



Lava dome deformation at Unzen volcano as Viewed from ALOS PALSAR InSAR

Continued report

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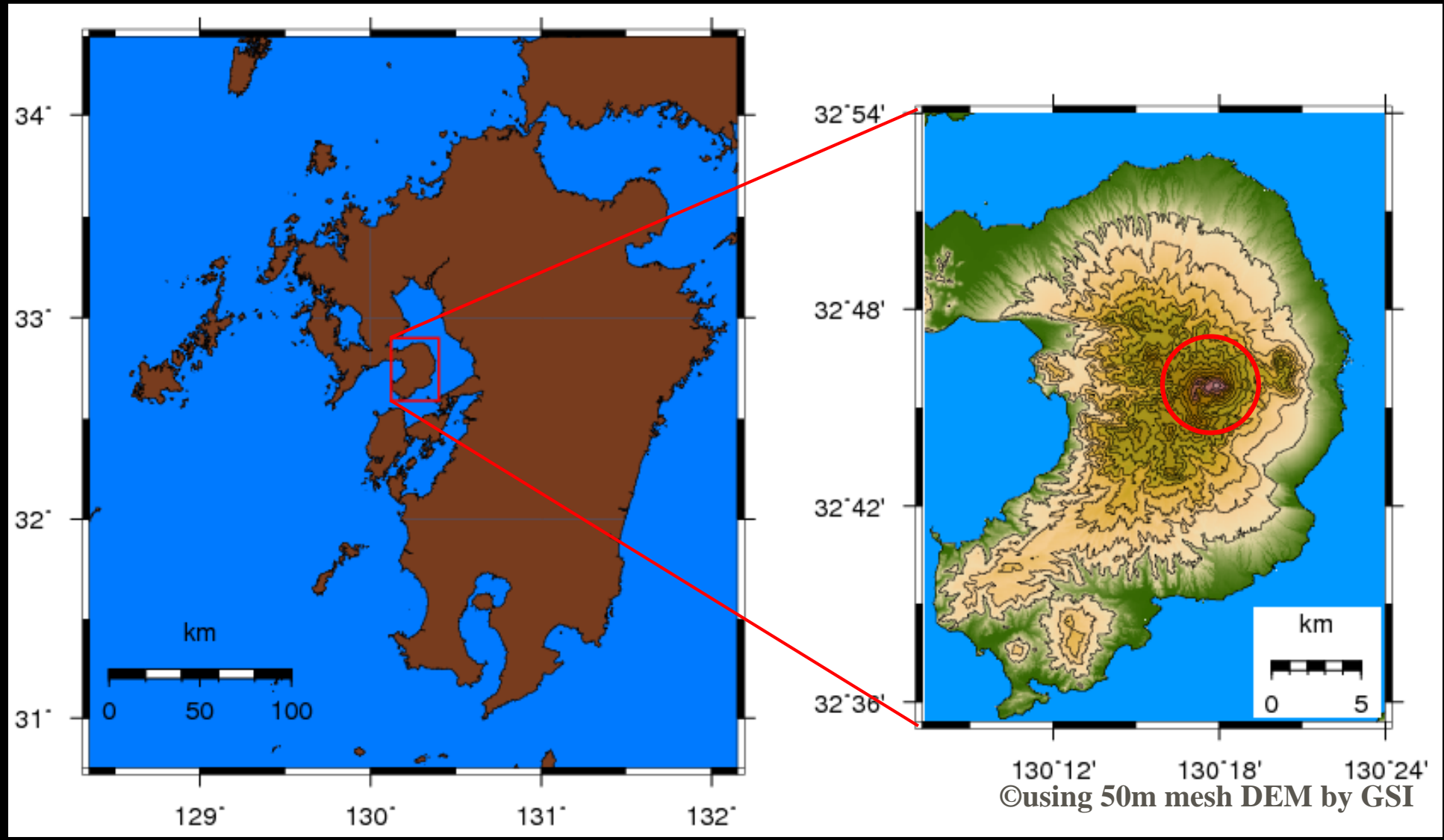
(¹気象庁気象研究所 ²気象庁火山課)



Abstract

- *Review about Unzen volcano.*
- *InSAR of PALSAR(ALOS) show deformation of lava dome at Unzen volcano. → Try two orbits*
- *Compare to GPS campaign observation .*
→ *Additional ground truth*
in November, 2007

Unzen volcano



Pyroclastic flow



Photo May 4, 1993

November, 1990
Eruption



Photo May 15, 1993

May, 1991
Lava dome appeared

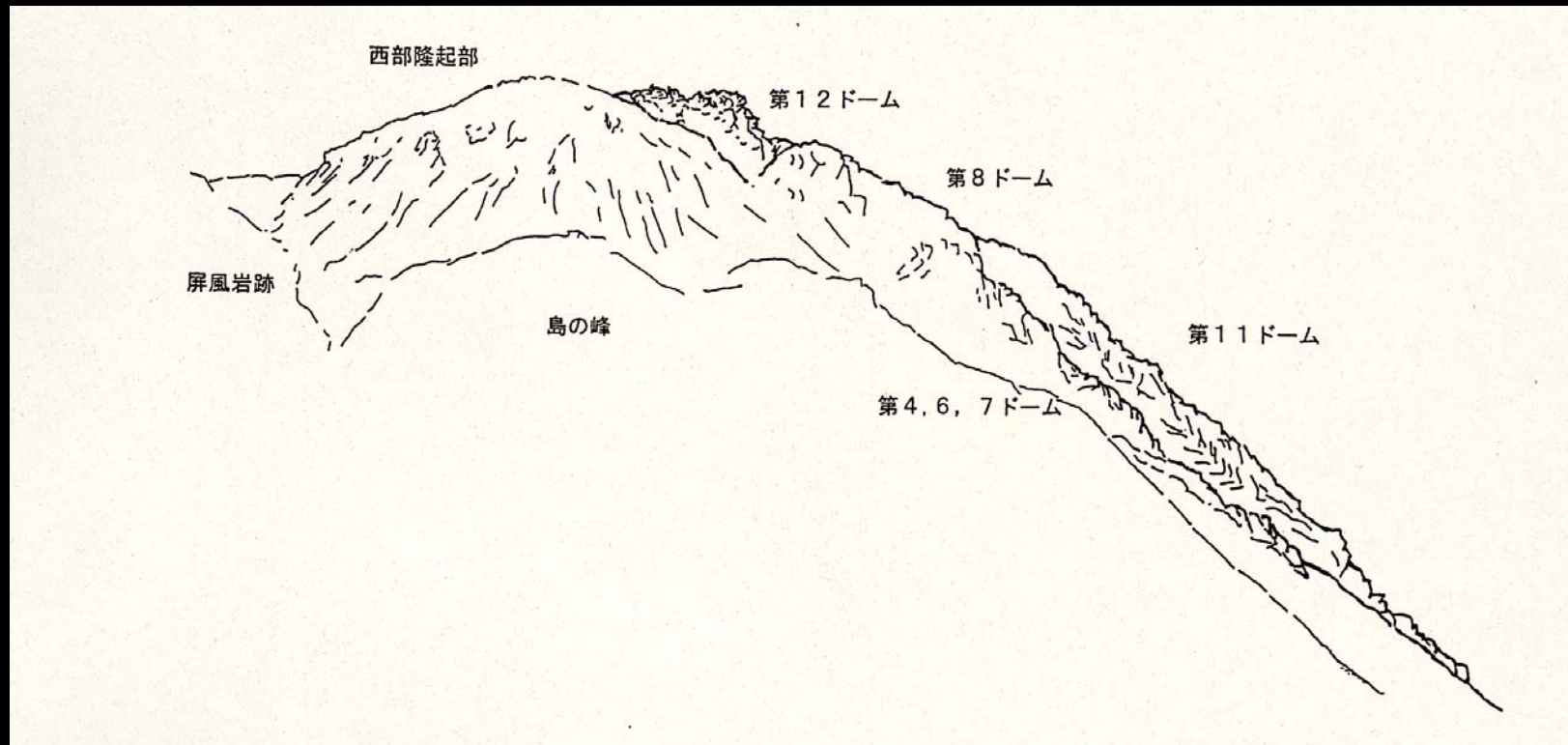


13 lobes

<i>date</i>	<i>lobe</i>
1991/5/20	1 st lobe
1991/6/5	2 nd lobe
1991/8/14	3 rd lobe
1991/9/16	4 th lobe
1991/11/24	5 th lobe
1991/12/3	6 th lobe
1992/3/23	7 th lobe

<i>date</i>	<i>lobe</i>
1992/8/10	8 th lobe
1992/12/3	9 th lobe
1993/2/2	10 th lobe
1993/3/17	11 th lobe
1994/1/15	12 th lobe
1994/7/12	13 th lobe

Sketch of lava dome



1000m

Lava dome



Photo December 6, 1994

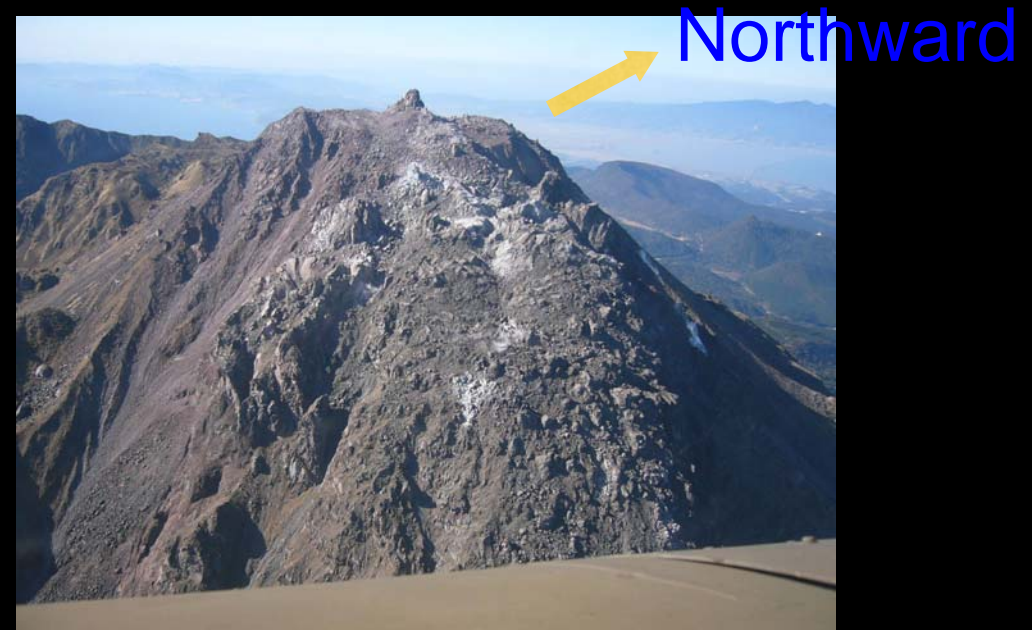
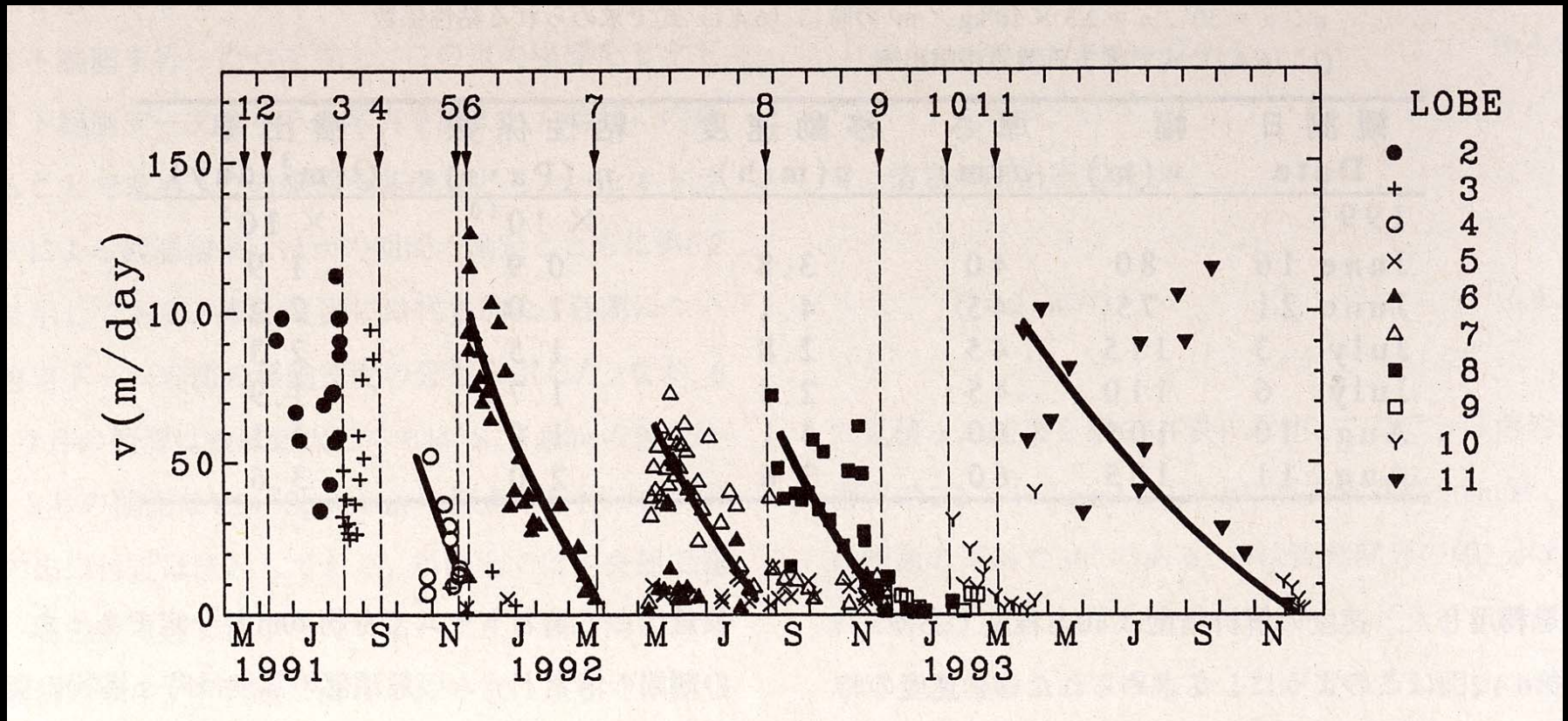


Photo November 23, 2007

Deformation of lava dome



(Fukui 2002)

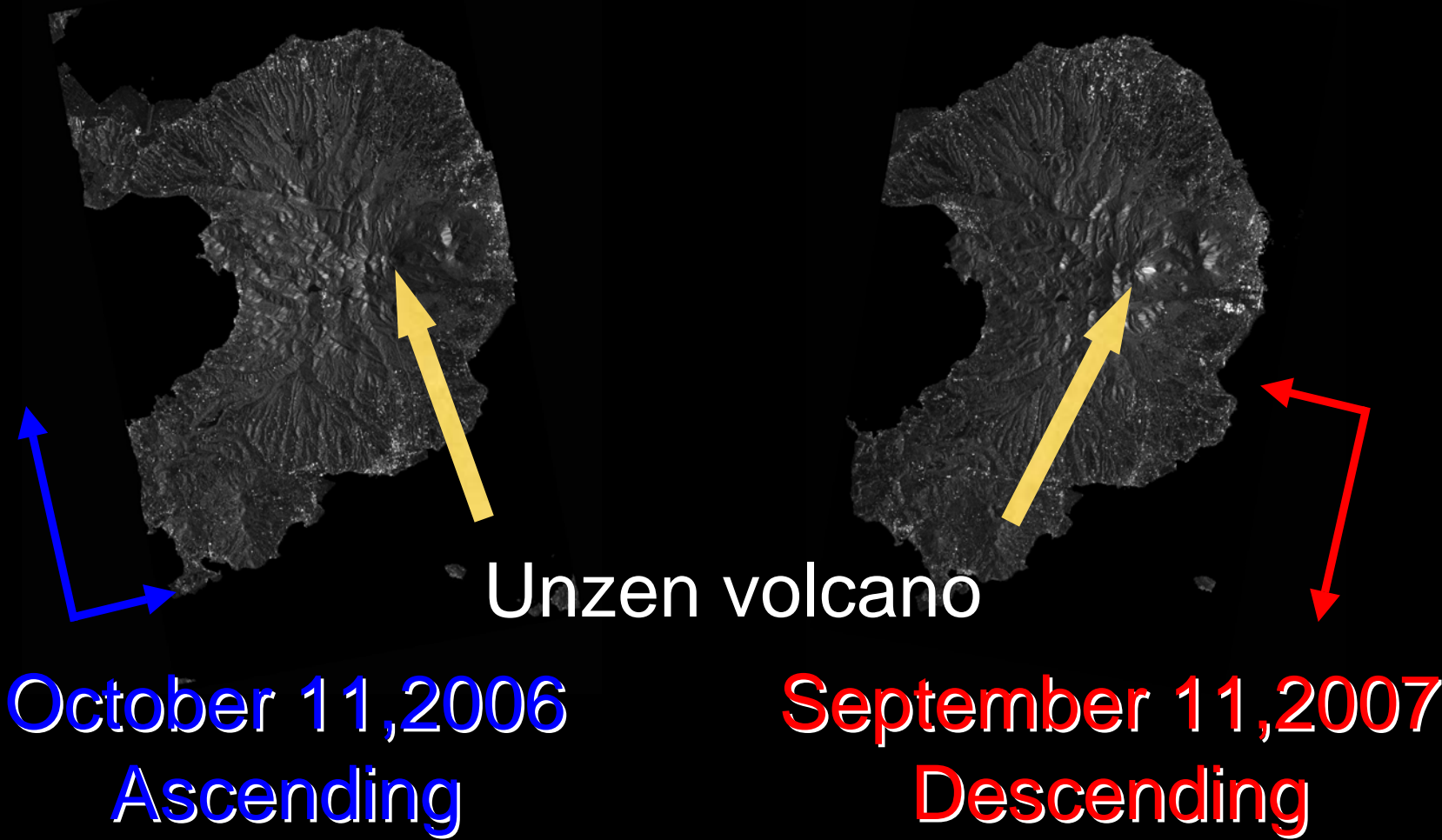
video, photo and theodolite



PALSAR Images

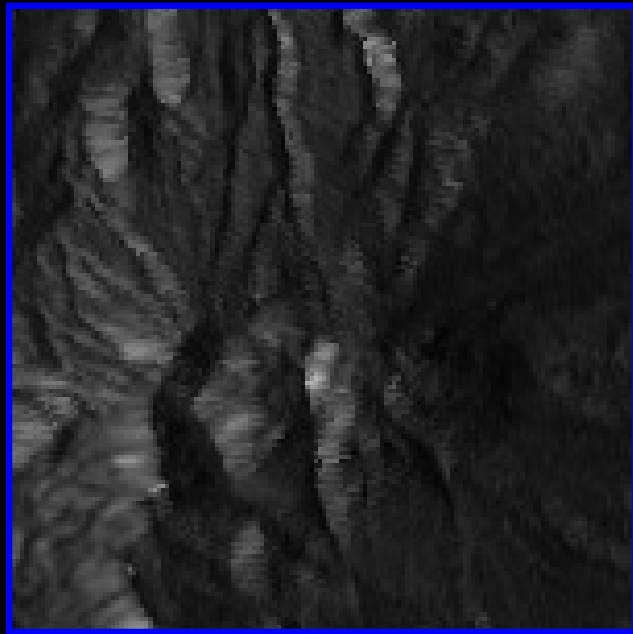
Date	Interval	mode	Off nadir angle	B_{perp}	Orbit
August 26-October 11 2006	46	FBS	34.3°	670m	Ascending
July 27-September 11 2007	46	FBS	34.3°	70m	Descending

Power images

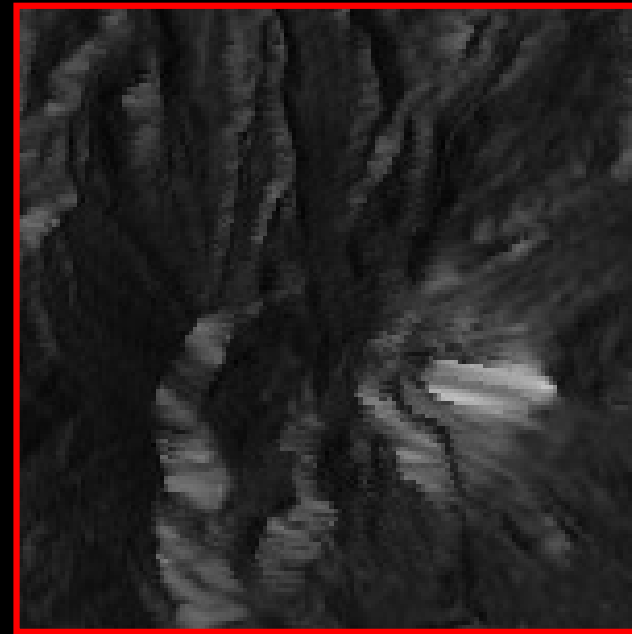


Power images

Unzen volcano

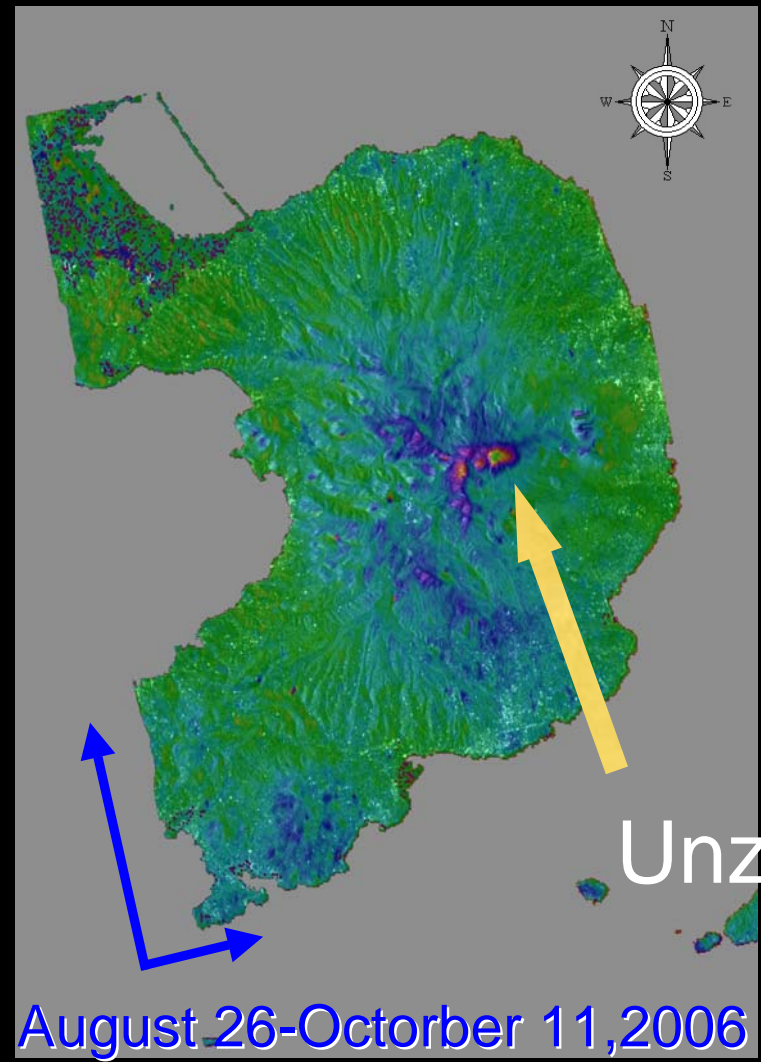


October 11, 2006
Ascending



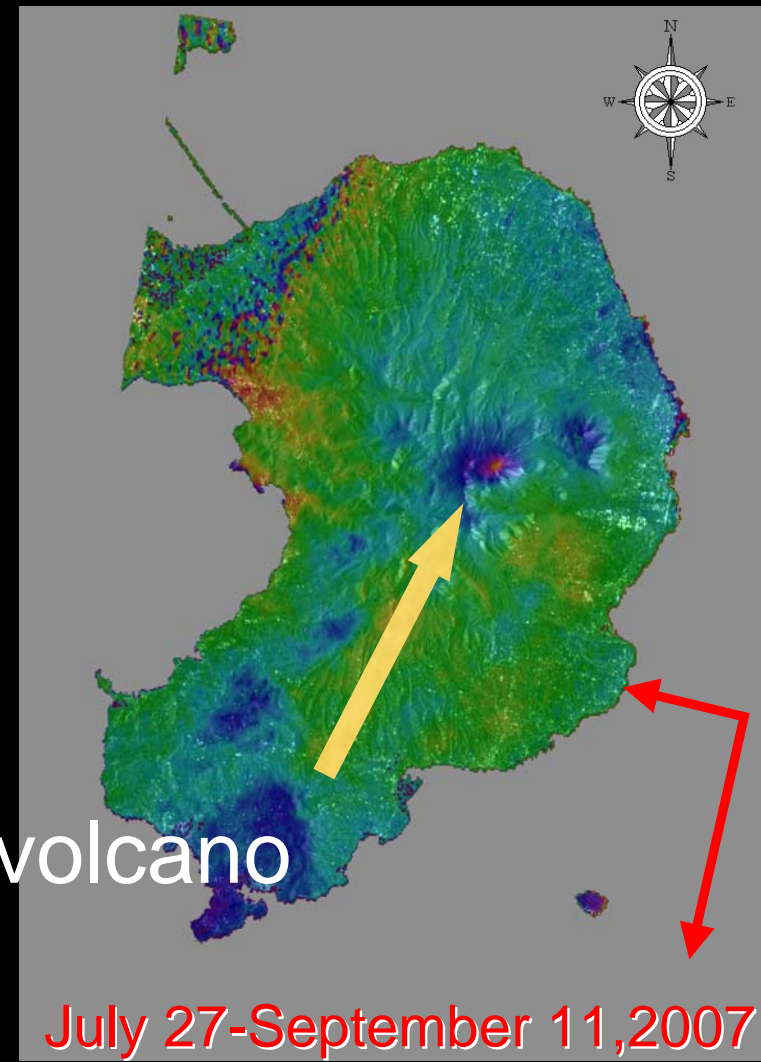
September 11, 2007
Descending

Interferogram



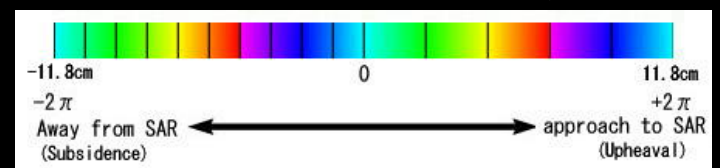
August 26-October 11, 2006

Ascending

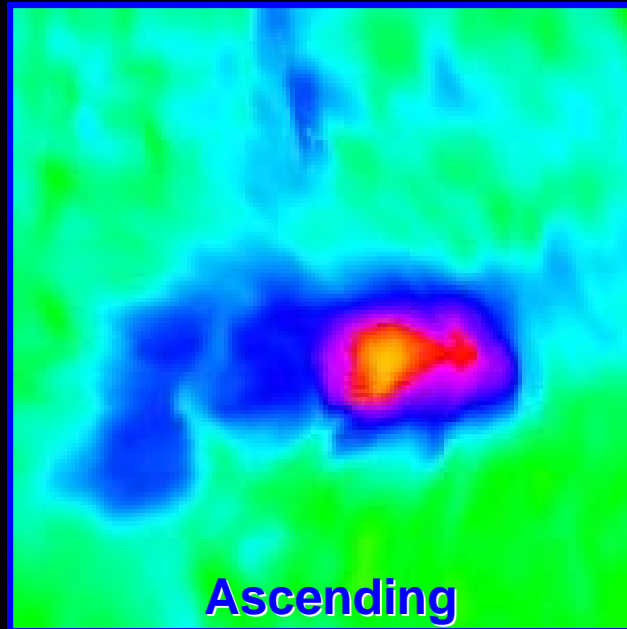


July 27-September 11, 2007

Descending

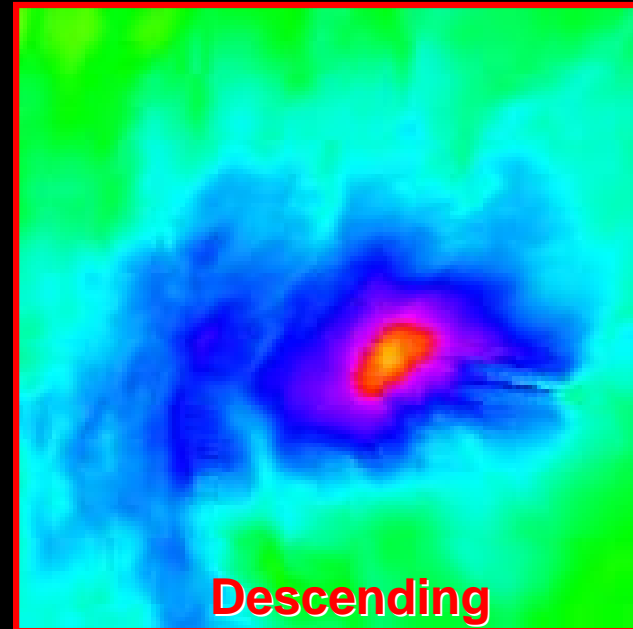


Lava dome



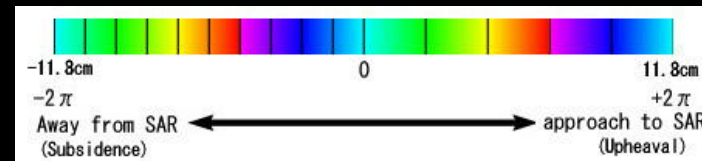
Ascending

August 26-October 11, 2006



Descending

July 27-September 11, 2007



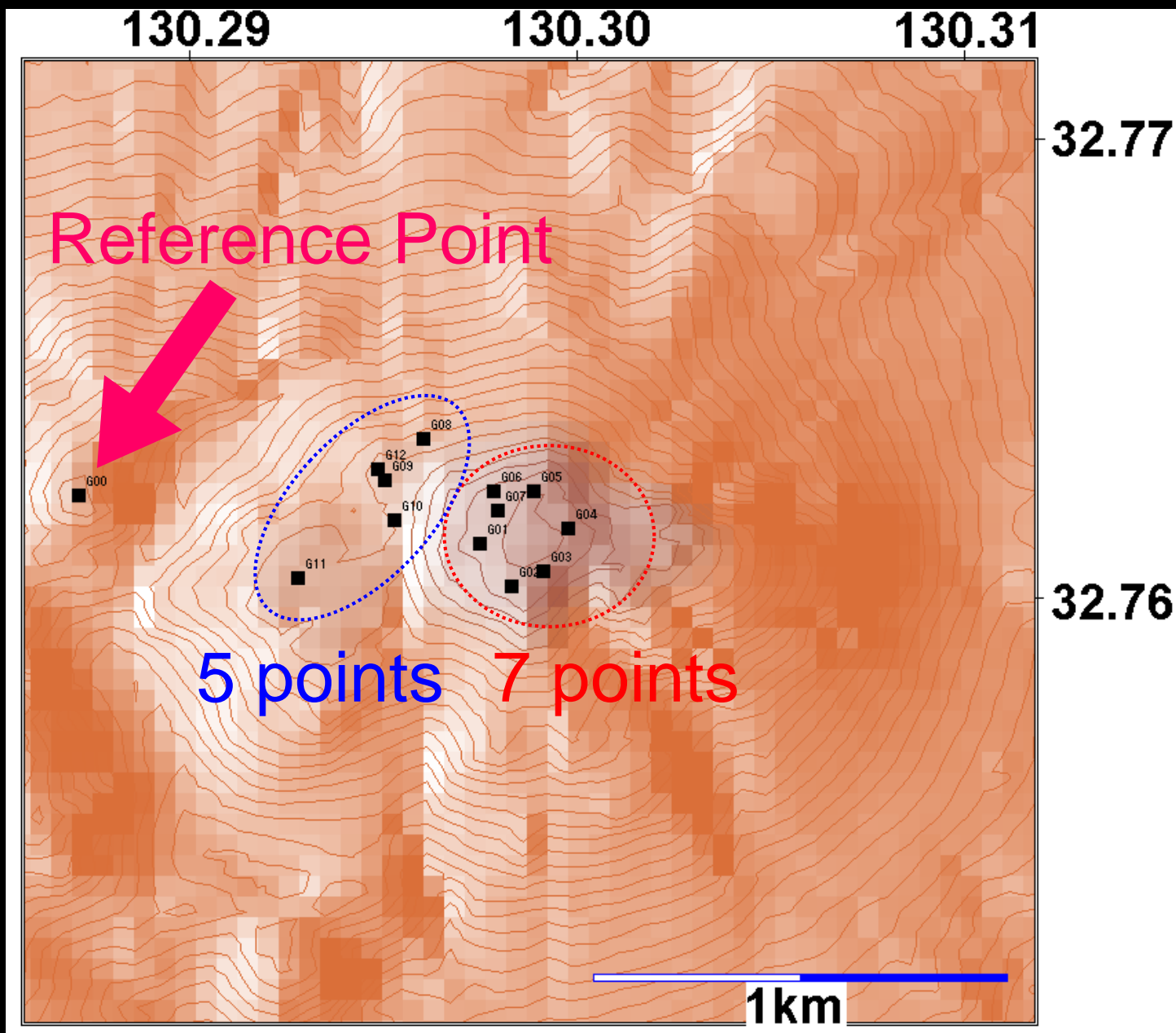
Deformation $\sim \pi$ = several cm
Both orbits



GPS observation

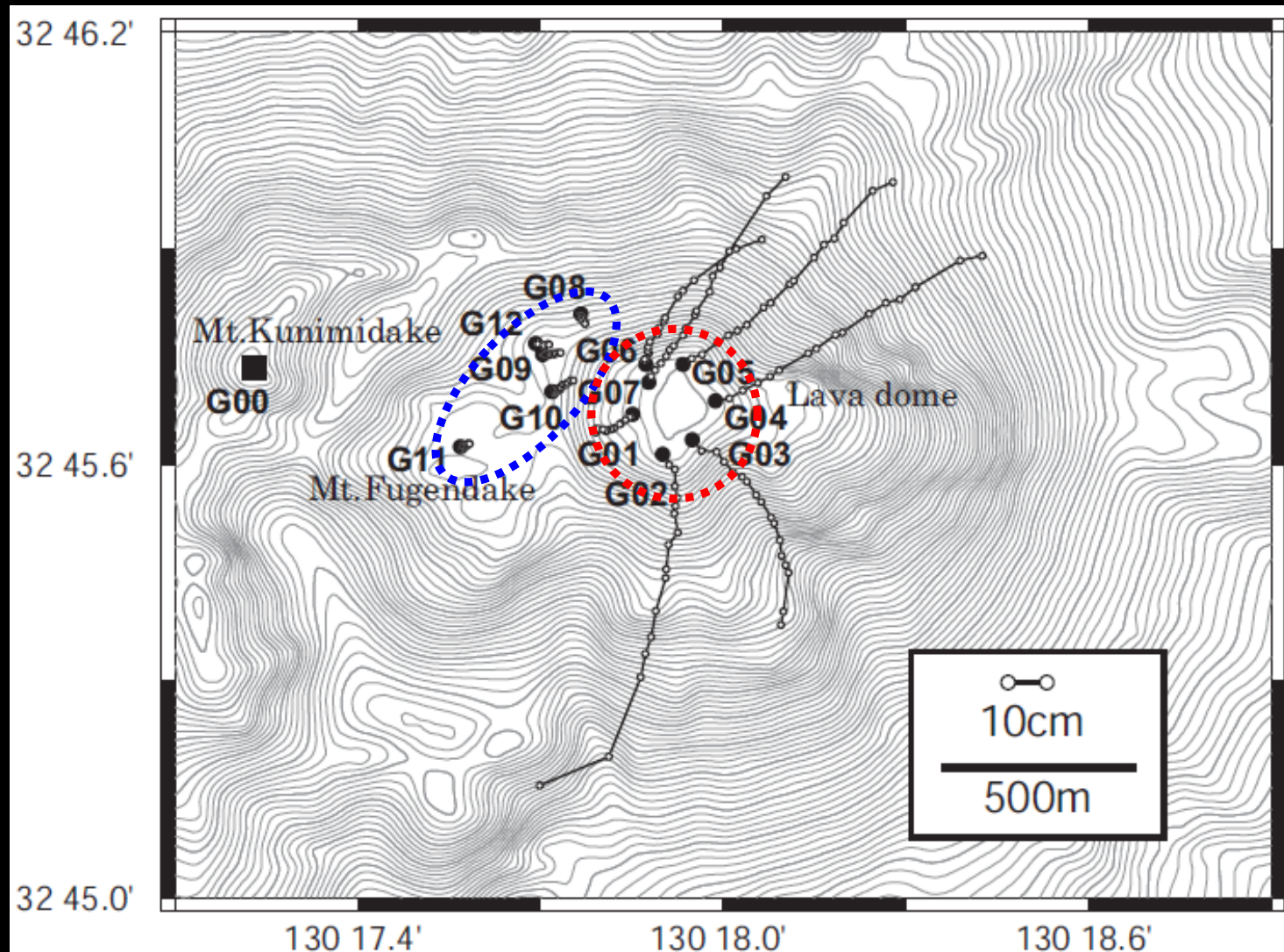
- Collaboration with Fukuoka District Meteorological Observatory, (former) Unzen-dake weather station, and MRI
- Using MG2110 (Furuno Electric CO.)
single band
campaign observation since September, 1999
- Approximation straight line between each data
(Nov,2004、 Sep,2006、 **Nov,2007**)
→ Deformation of photography interval (46days)

GPS observation



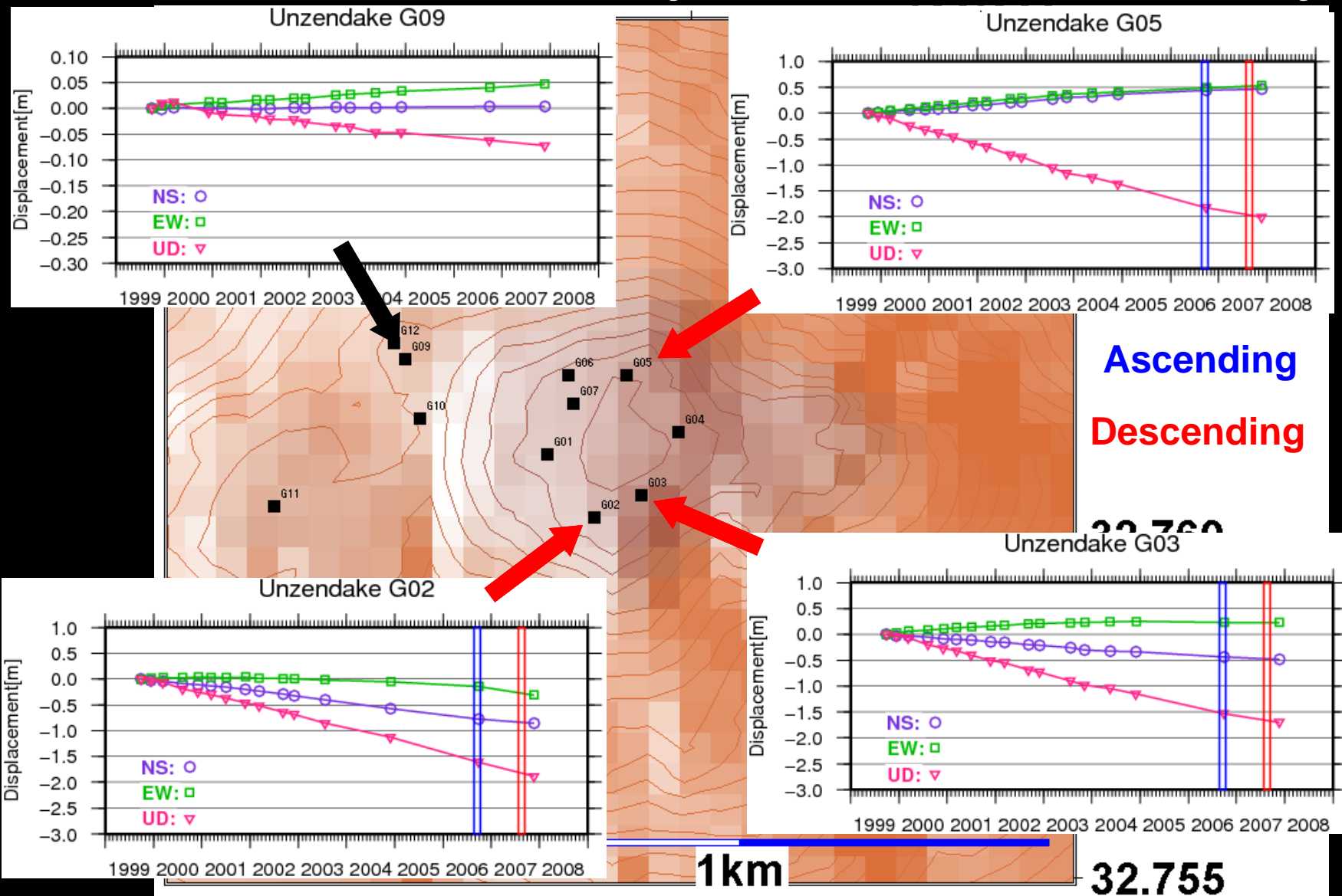
GPS observation

Since September, 1999 to November, 2007



GPS observation

Deformation velocity = several tens cm / year



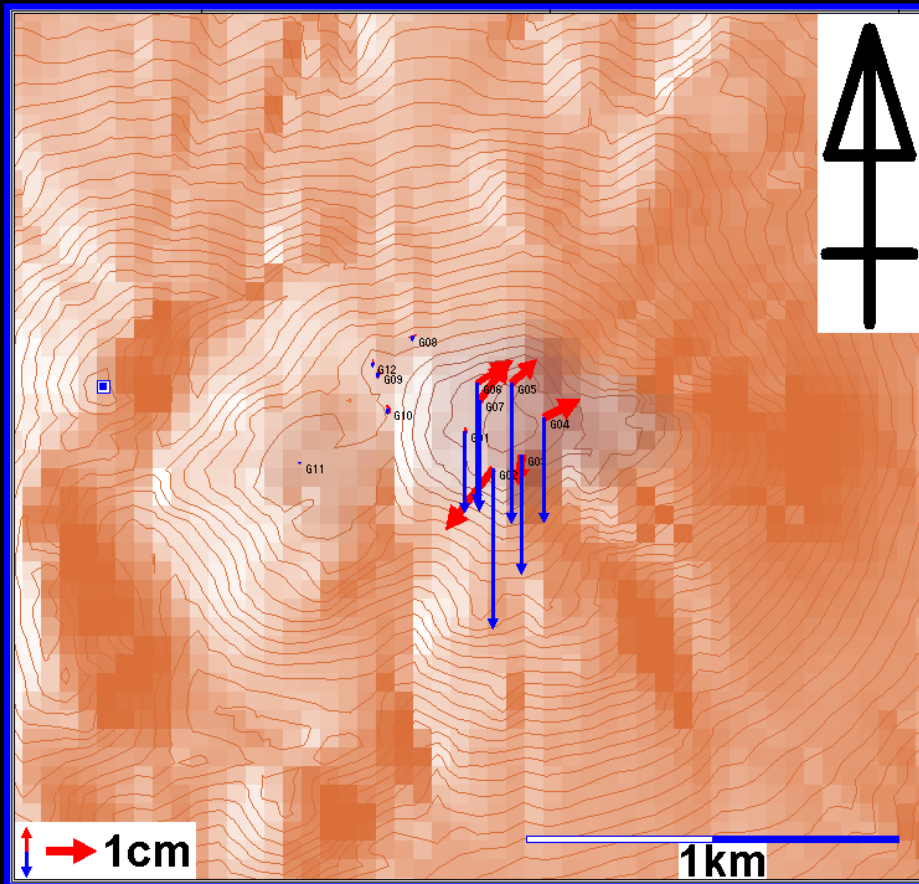
Ascending
Descending

1km

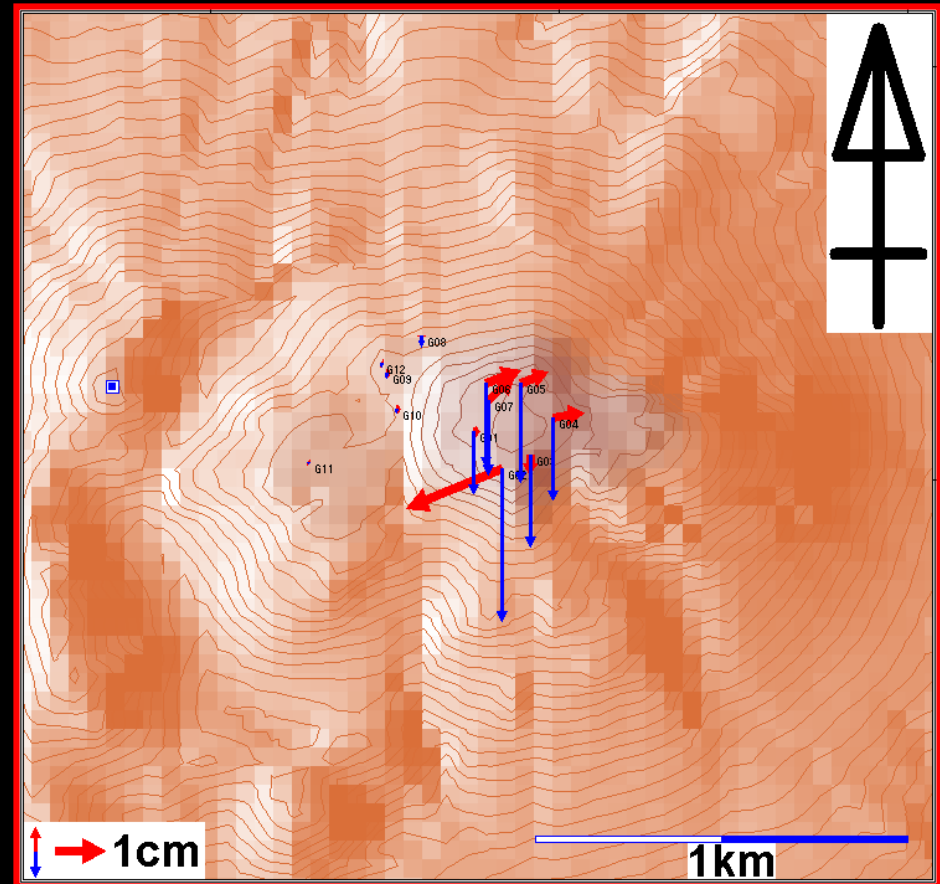
32.755

Deformation of Lava dome

Deformation velocity = several cm / 46days

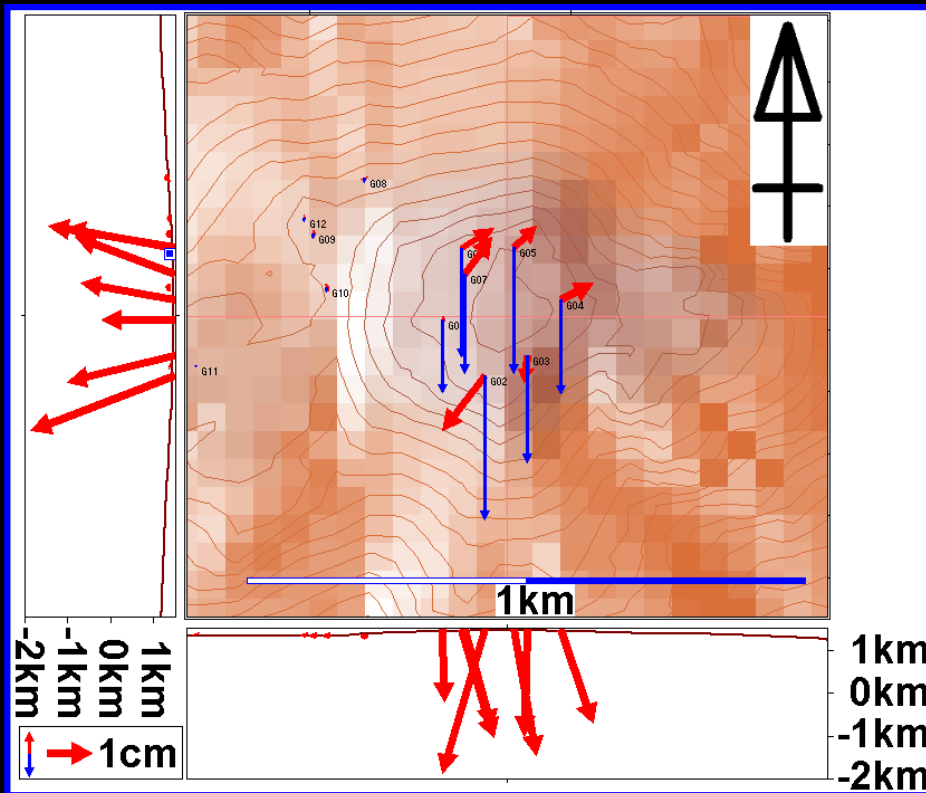


August 26-October 11, 2006
Ascending

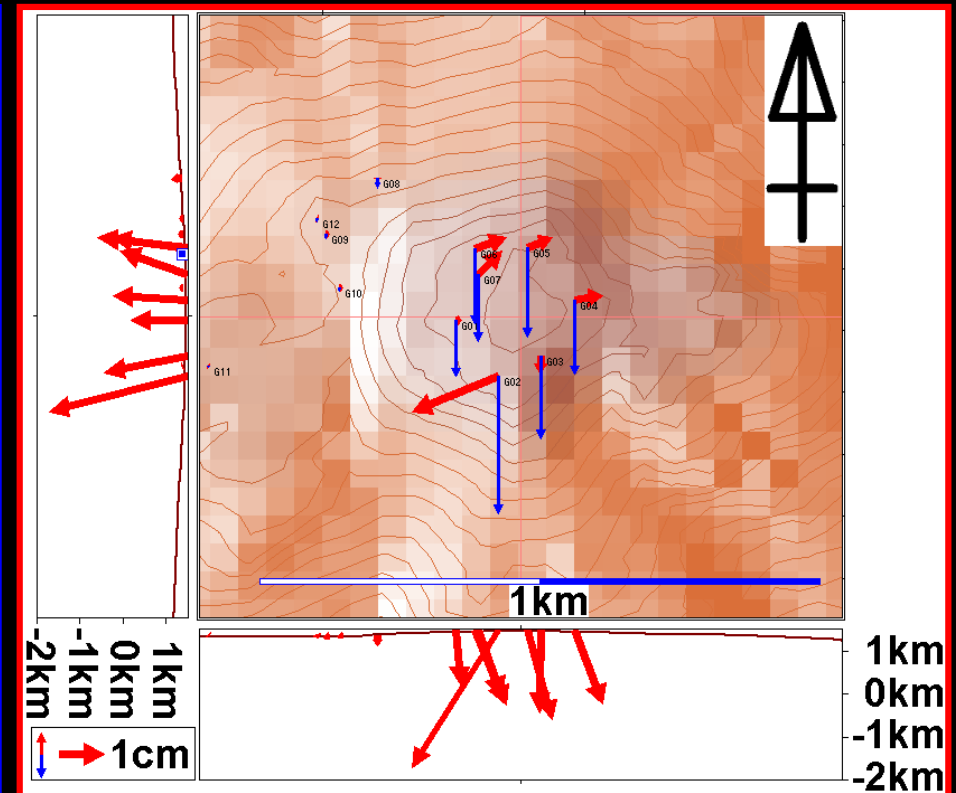


July 27-September 11, 2007
Descending

Deformation of Lava dome



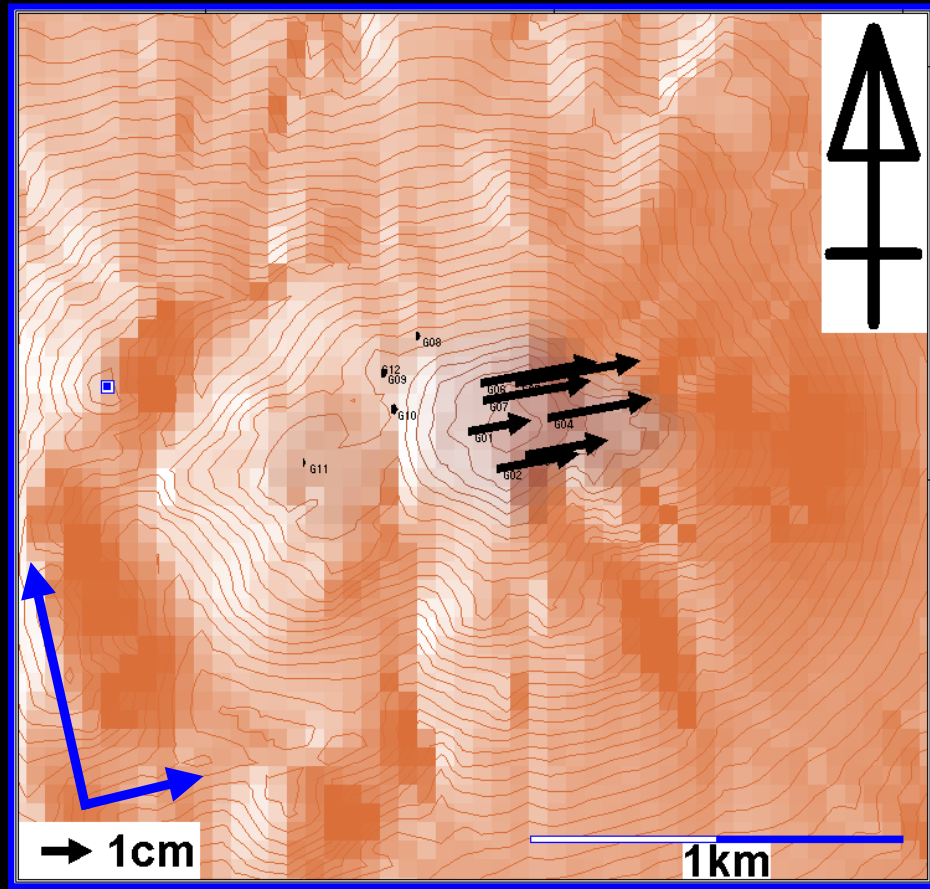
August 26-October 11, 2006
Ascending



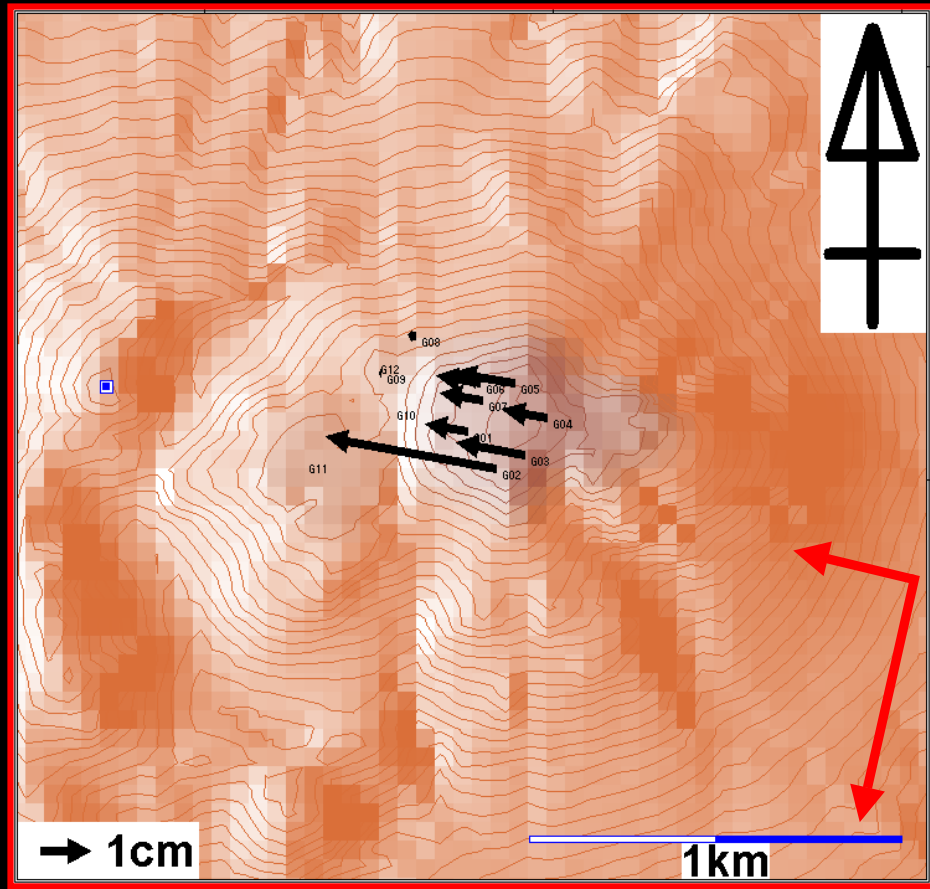
July 27-September 11, 2007
Descending

Deformation of Lava dome

Line-of-sight (slant-range)

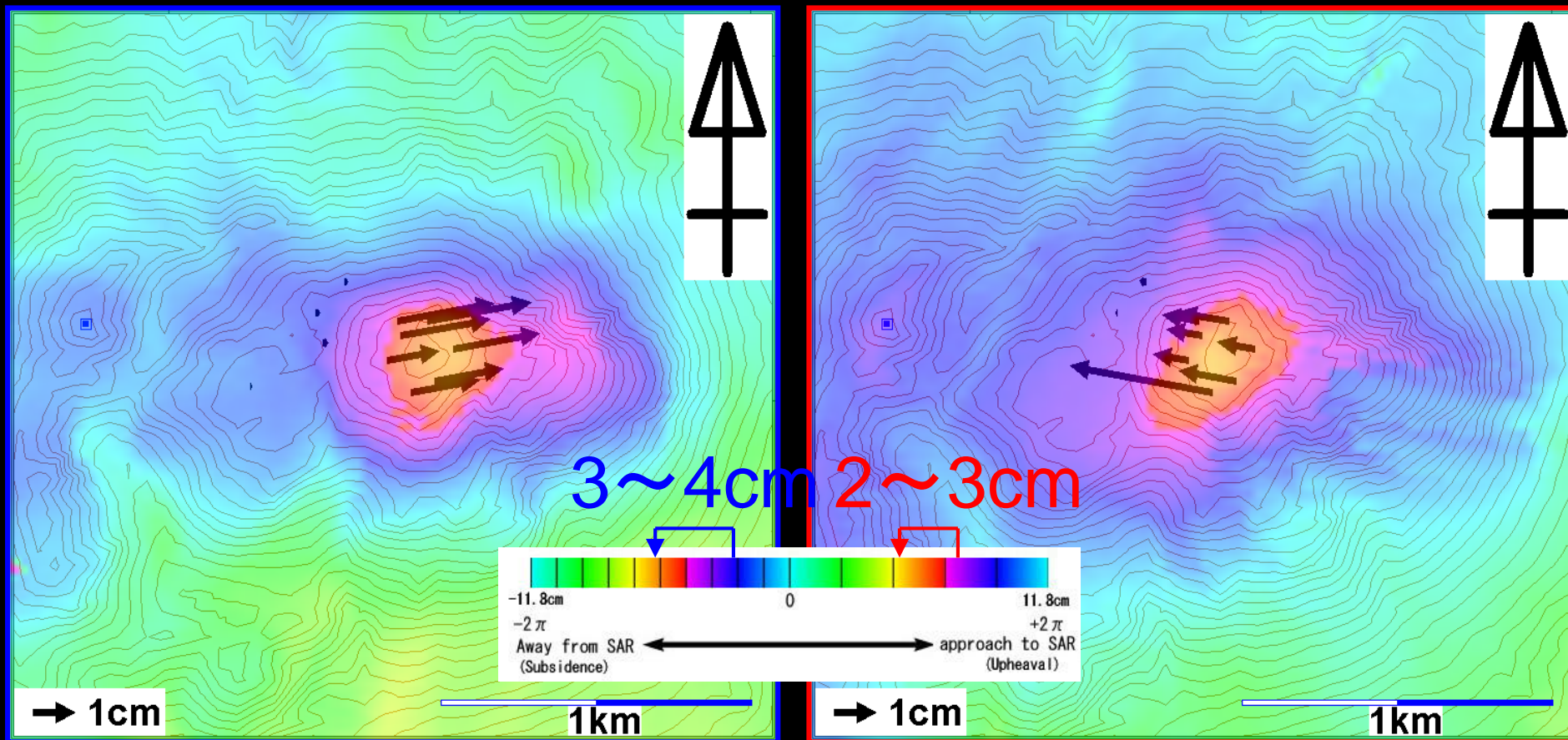


August 26-October 11, 2006
Ascending



July 27-September 11, 2007
Descending

Superimpose on vector map



August 26-October 11, 2006
Ascending

July 27-September 11, 2007
Descending



Conclusion

- ALOS PALSAR InSAR detected viscoelastic deformation of lava dome at Unzen volcano.
- Both interferometry images captured at Ascending and Descending showed that the deformation of lava dome in the direction that went away from the satellite.
- The result is consistent with GPS observation.



Acknowledgment

Some of PALSAR DATA using this report were prepared by ALOS “Daichi” Domestic Demonstration on Disaster Management Application that CCPVE (Coordinating Committee for Prediction of Volcanic Eruption) played a key role partly.

Also, some of PALSAR DATA were prepared by PIXEL (PALSAR Interferometry Consortium to Study our Evolving Land surface).

PALSAR DATA belongs to METI/JAXA.

We would like to thank Dr.Shimada (JAXA) for the use of his SIGMA-SAR software.



Photo 2007/11/23
From Shimabara Fukko Arena