SAR画像と河川状況の比較

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Comparison of SAR Images with Situation of a River

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1. Introduction

Space-borne SAR (Synthetic Aperture Radar) sensors can provide images of ground surface under all weather conditions in day and night.

>> Very useful for disaster monitoring

JAXA established a Working Group for flood disasters monitoring by using SAR sensors. In 2008, the working group and some Local Government Unit (LGU) in Japan carried out joint demonstration experiments of flood disaster monitoring.

Shimanto River is monitored by agreement of Shimanto City, Kochi prefecture and JAXA.

The experiments are trying

to apply data mainly from the Japanese L-band Space-borne SAR, ALOS/**PALSAR**

>> method for detection of the flood

Present study deal with case study for monitoring the usual river conditions.

and to carry out **semi-real-time distributions of monitored information** to disaster-prevention groups in each LGU.

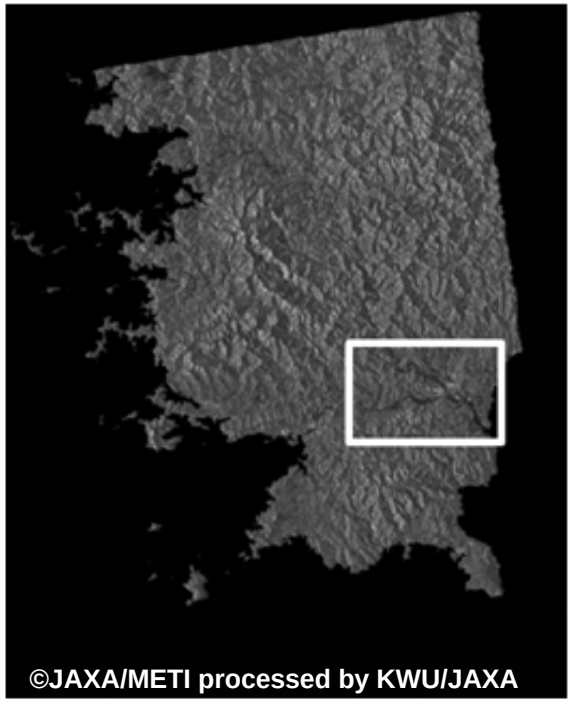
>> method for GIS applications and data transfer

Rivers in Japan have rather small scale in space and very rapid water level changes on the occasion of the flood disasters. The rapid coordination of the satellite observation is essential in general.

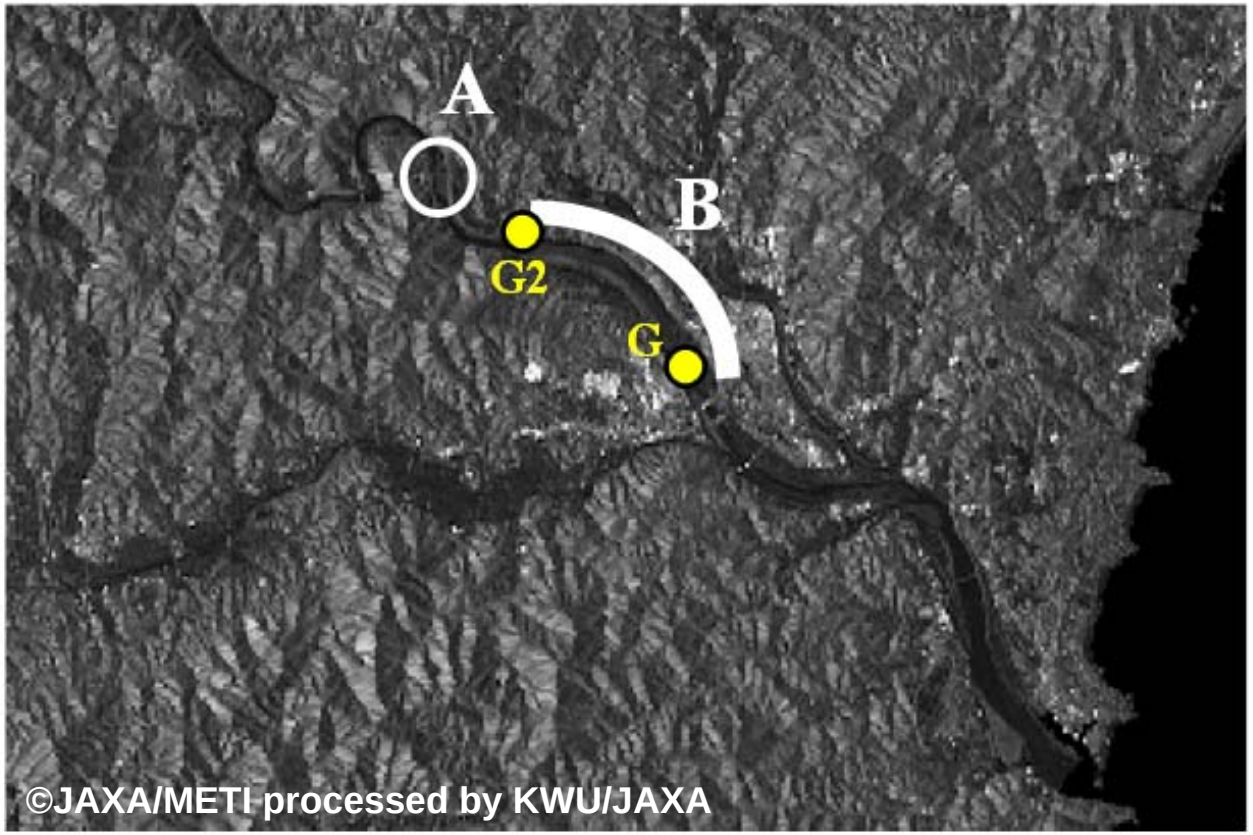
We analysed the ALOS/PALSAR data for the Shimanto River, Shikoku, Japan in the period from January 2007 to December 2008.

We mainly discussed on the detectability of dry holms by using SAR amplitude images with very simple method.

2. Shimanto River



The west part of the Shikoku Island is shown by ALOS/PALSAR geo-coded amplitude image (85 km x 100 km) observed on 7 March 2008.



Downstream region of the Shimanto River.

ALOS/PALSAR amplitude image (20 km x 13 km).

Circle labeled ‘A’ and the zone ‘B’ are the holms.

‘G’ and ‘G2’ are gauging stations ‘Gudo’ and ‘Gudo-2nd’, respectively .

Point A: Chinka-bashi (sinking bridge) **Width:4m, Length:292m**

(from down stream to upper stream)

Holms upper stream of Point A

Holms upper stream of Gauging Station Gudo (Point G)

3. ALOS/PALSAR data and processing

Table 1. ALOS/PALSAR data for Shimanto River

All the data were acquired at night (22:40, JST)

Path-Frame	Scene Shift	Mode	No. of Scenes	Off-nadir
419-650 Ascending	-1	FBS	6	34.3 Degrees
		FBD	6	
420-650 Ascending	-3	FBS	7	
		FBD	5	

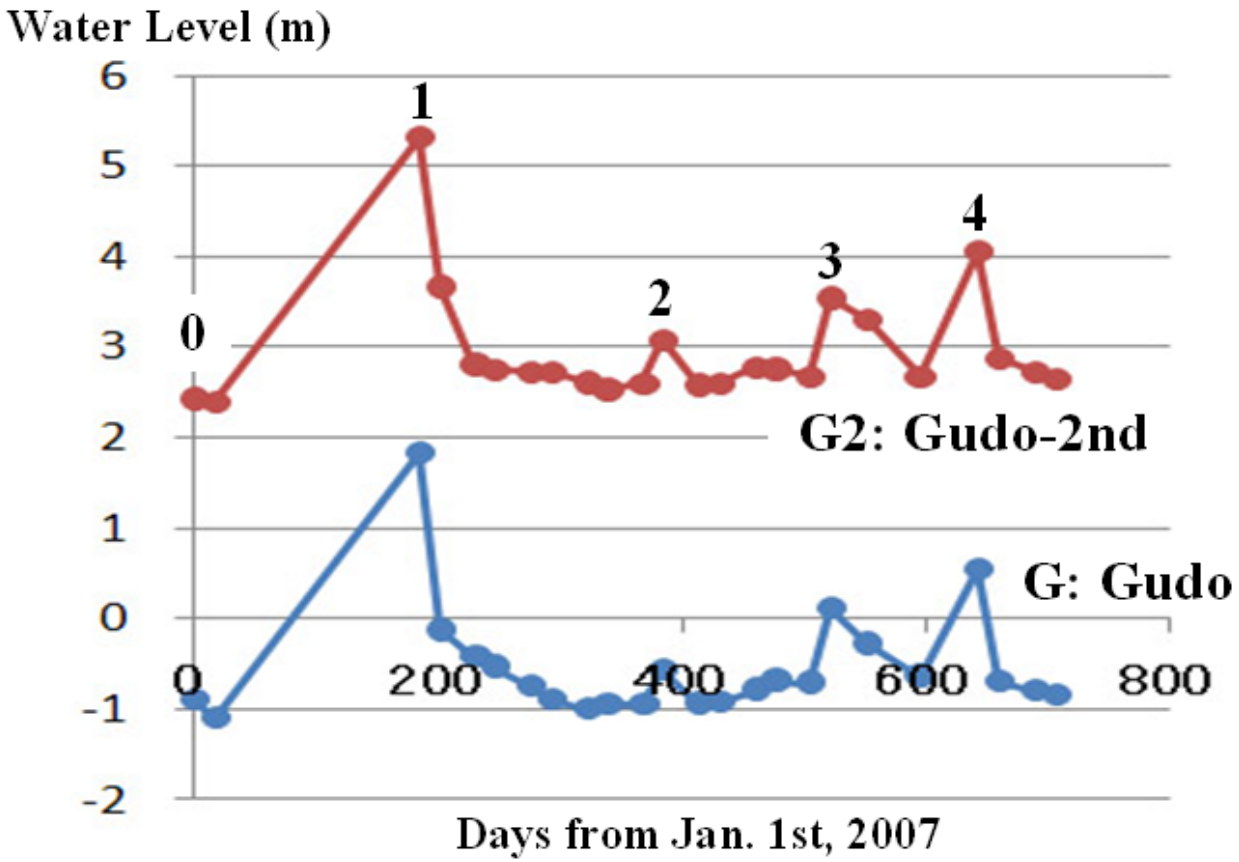
Ownership of ALOS/PALSAR original data is retained by JAXA and METI.

SIGMA-SAR software (Shimada, 1999) was applied for the present study.

In the present case, amplitude images mainly show the surface roughness of the holms which are covered by rounded pebble. The smooth water surface is detected as a portion of the very low intensity.

Original pixel resolution of the FBS and FBD image are 4.7 m and 9.4 m in range, respectively. Those in azimuth is 9 m for both FBS and FBD images by 2-Look processing. But after the processing, **overall pixel resolution** may be about **10m x 10m** in radar-coordinate.

4. Water level data, Shimanto River

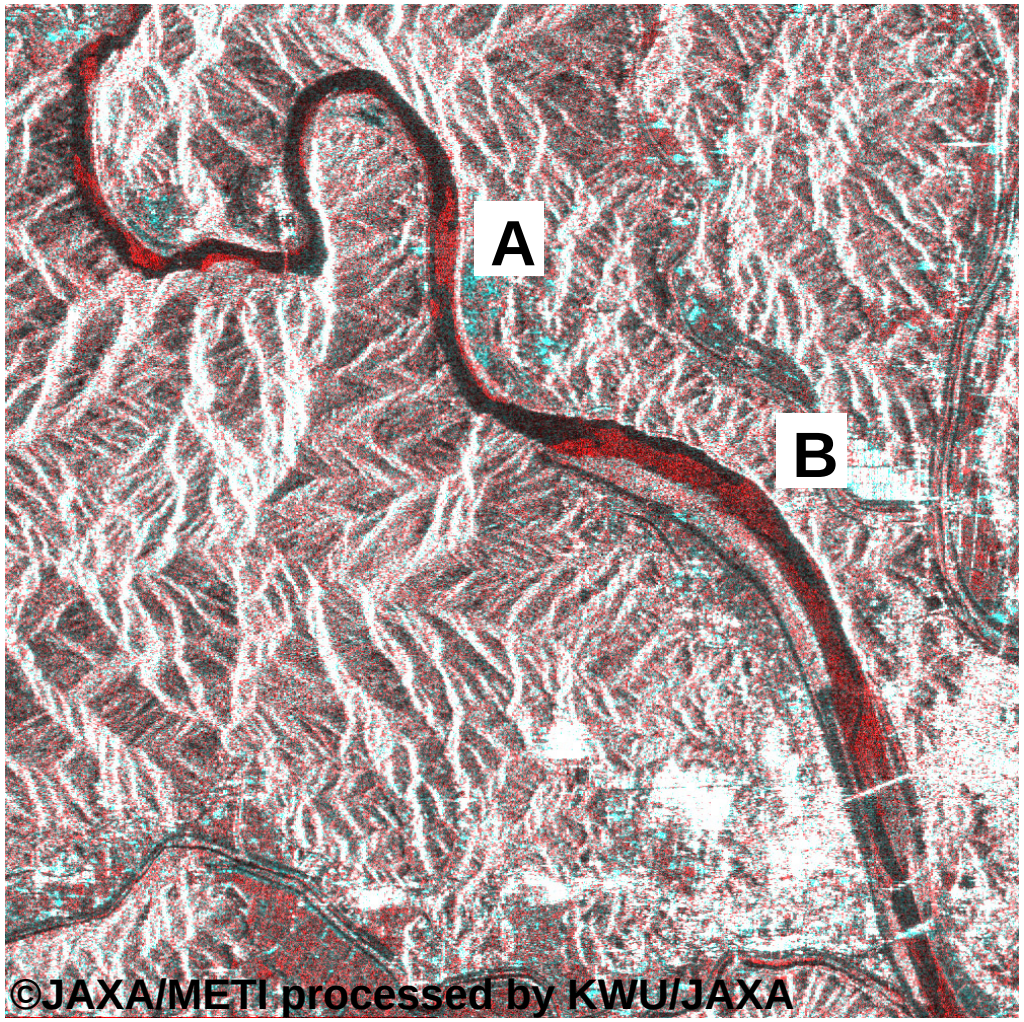


Water Information System, Ministry of Land, Infrastructure and Transport, Japan, http://www1.river.go.jp/

Table 2. SAR Images and Water Level

Label for Date	Date Path, Mode	Water Level (m)		Remarks
		G	G2	
0	Jan. 1, 2007 419 FBS	-0.90	2.43	Basis
1	July 4, 2007 419 FBD	1.82	5.31	Local WL max.
2	Jan. 21, 2008 420 FBS	-0.57	3.08	Local WL max
3	June 7, 2008 420 FBD	0.10	3.54	Local WL max
4	Oct. 6, 2008 .419 FBD	0.54	4.05	Local WL max

5. Results and Discussions



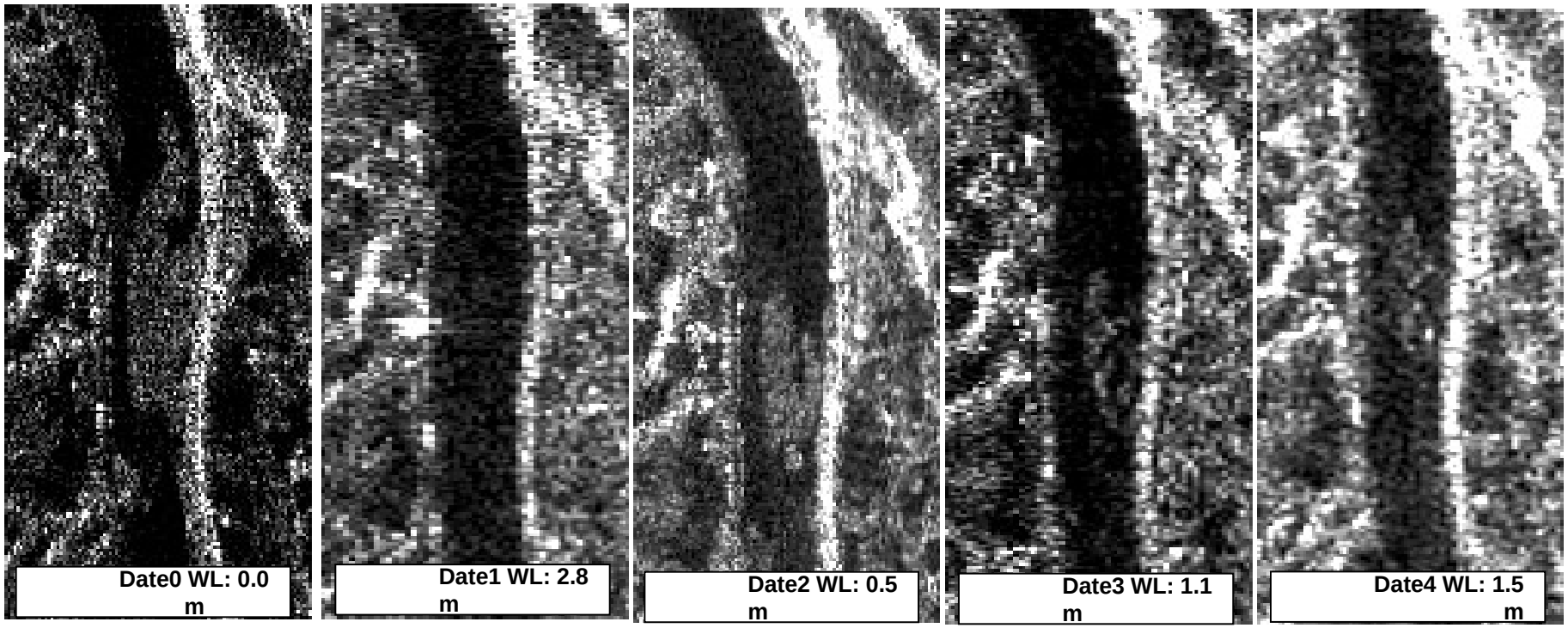
Change in the water coverage between Date 0 (Jan.1st, 2007) and Date 1 (July 4, 2007) when the water became **higher about 2.8 m.**

Red portion was covered with water on July 4, 2007.

The western part of the holm B is covered with trees above 3 m in hight.

R: Date 0 (Jan. 1, 2007) , **G** and **B**: Date 1 (July 4, 2007)

Holms A



Time series of amplitude images for holms A.

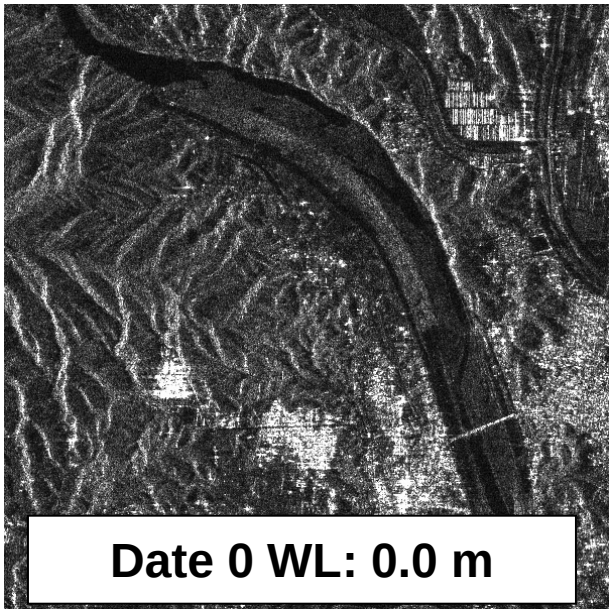
The bright part is not clear when the averaged WLs are 1-2 m.

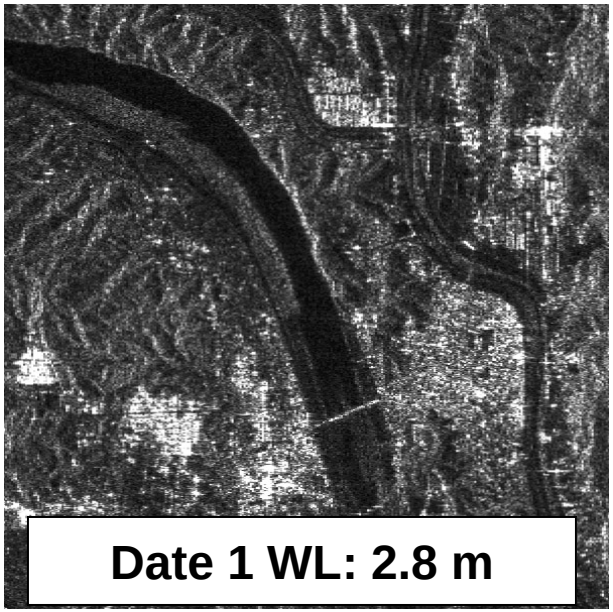
Holms A

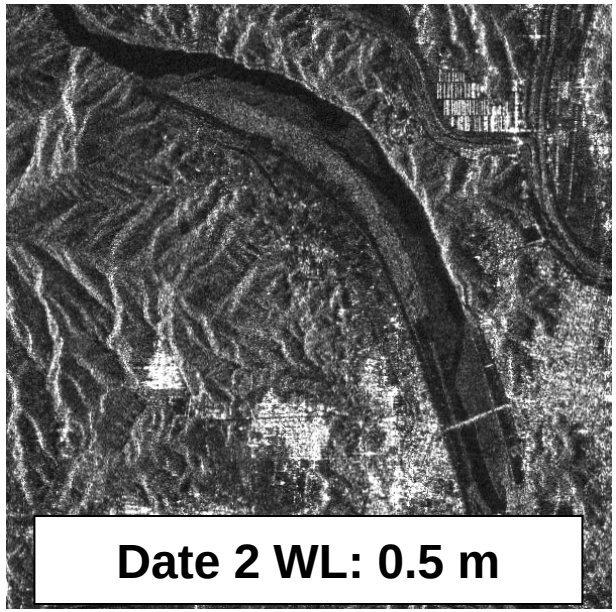
Small streams appear on the holms.

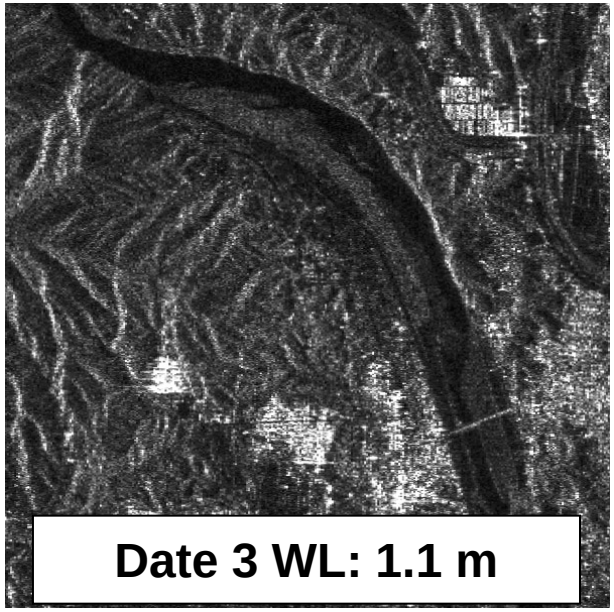
The 10m of the pixel resolution is not enough, because the spatial scale of the streams is a few meter.

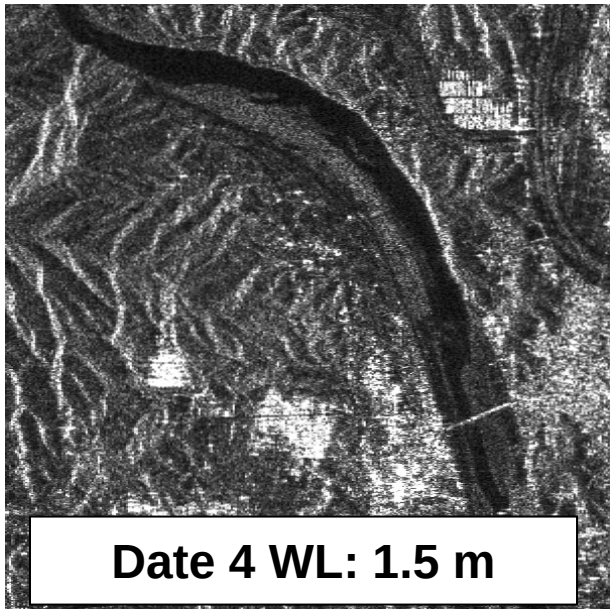
Holms B











Time series of amplitude images for holms B.

Holms B

The width of the main stream changed rather clearly.

West part is vegetated including high trees. The canopies are more than 3m in height.

‘Red Iron Bridge’ at Nakamura City

6. Conclusion

We analysed the ALOS/PALSAR data for the Shimanto River, Shikoku, Japan in the period from January 2007 to December 2008.

We mainly discussed on the detectability of dry holms by using SAR amplitude images with very simple method.

Typical changes were detected in amplitude images acquired at night (22:40 JST) .

However, 10m pixel resolution is not fine enough to represent the detailed situation of the holms.

L-band D-InSAR image pointed out changing areas in a large area.

For the future

The finer resolution (1-3 m) and some other methods (D-InSAR, POLSAR etc.) are necessary for detailed detection of flood by L-band SAR sensors.

>> ALOS-2

Airborne sensors have much potential for the timely and detailed mapping of the flooded area in Japan.

Acknowledgments

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Thank you for your attention !

http://www.jaxa.jp/projects/sat/alos/index_e.html