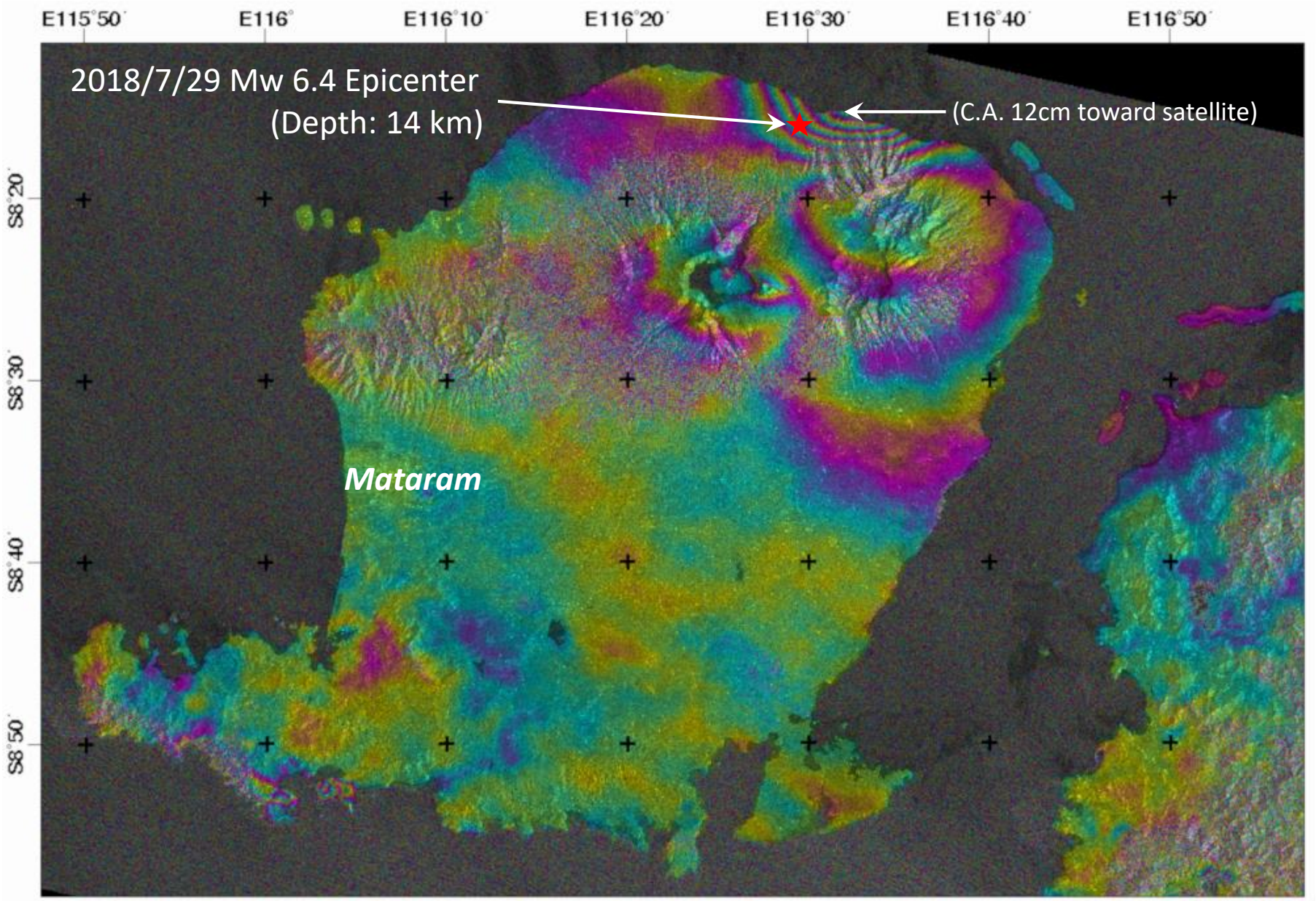
Lombok Earthquakes
Preliminary Results of the Sentinel-1 DInSAR Analysis

A significant earthquake of Mw 6.9 hit the Lombok Island on August 5th, following the foreshock of Mw 6.4 earthquake on July 29th. Preliminary results of Sentinel-1 DInSAR analysis show the displacement patterns of the surface caused by these earthquakes. The displacement is projected on the Line of Sight (LOS) direction of the radar (viewing from S12E with the elevation of about 54 deg.), and its amount is relative to that at the Mataram city. One fringe (color cycle) corresponds to the LOS displacement of 2.8 cm. Northeastern part of the Island was mainly affected by the foreshock with a maximum LOS shortening (suggesting the uplift) of 12 cm along the NE coastline (Figure 1). The northern half of the island was significantly deformed by the mainshock (Figure 2), causing a maximum LOS shortening of 30 cm at the northwestern edge of the island, whilst E-W trending zone of LOS extension (suggesting the subsidence) traversing the Island was confirmed with a maximum extension of 12 cm at Mt. Rinjani.



Sentinel-1 DInSAR
LOS Displacement

2018/7/18 – 2018/7/30

Toward Satellite
(Uplift)

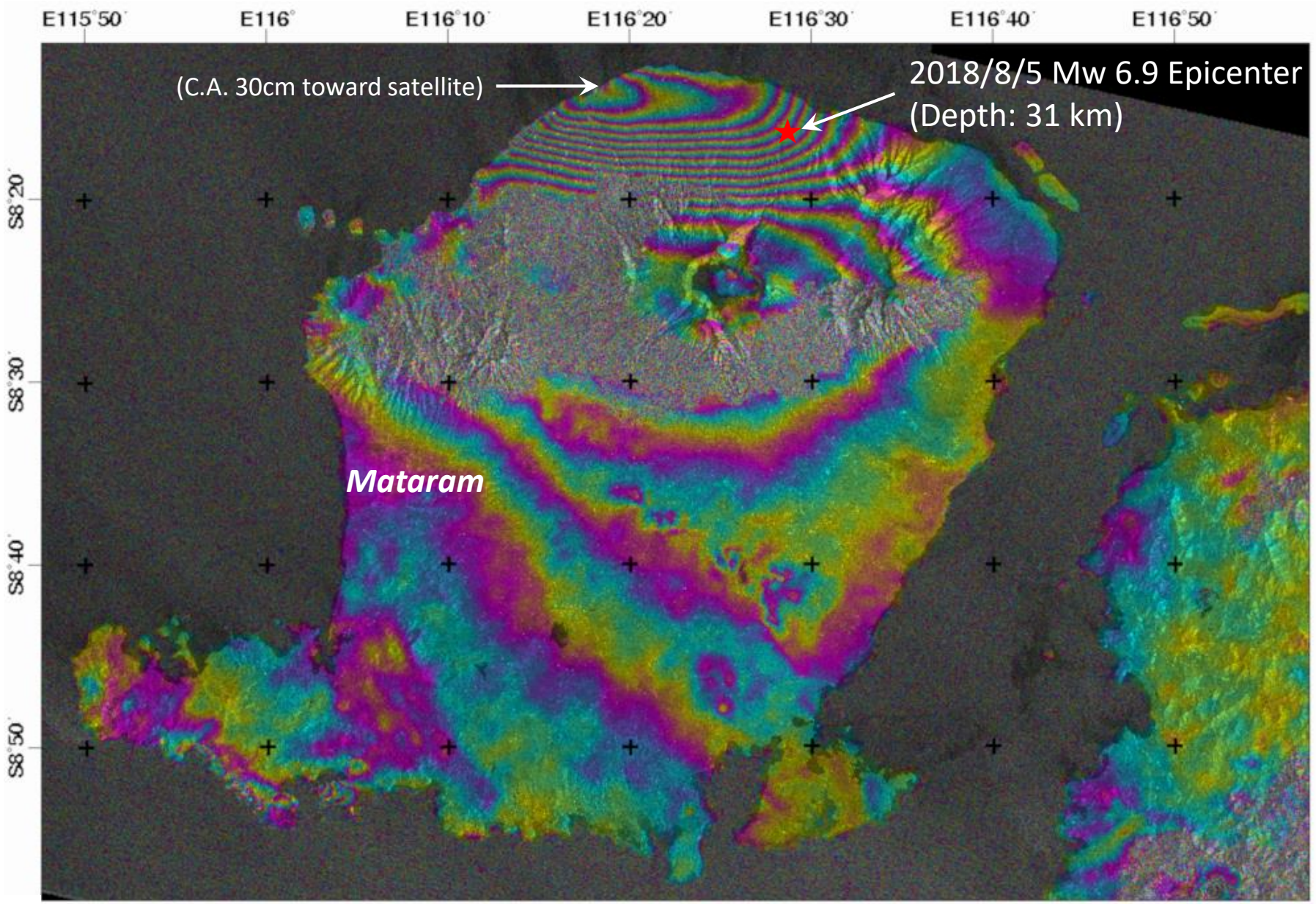
2.8cm

Away from Satellite
(Subsidence)

LOS Direction

Copernicus Sentinel Data [2018]

Figure 1



Sentinel-1 DInSAR
LOS Displacement

2018/7/30 – 2018/8/5

Toward Satellite
(Uplift)

2.8cm

Away from Satellite
(Subsidence)

LOS Direction

Copernicus Sentinel Data [2018]

Figure 2

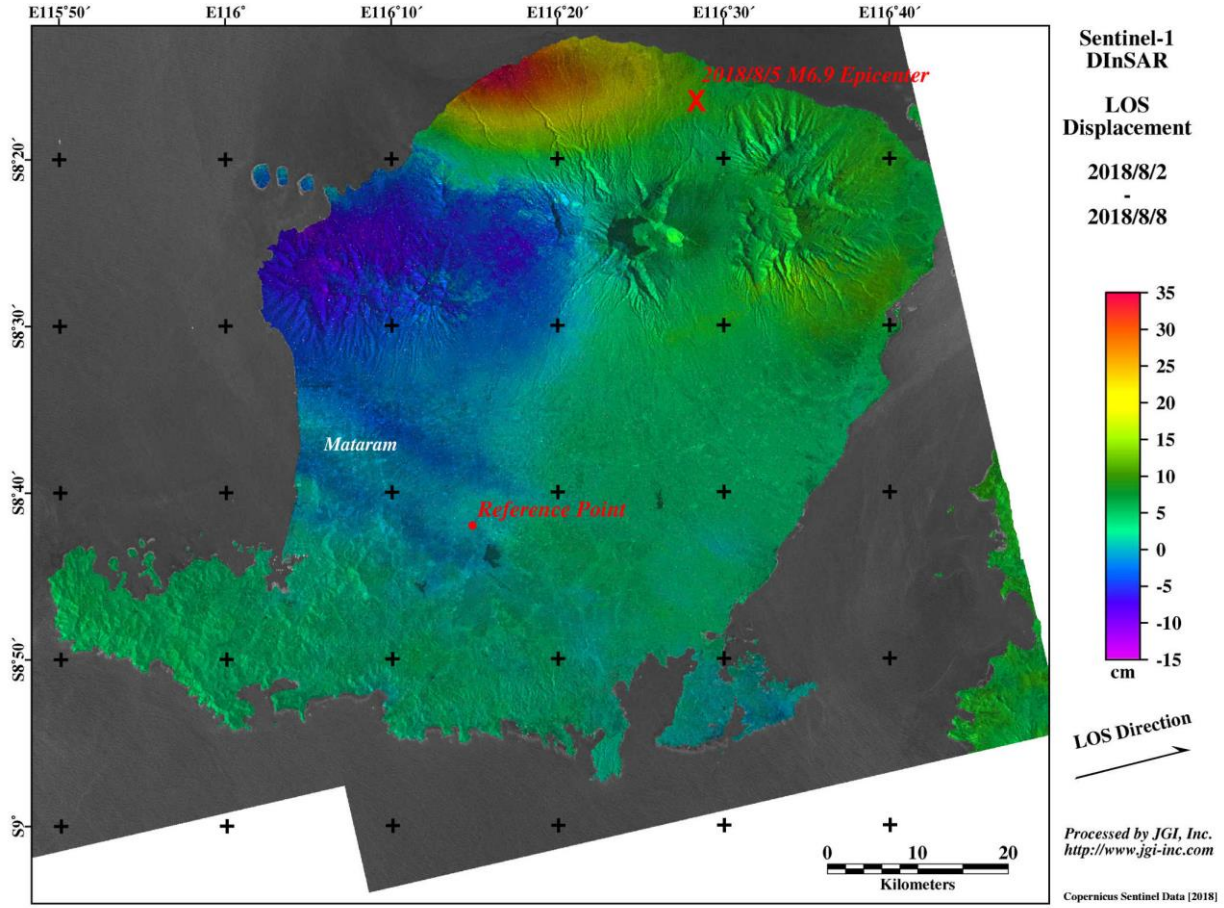


Figure 3 LOS displacement by the ascending (S->N) pair.

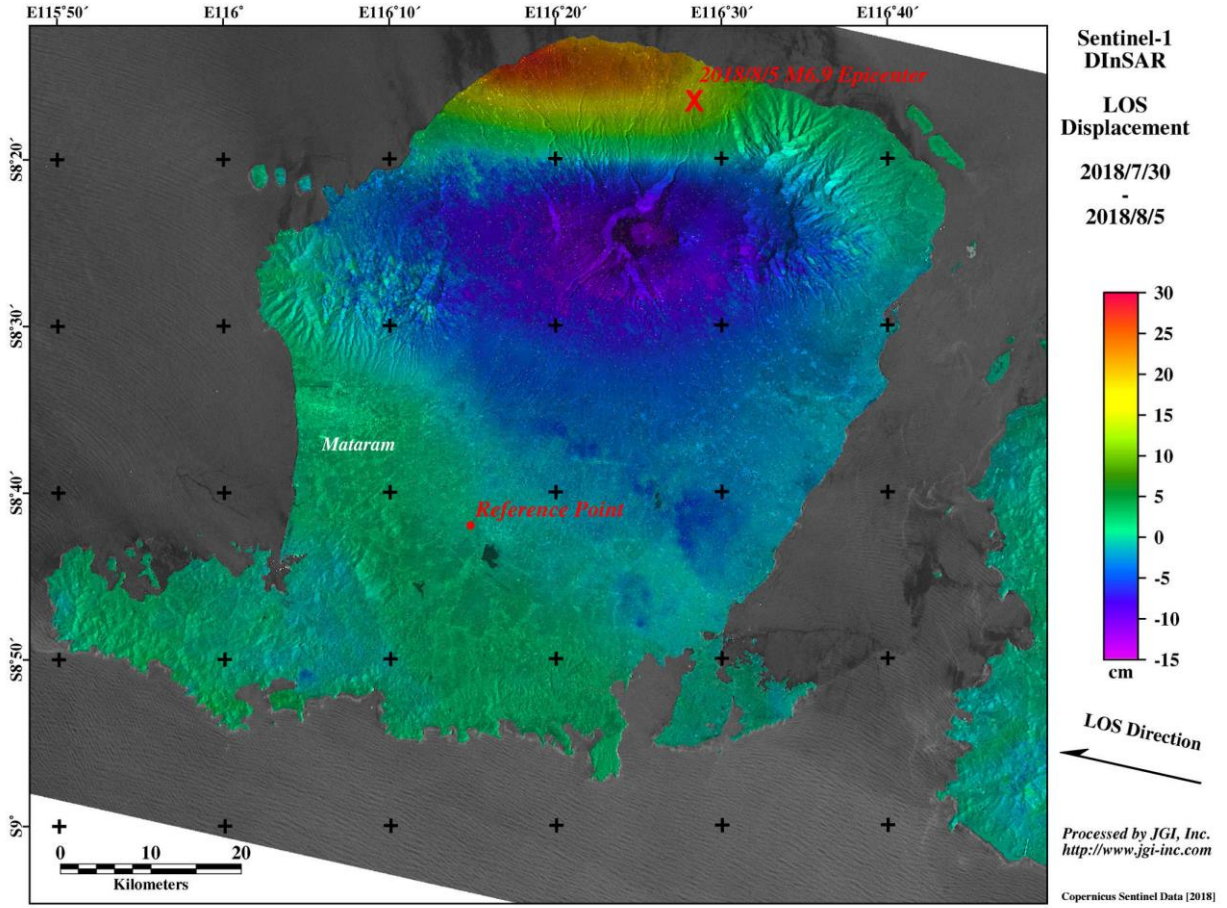


Figure 4 LOS Displacement by the descending (N -> S) pair.

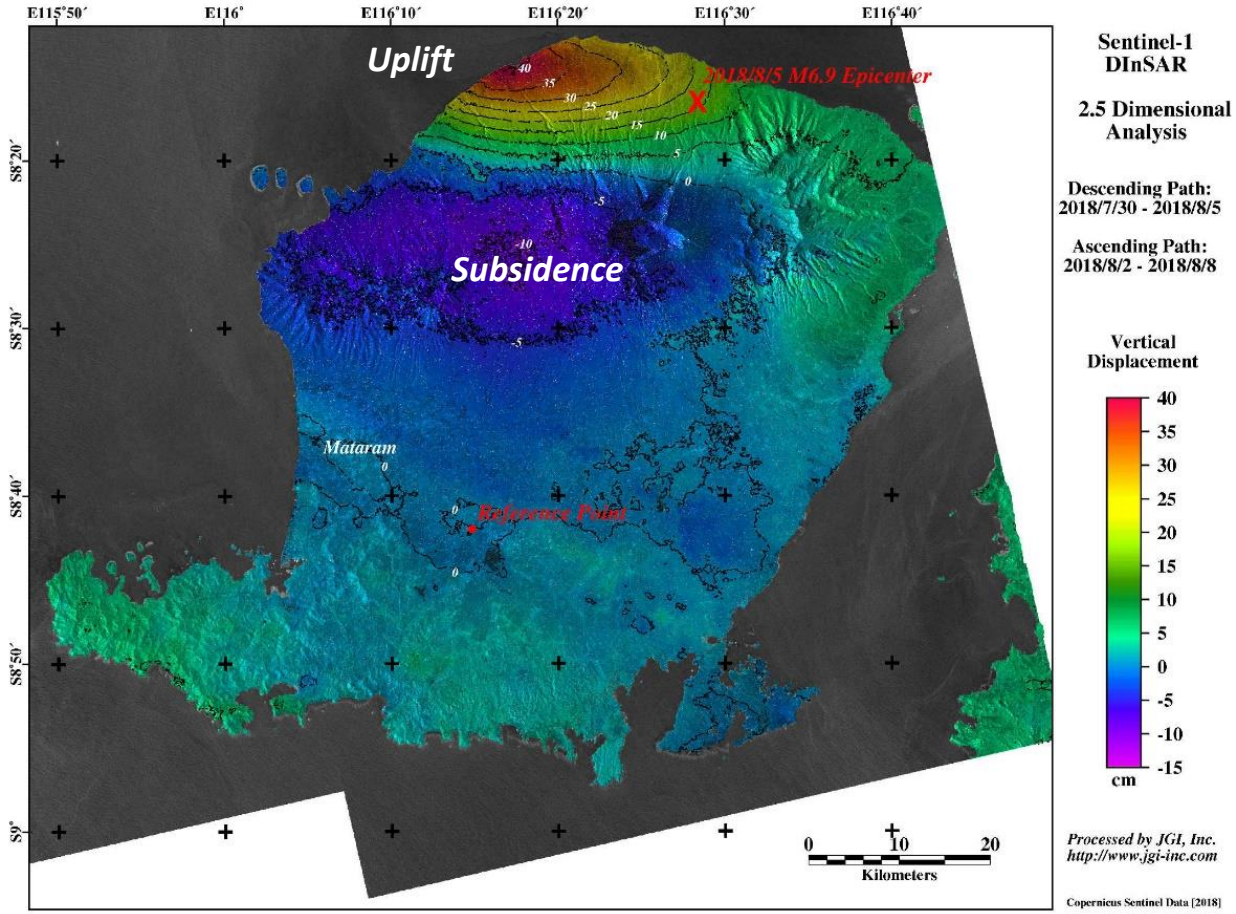


Figure 5 Vertical displacement by 2.5 dimensional analysis.

Significant deformation of the northern half of the Lombok Island caused by the Mw 6.9 mainshock on August 5th was revealed by the Sentinel-1 DInSAR analysis. Maximum uplift of about 42cm at the northwestern edge of the Island was detected from 2.5 dimensional analysis of Sentinel-1 DInSAR results (Figures 2, 3 and 4), whilst E-W trending subsidence zone traversing the Island was confirmed to the south of the uplift zone. Note that the displacement amount is relative to that at the reference point.

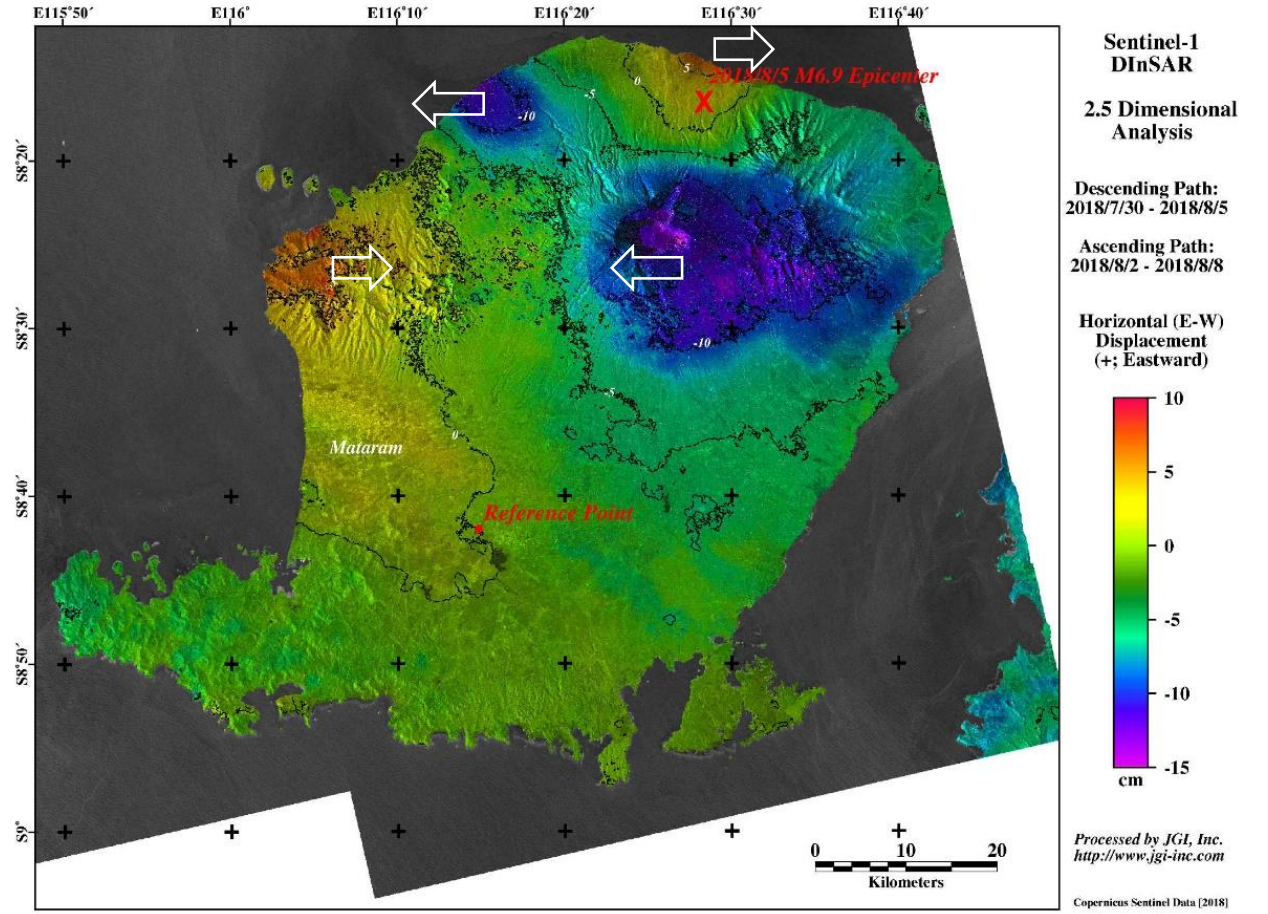
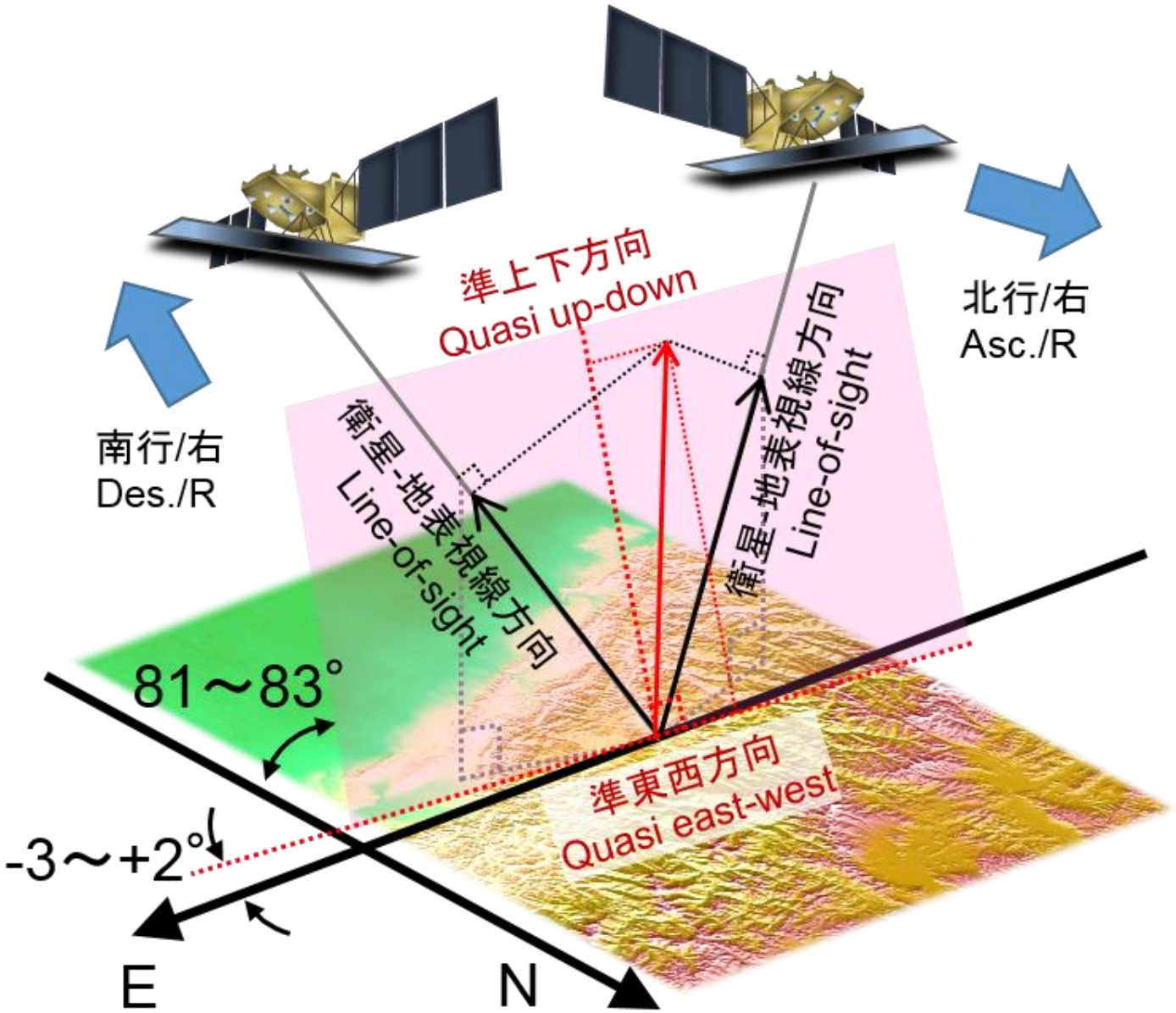


Figure 6 Horizontal(E-W) displacement by 2.5 dimensional analysis.

The eastward displacement (shown by the positive value) was detected around the western part of the EW trending subsidence zone (see Figure 5), whilst the westward displacement around the eastern part of the zone as well as no displacement around the center of the zone. This can be interpreted as follows; the subsidence of the zone forms the depression, and the eastern / western parts of the zone are slightly moved toward the center along the slopes. To the contrary, in the uplift zone to the north, the relative steep SW-dipping slope might be formed on SW flank of the zone by the uplift, and the surface may be slightly moved toward SW. Thus the westward displacement was detected on SW flank because 2.5 dimensional analysis can only detect the movement projected in EW direction. Considering the magnitude of the displacement and the scale of the deformation, it is suggested that the earthquake is caused by the movement of the steep N-dipping, EW striking reverse fault which may traverse the Island. Note that the displacement amount is relative to that at the reference point.



Geometry of 2.5 Dimensional Analysis
http://www.gsi.go.jp/common/000105855.png