface)

1. Deforestation detection timing



Aerial photos taken on Dec. 3, 2016

Early-stage

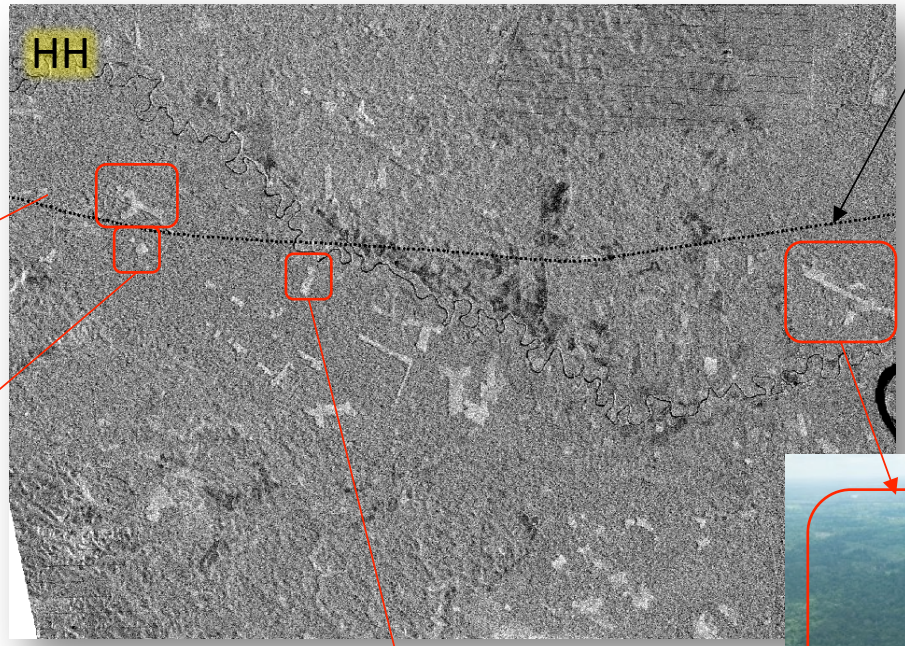
Fallen trees left on the ground

Late-stage

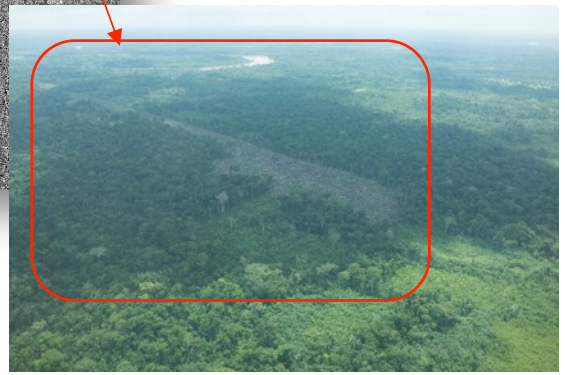
Fallen trees removed

Early-stage deforestation sites
~ Example ~

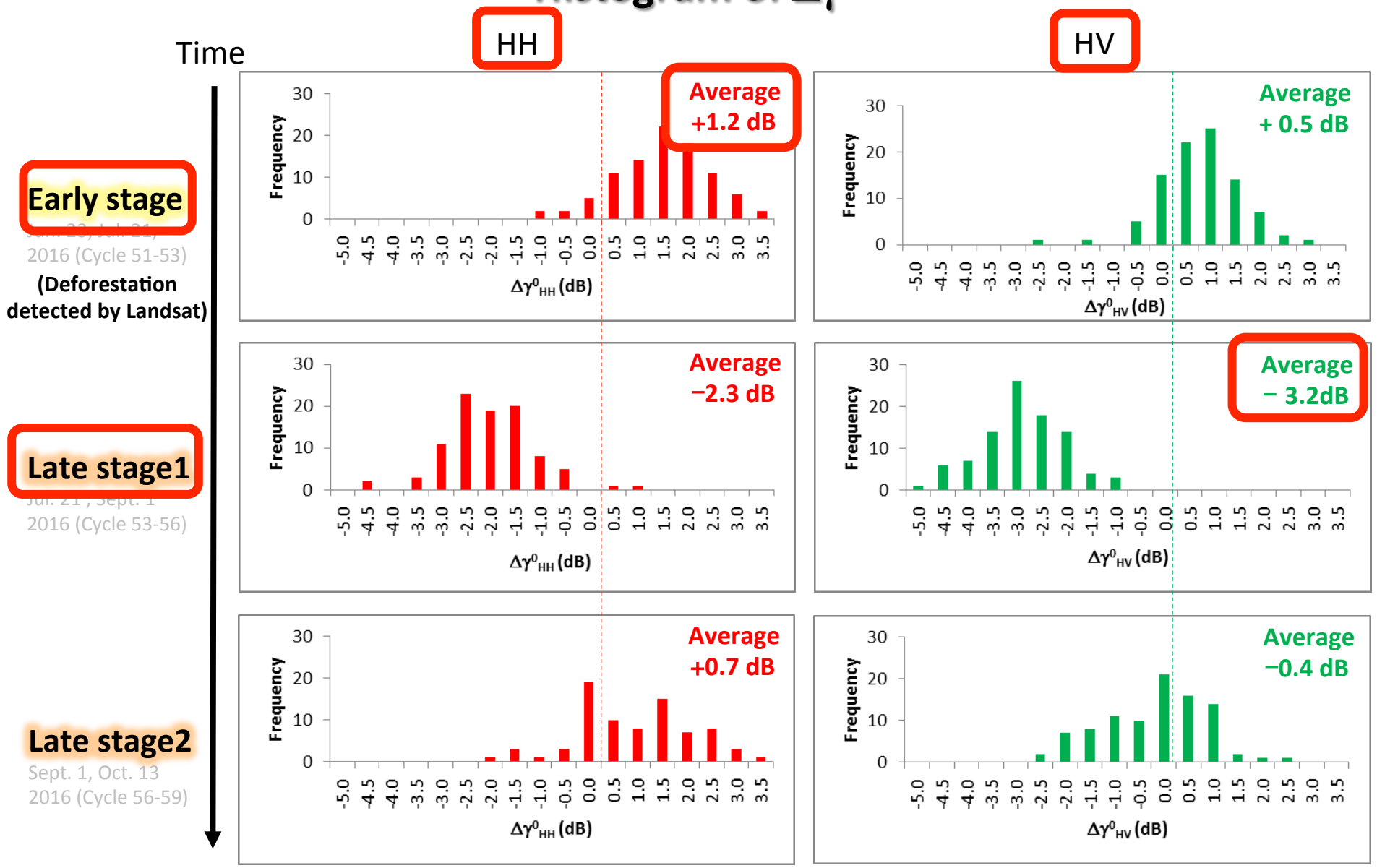
PALSAR-2/polarimetry (FP6-4, Off-nadir: 28°)
Obs. Date : Dec. 1, 2016



Flight course
Dec. 3, 2016



Histogram of $\Delta\gamma^0$



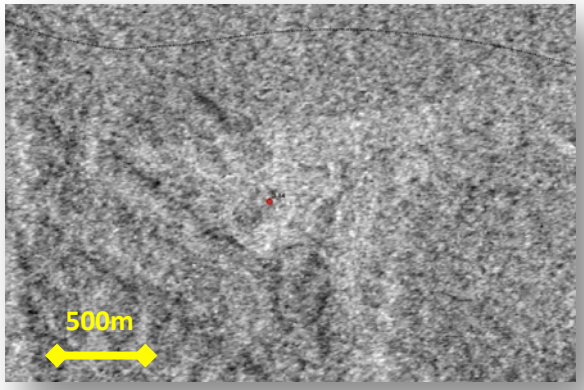
Early stage : $\Delta\gamma^0_{HH}$ increased by 1.2 dB.

Late stage : $\Delta\gamma^0_{HV}$ decreased by 3.2 dB.

2. Polarimetric characteristics for the early-stage deforestation area

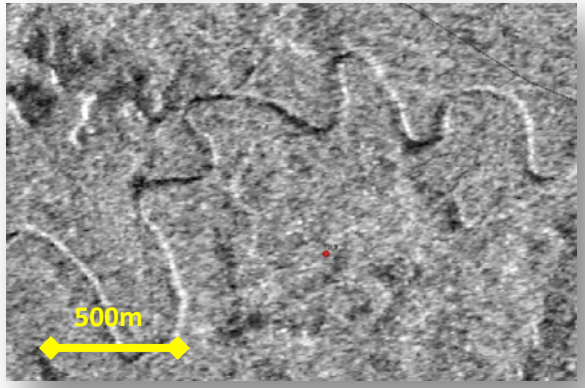
Early stage

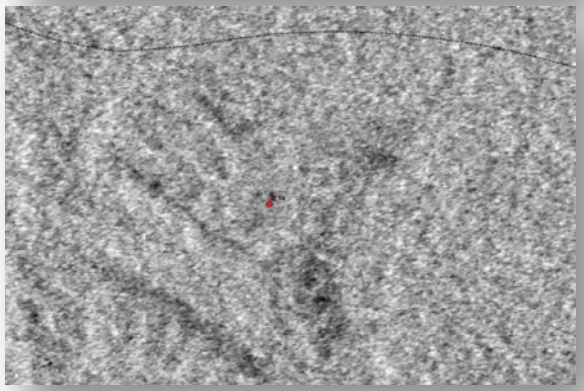
Late stage1



HH

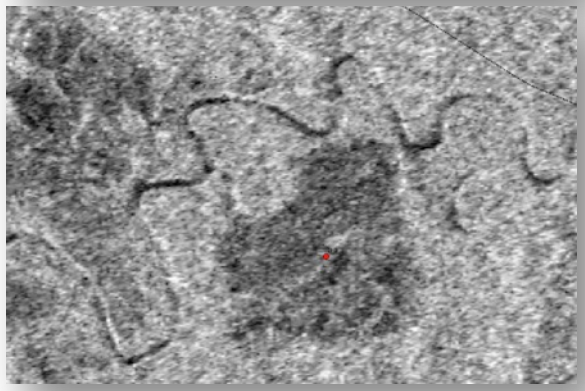
Bright

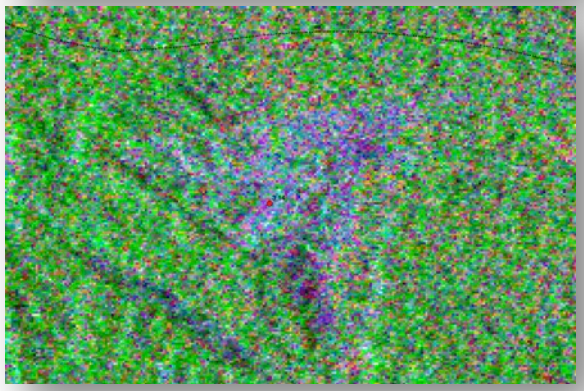




HV

Dark

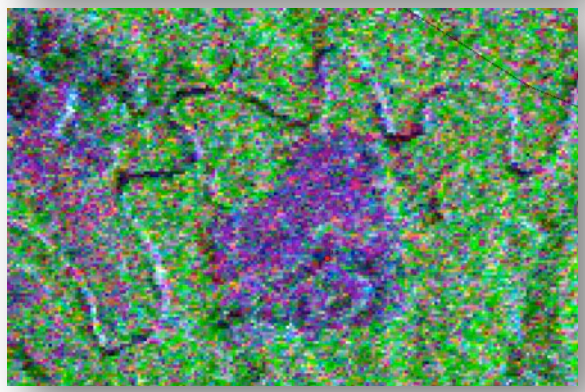




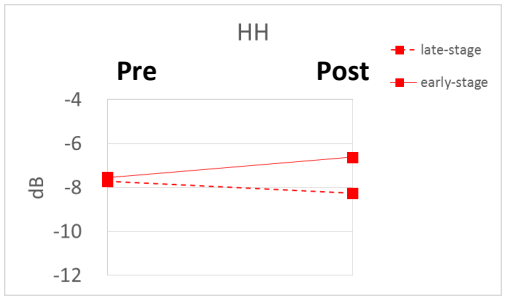
Four component

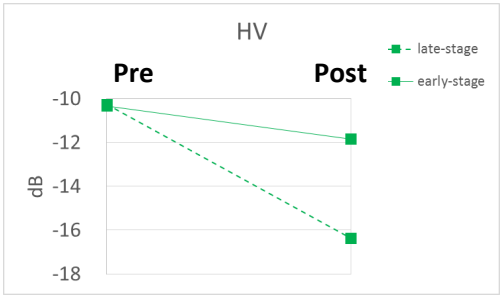
Surface & Volume

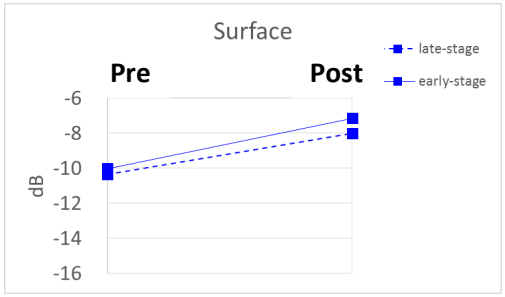
Surface

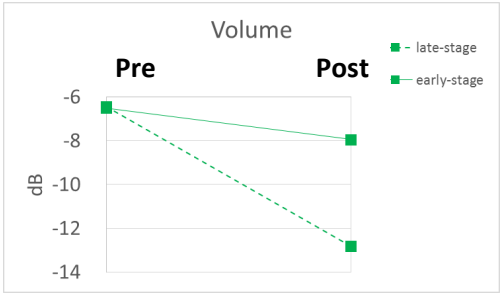


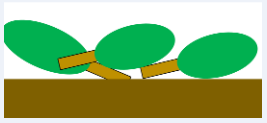
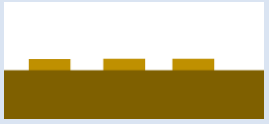
Pol. Parameters pre- & post- deforestation







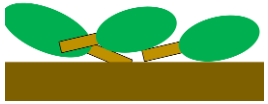


		Branches left on the ground		Fallen trees on the ground	
		σ^0_{HH}	$\sigma^0_{surface}$	σ^0_{HV}	σ^0_{volume}
Early-stage		**0.9 dB↑**	**2.9 dB ↑**	**1.5 dB↓**	**1.4 dB ↓**
Late-stage		0.6 dB ↓	**2.3 dB ↑**	**6.1 dB↓**	**6.4 dB↓**

Summary

- Compare radar scattering from deforestation site.

  Early stage : Fallen trees left on the ground.



  Late stage : Fallen trees removed from the ground.

  Test site: Ucayali/Peru (a hot deforestation spot)

  Data : PALSAR-2/ScanSAR & Polarimetry

- **Optical sensor & L-band HH : Detect early stage deforestation.**

  HV : Detects late stage deforestation.

- **Pol. Parameters pre- & post- deforestation**

  $\sigma^0_{surface}$ **&** σ^0_{HH} **increase** : Induced by **branches** left on the ground.

  σ^0_{volume} **&** σ^0_{HV} **decrease** : Induced by **fallen trees** on the ground.

Early stage deforestation site with C-band (Sentinel-1)