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PALSAR ScanSAR 干渉による 地殻変動抽出

Extraction of crustal movement using PALSAR ScanSAR interferometry

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「高分解能レーダー・リモートセンシングによる災害観測の革新」

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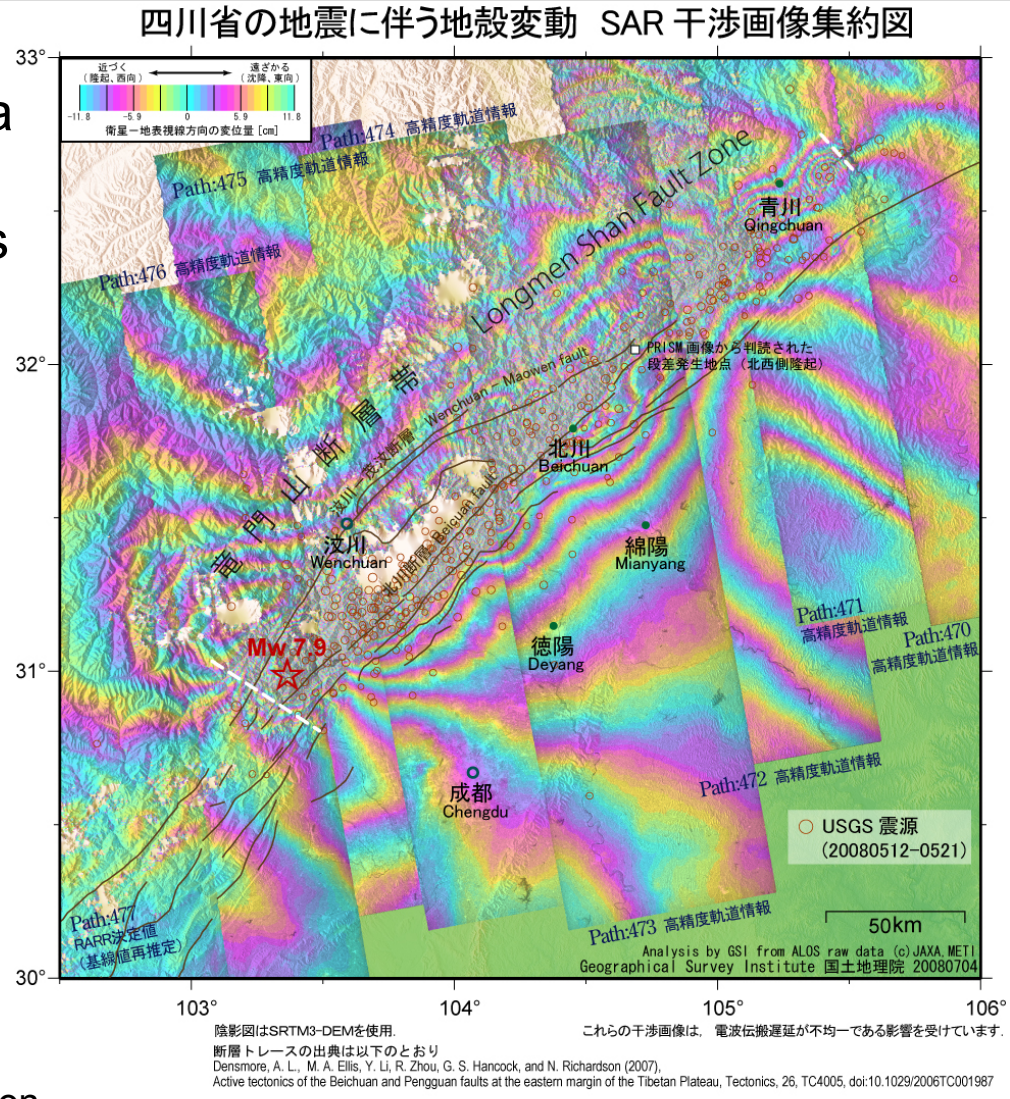
Comparison of stripmap-mode and ScanSAR-mode

Mode	Stripmap-mode	ScanSAR-mode
Swath	**40～70km**	**250～350km**
Resolution	**10m**	**100m**
Strong point	✦High resolution ✦High signal to noise ratio ✦Suitable for detection of detail crustal movement ～ within 50km swath	✦Wide swath ✦Suitable for detection of widespread crustal movement ～ over 100km swath
Weak point	✖Narrow swath ✖Wide ranging crustal movement cannot be covered by one pass data ✖ Phase discontinuity is caused by the difference of the observation condition in the combination of the results of two or more pass data	✖Low resolution ✖Low signal to noise ratio ✖Severe the interferometric condition (Baseline condition and fitting the burst timing)

Exsample of Analysis result by combination of stripmap-mode data（Analysis by GSI）

Analysis by GSI from ALOS raw data
(c) JAXA, METI
（http://cais.gsi.go.jp/Research/topics/topic080604/index.html）

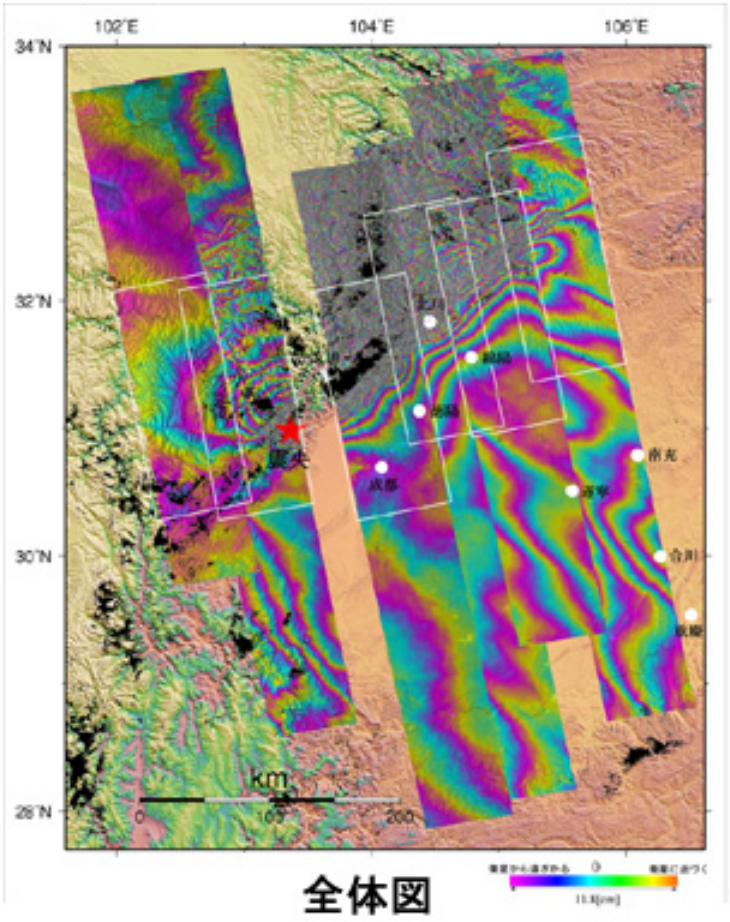


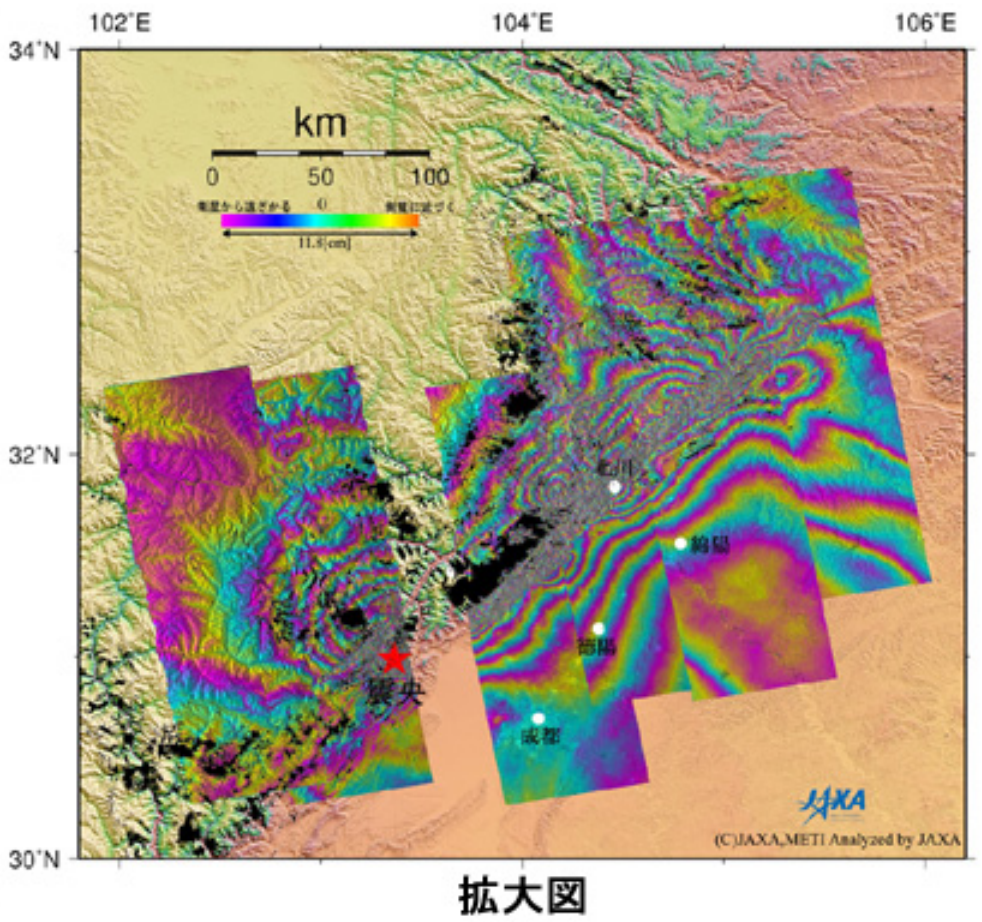
Flight direction

Illuminated direction

干渉画像から，震源断層両端の位置（白破線）がほぼ特定された。
震源断層の長さは，約 285km±5km とみられる。
地殻変動集中帯は，竜文山断層帯（龍門山断層帯）に沿っている.

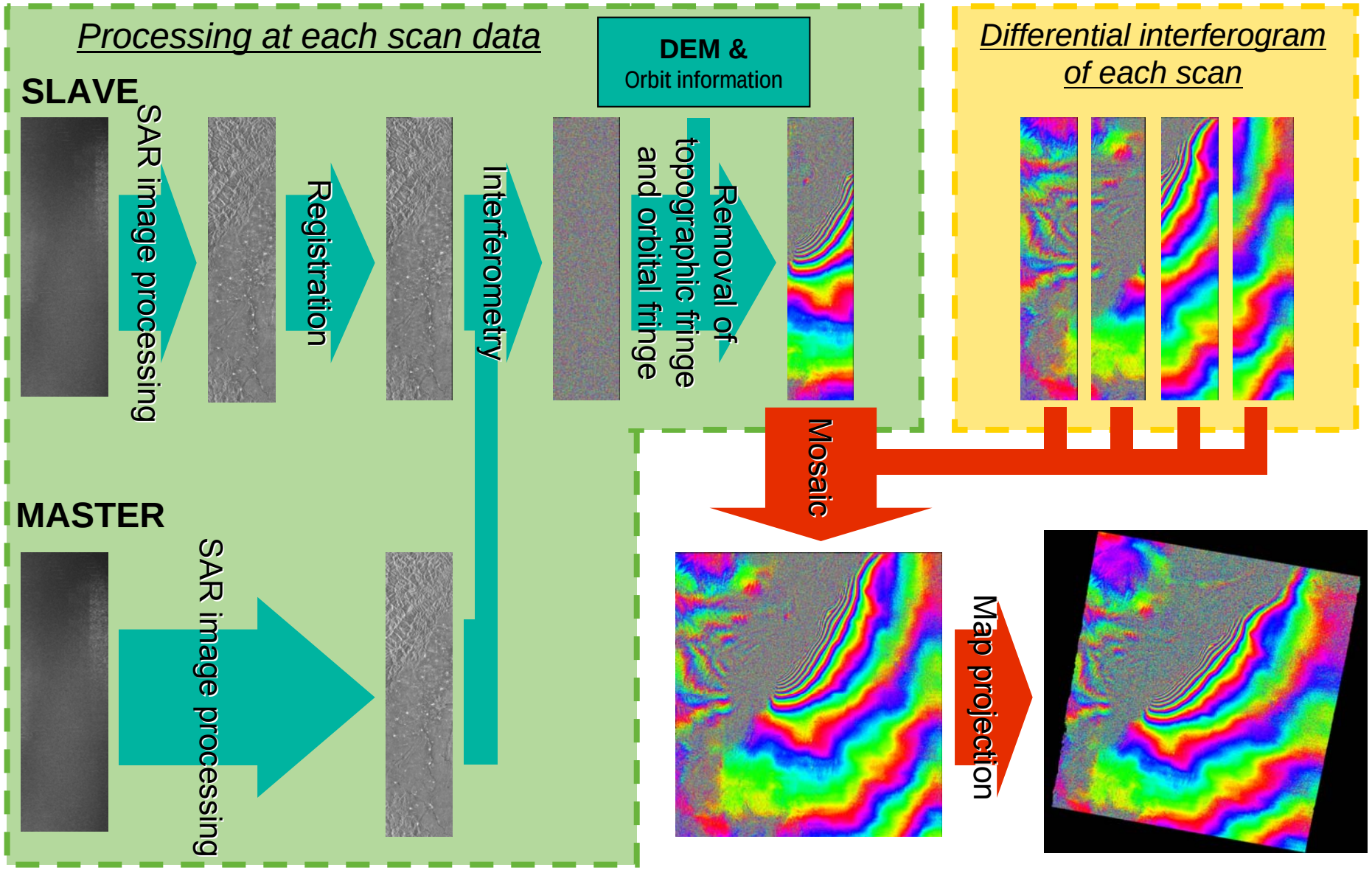
Exsample of Analysis result by combination of stripmap-mode data（Analysis by JAXA）



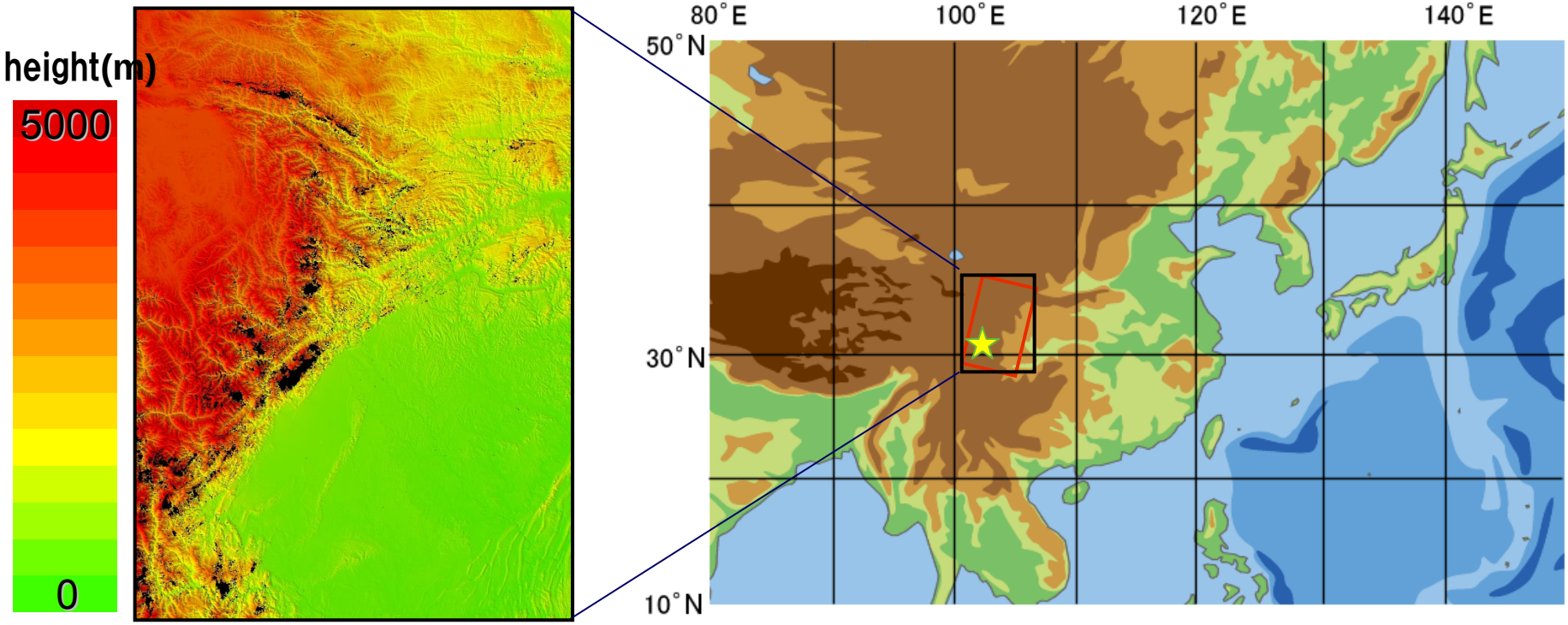


http://www.eorc.jaxa.jp/ALOS/img_up/jdis_china_eq_080618.htm

Processing flow of ScanSAR interferometry



Analysis area



□:ScanSAR Image area

□:Analysis area

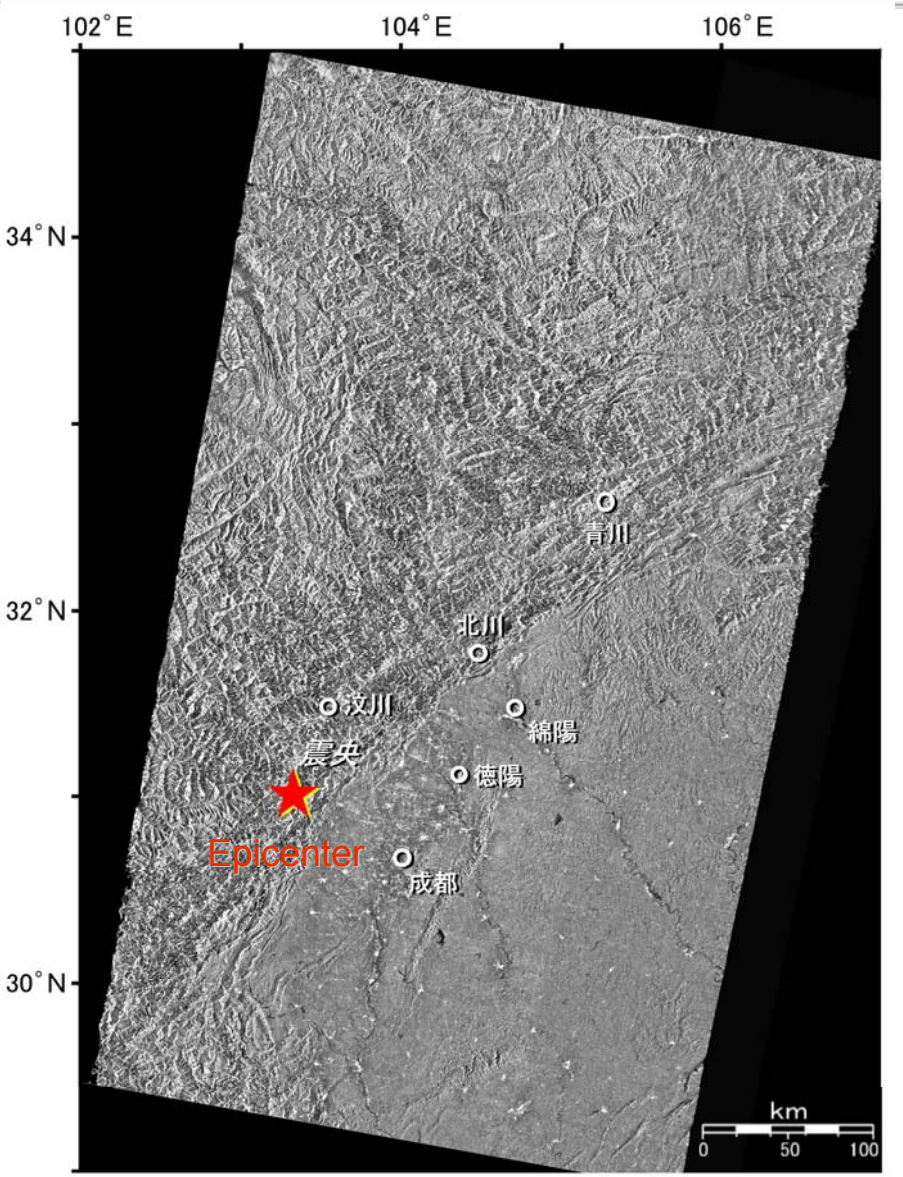
2008 China Sichuan Earthquake

Date Time	2008/5/12 6:28:01UTC
Epicenter	30.986° N, 103.364° E
Magnitude	M7.9
Kind of earthquake	Directly above its epicenter(Reverse fault)

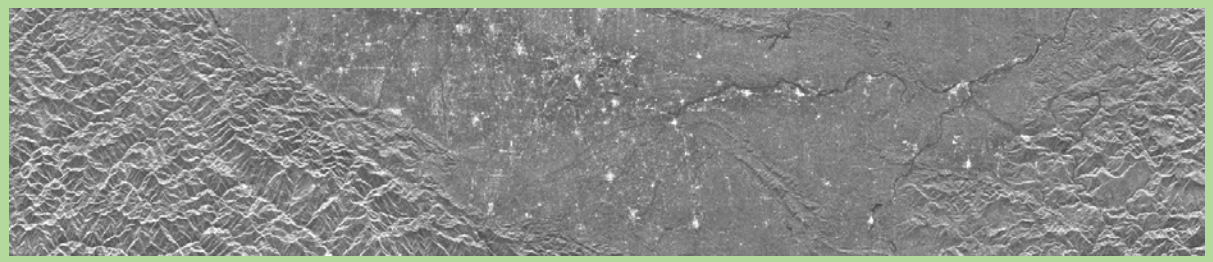
Analysis Data and Amplitude Image

Analysis Data

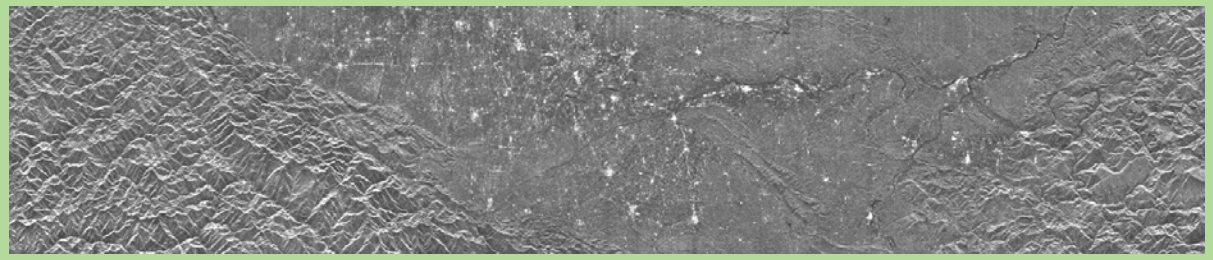
Observation mode	Scan-SAR Mode（5-scan）
Obsevation Date（UTC）	2008/01/03 (master data), 2008/05/20 (slave data)
Flight direction	Descending
Offnadia angle	20.1˚, 26.1˚, 30.6˚, 34.1˚, 36.5˚
Illuminated direction	From right to left of image（east to west）
Interferometric Baseline	Bperp：477m, Bpara：440m
Scene number	2
Using DEM	SRTM 3arc-sec DEM



Example：Processing result（Scan3）

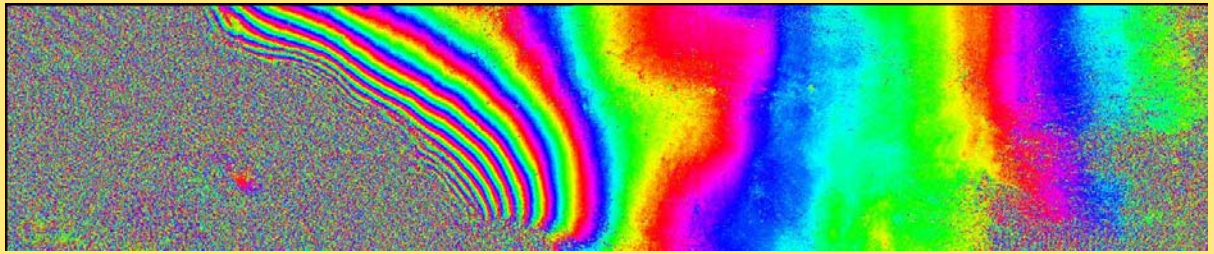


Master Image

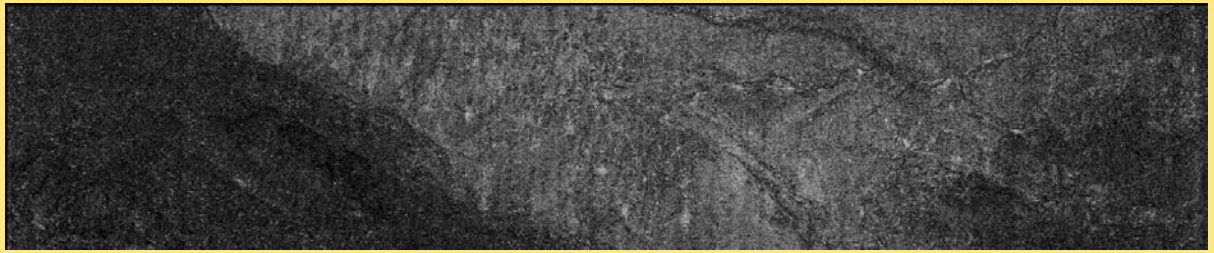


Slave Image
(After Registration)

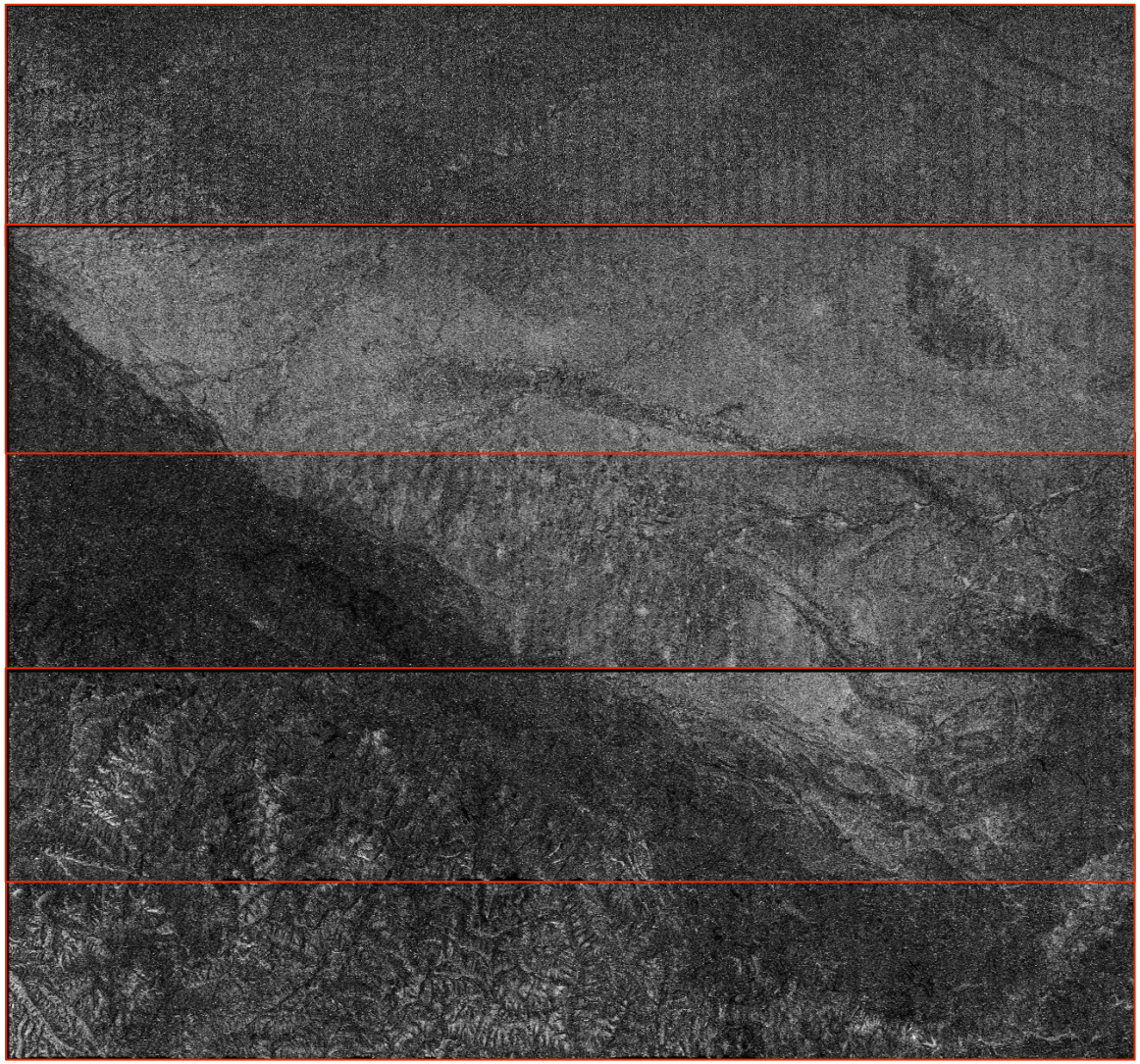
Interferogram

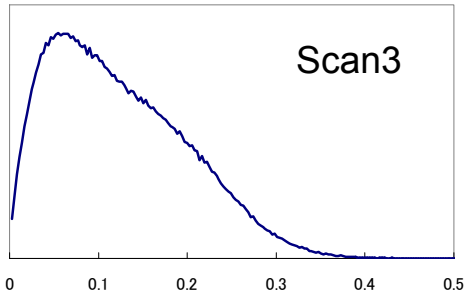


Coherence



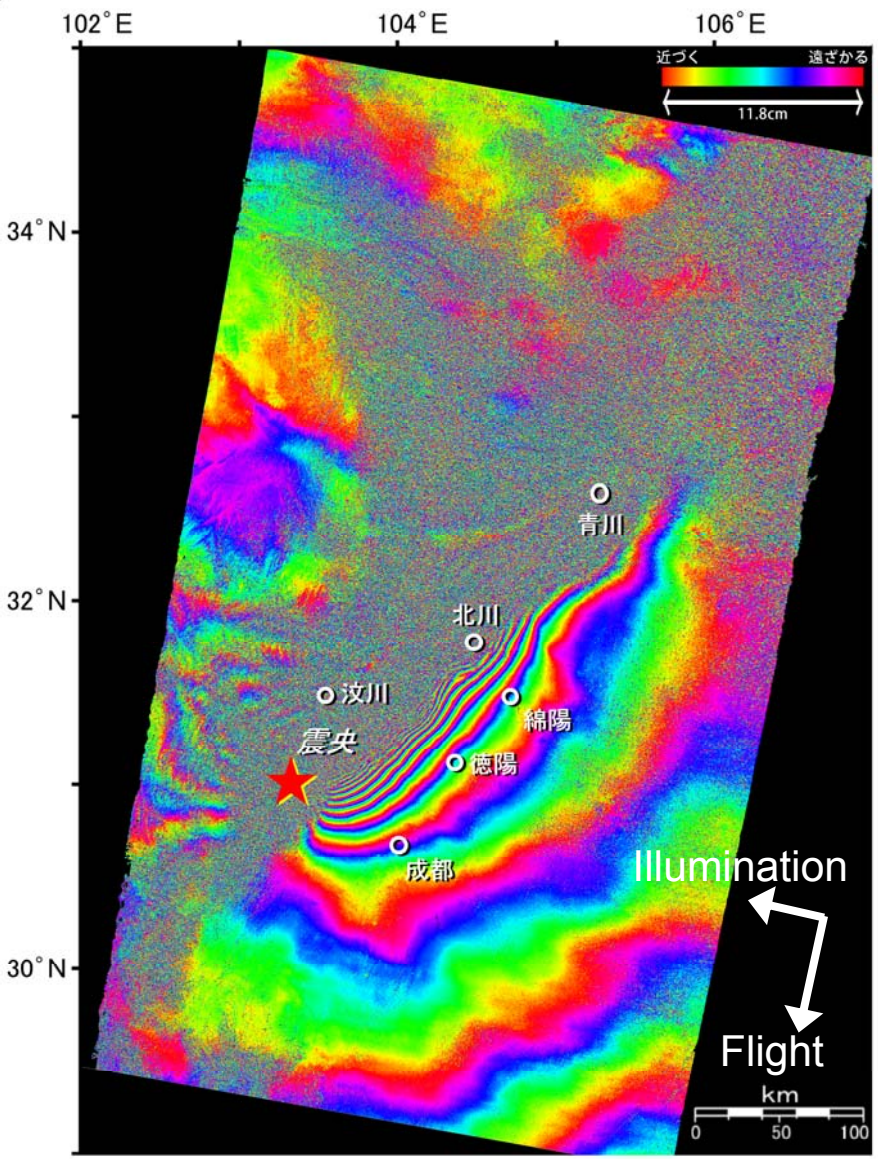
Coherence Image



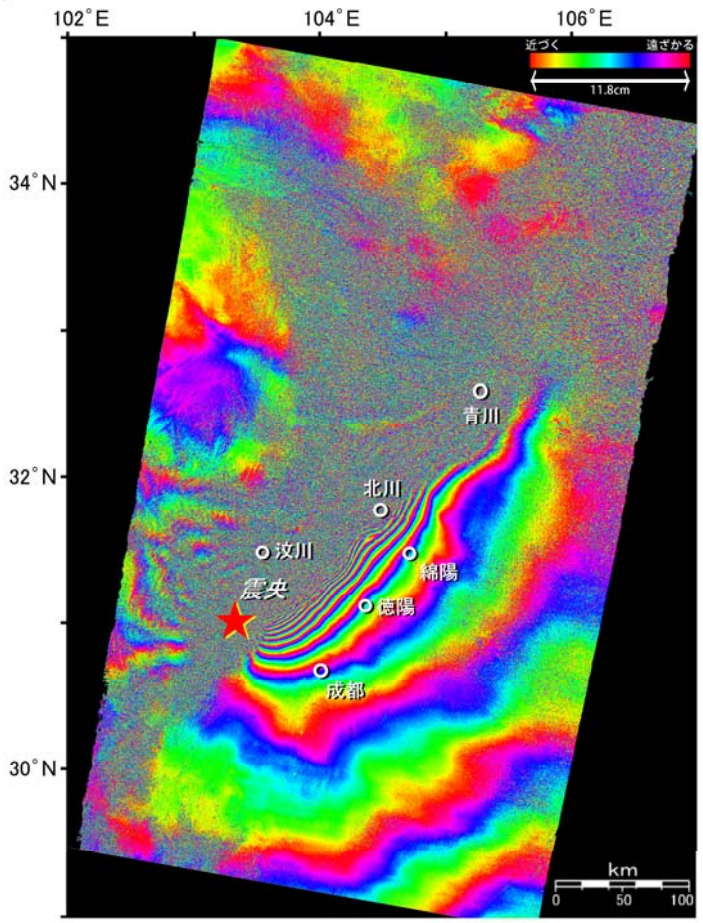


Coherence
(Az:64look, Rg:16look)

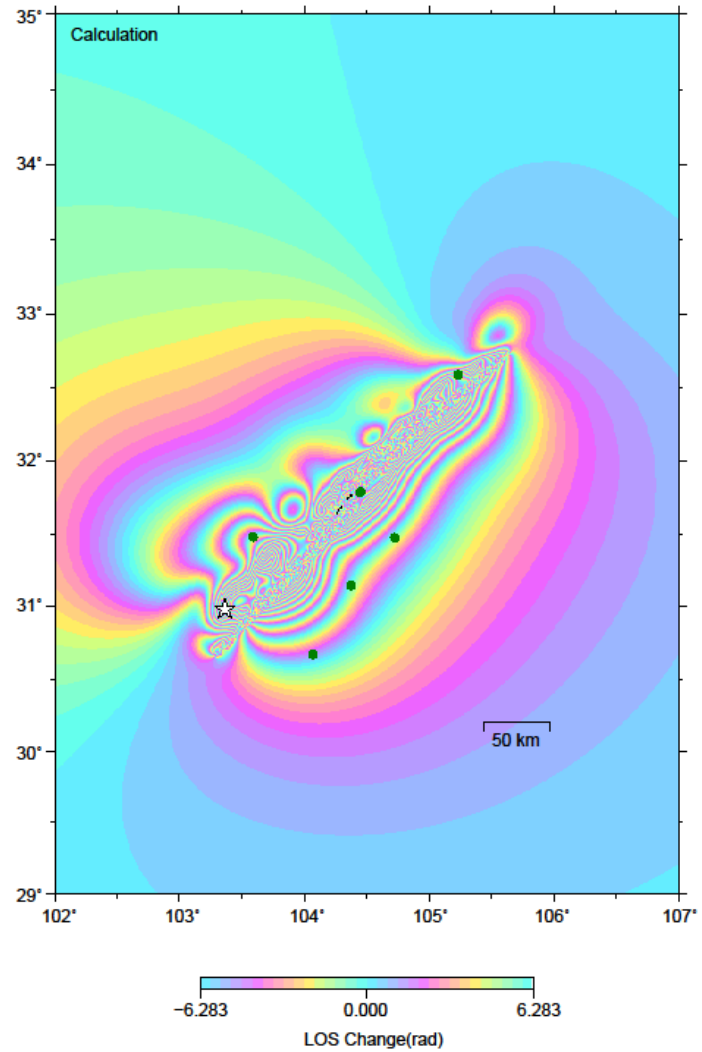
Differential Interferogram of PALSAR ScanSAR



Differential Interferogram of PALSAR ScanSAR



ScanSAR Interferogram by NEC



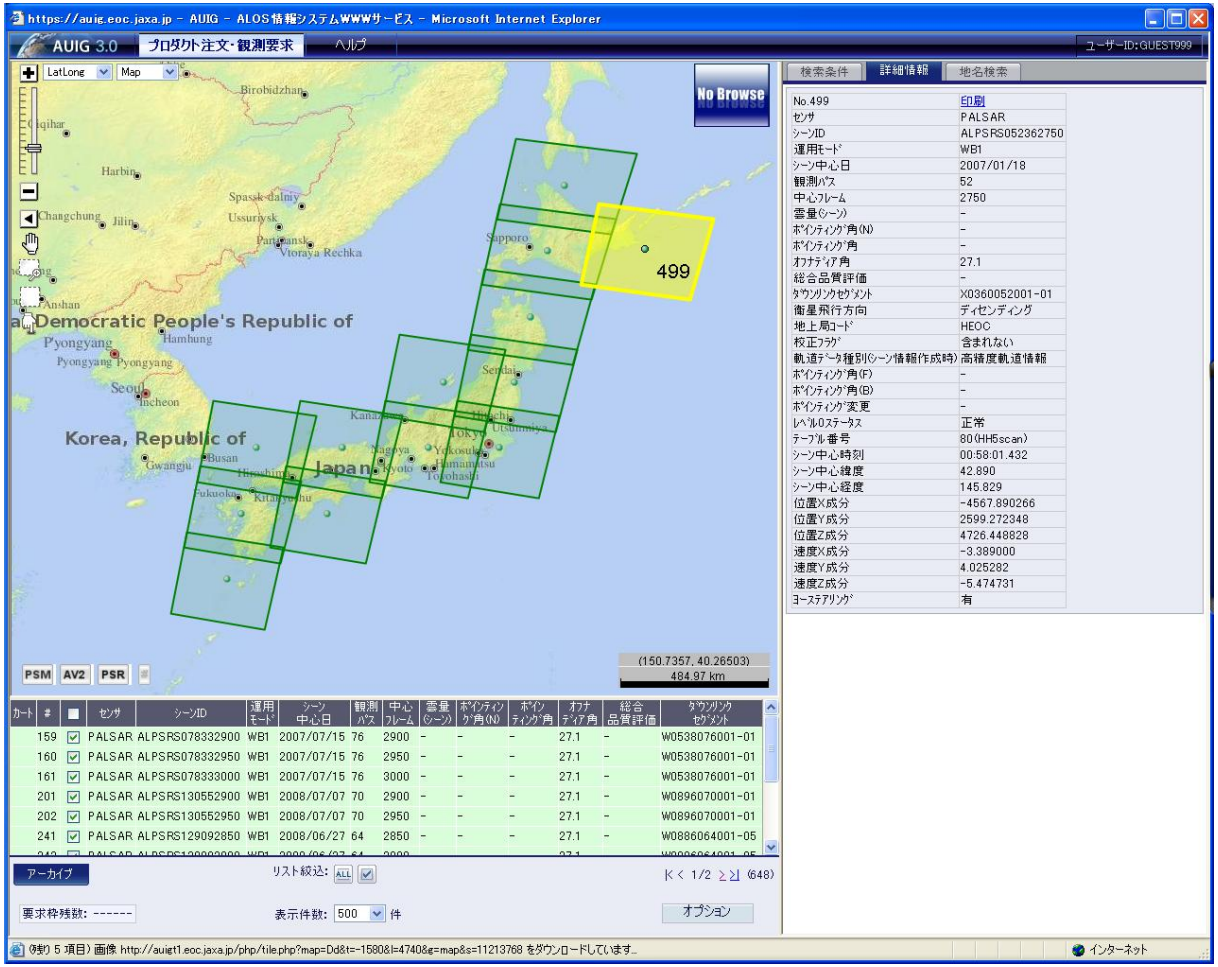
ScanSAR Simulated Interferogram by GSI fault model

Thanks Dr.Nishimura and Dr.Tobita (GSI) for calculation

Conclusions

- We tried to detect the crustal movement deformation on 2008 China Sichuan Earthquake by ScanSAR-ScanSAR interferometry analysis using the ALOS/PALSAR data.
- We could get the good interferogram without the phase discontinuity between scans.
- It was confirmed to be able to detect crustal movement by ScanSAR-ScanSAR interferometry analysis.
- It was shown that the ScanSAR-ScanSAR interferometry can be a very powerful tool of wider crustal movement analysis.

Example of the observation in Japan area by PALSAR ScanSAR mode



The entire Japan can be covered by about 10 scenes.

Acknowledgement

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