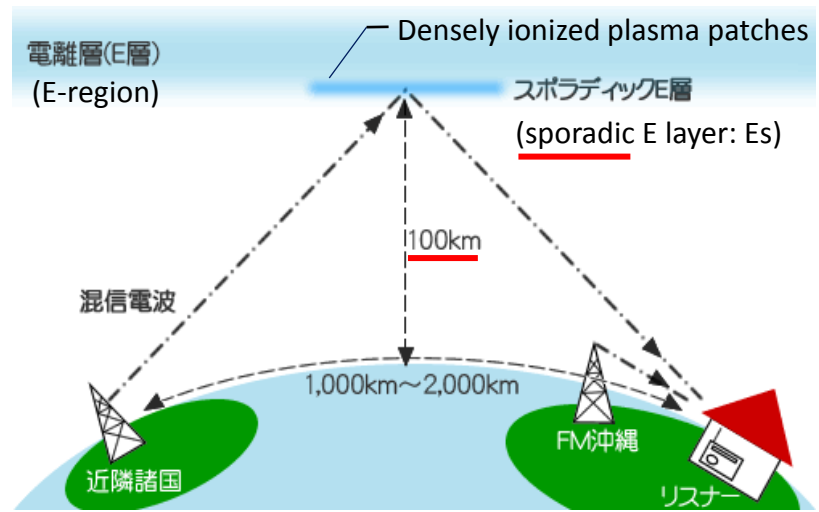


Detecting mid-latitude sporadic E layer by InSAR

Takato Suzuki, Masato Furuya, Kousuke Heki, Jun Maeda

Hokkaido Univ.

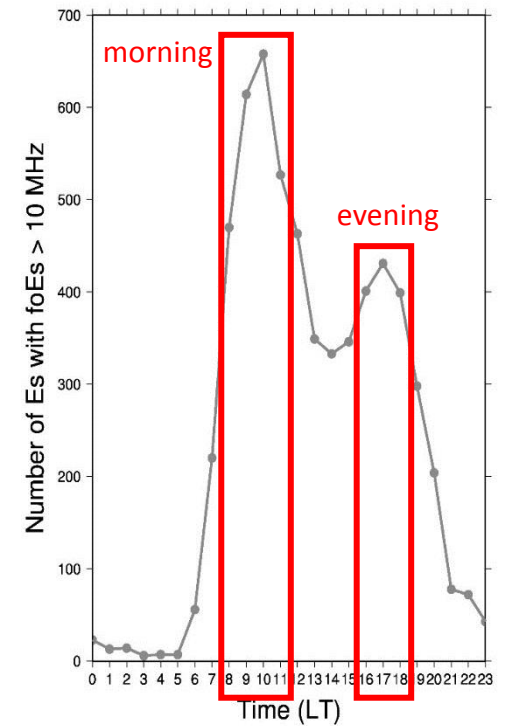
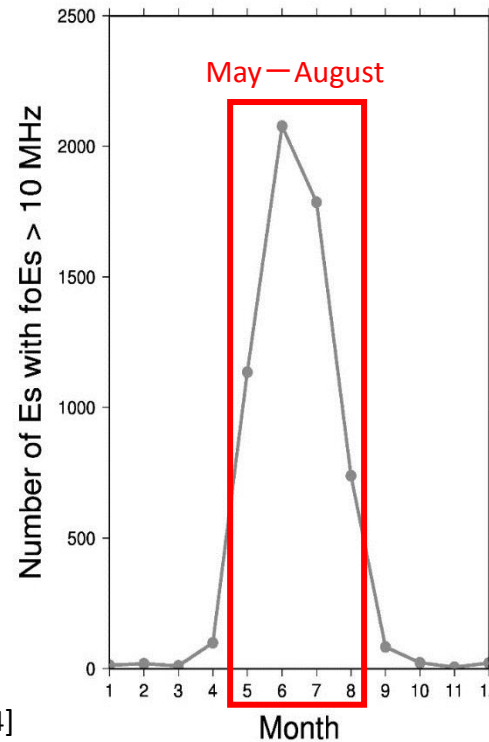
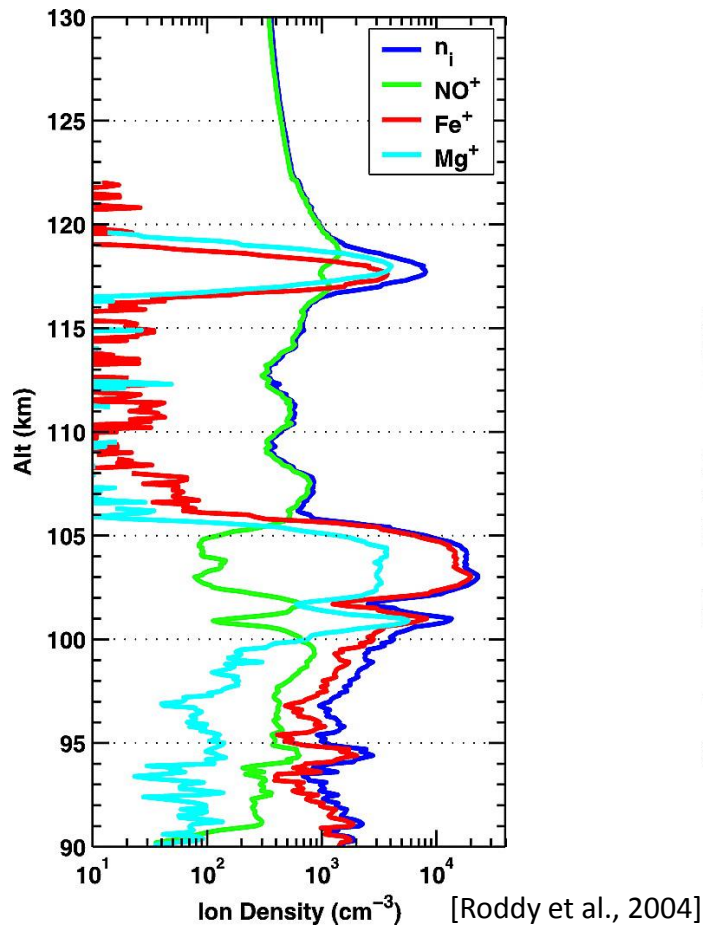
Sporadic E layer (Es)



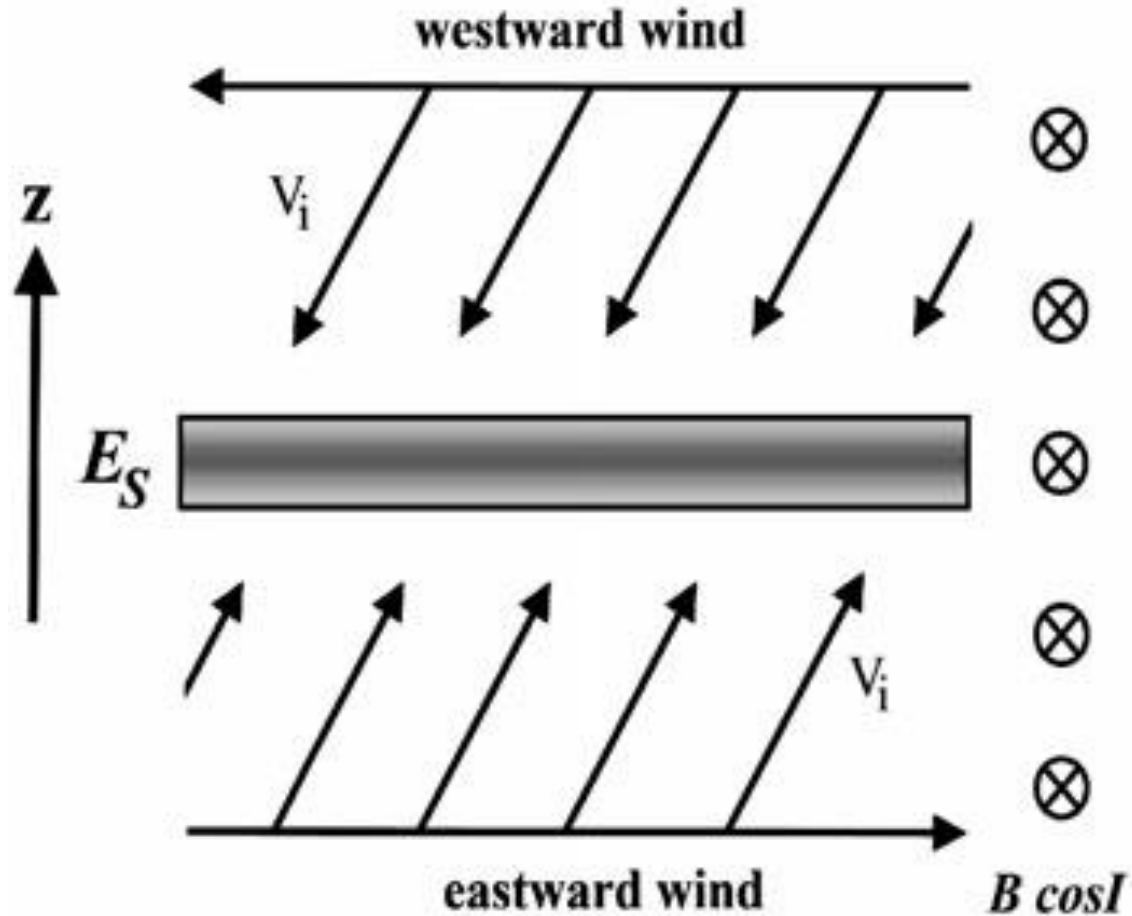
(<http://www.fmokinawa.co.jp/espo/>)

Kokubunji 2003-2012

Kokubunji 2003-2012

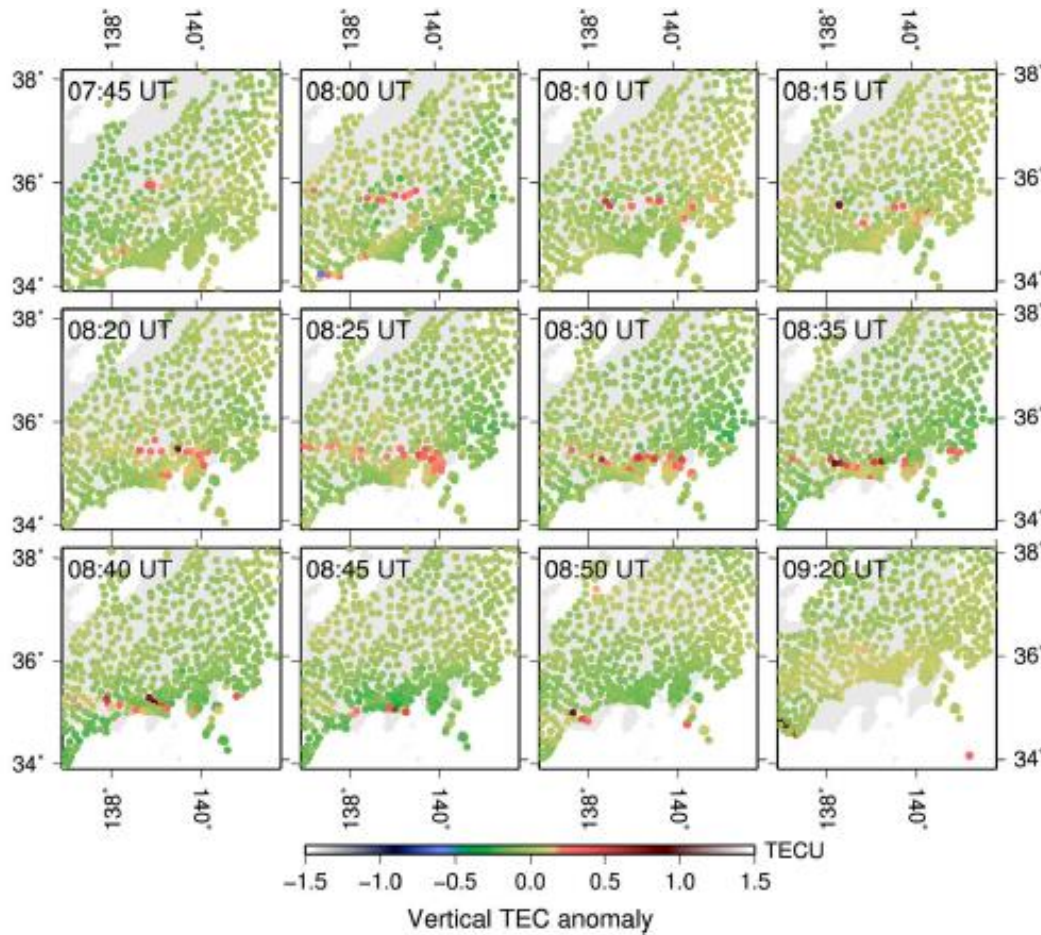


Wind shear theory

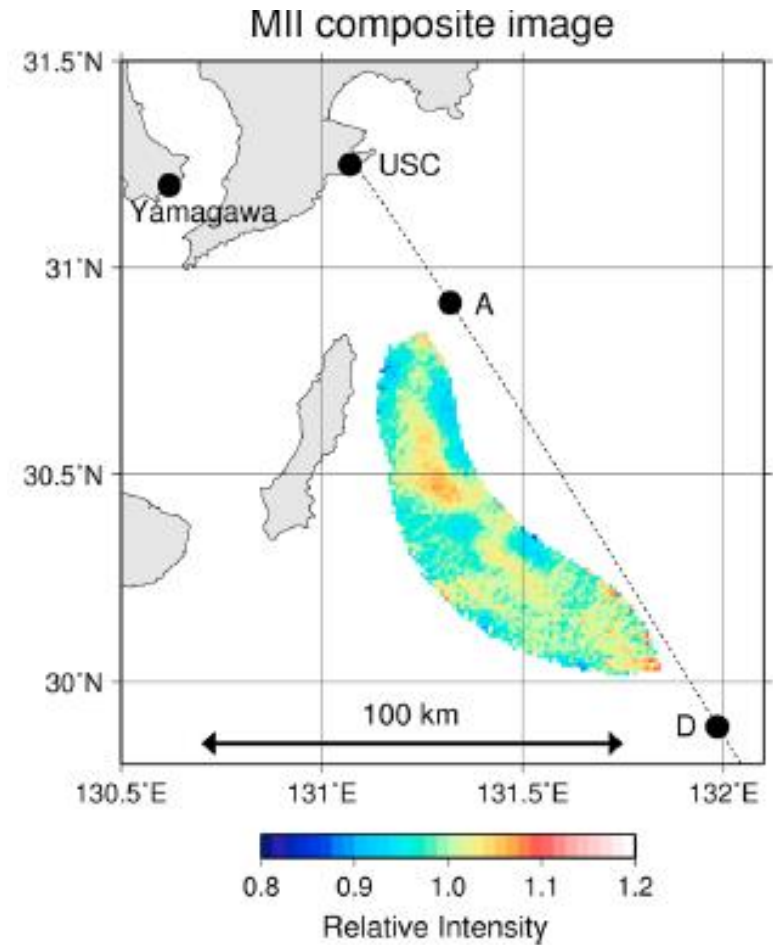


[Haldoupis, 2004]

Objective of this study



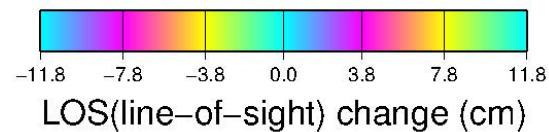
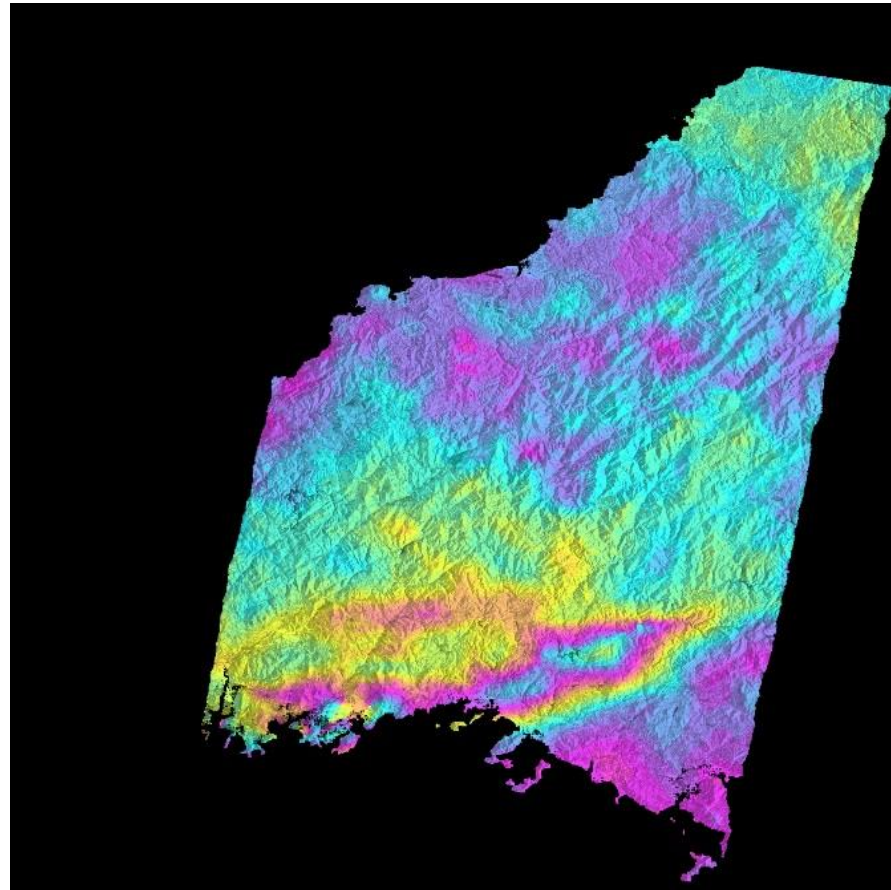
GNSS-TEC map
[Maeda and Heki, 2014]



Rocket observation
[Kurihara et al., 2010]

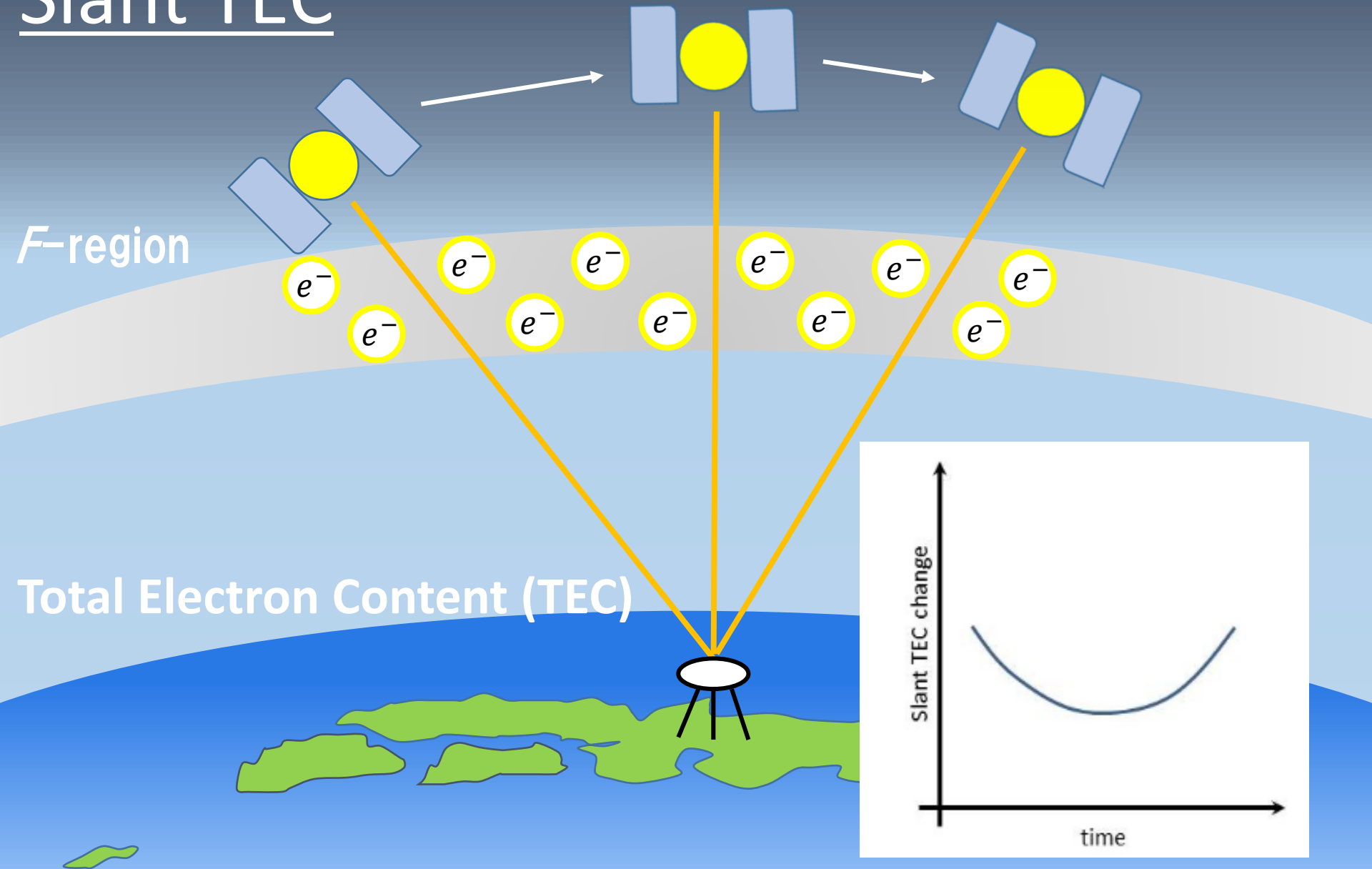
We want to know the morphology of Es
in more detail.

Es on the SAR image (ALOS-1)

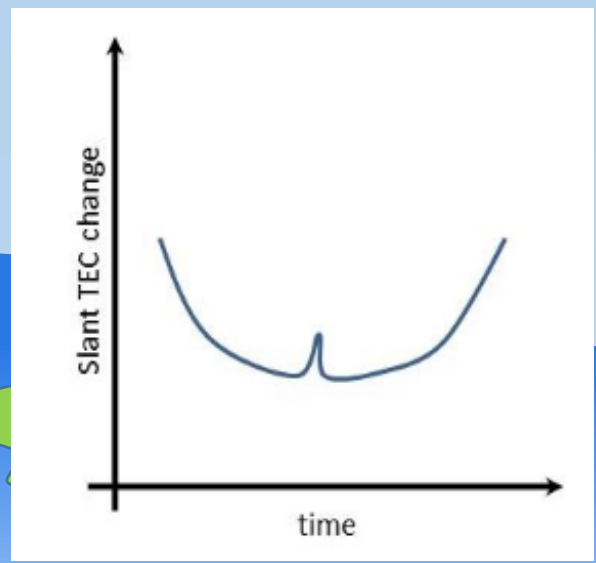
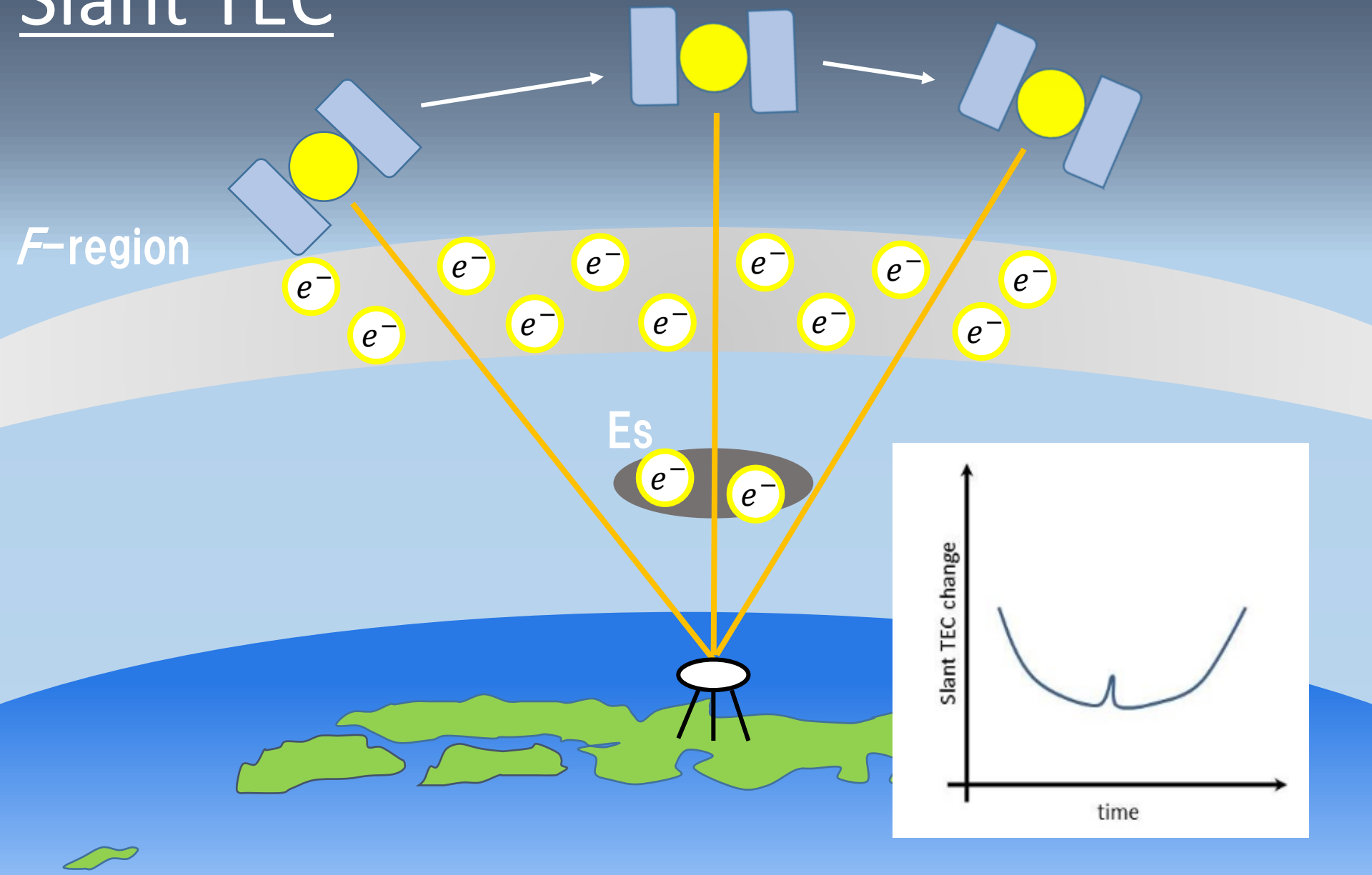


2009.03.28(Master)_2009.06.28(Slave)

Slant TEC



Slant TEC

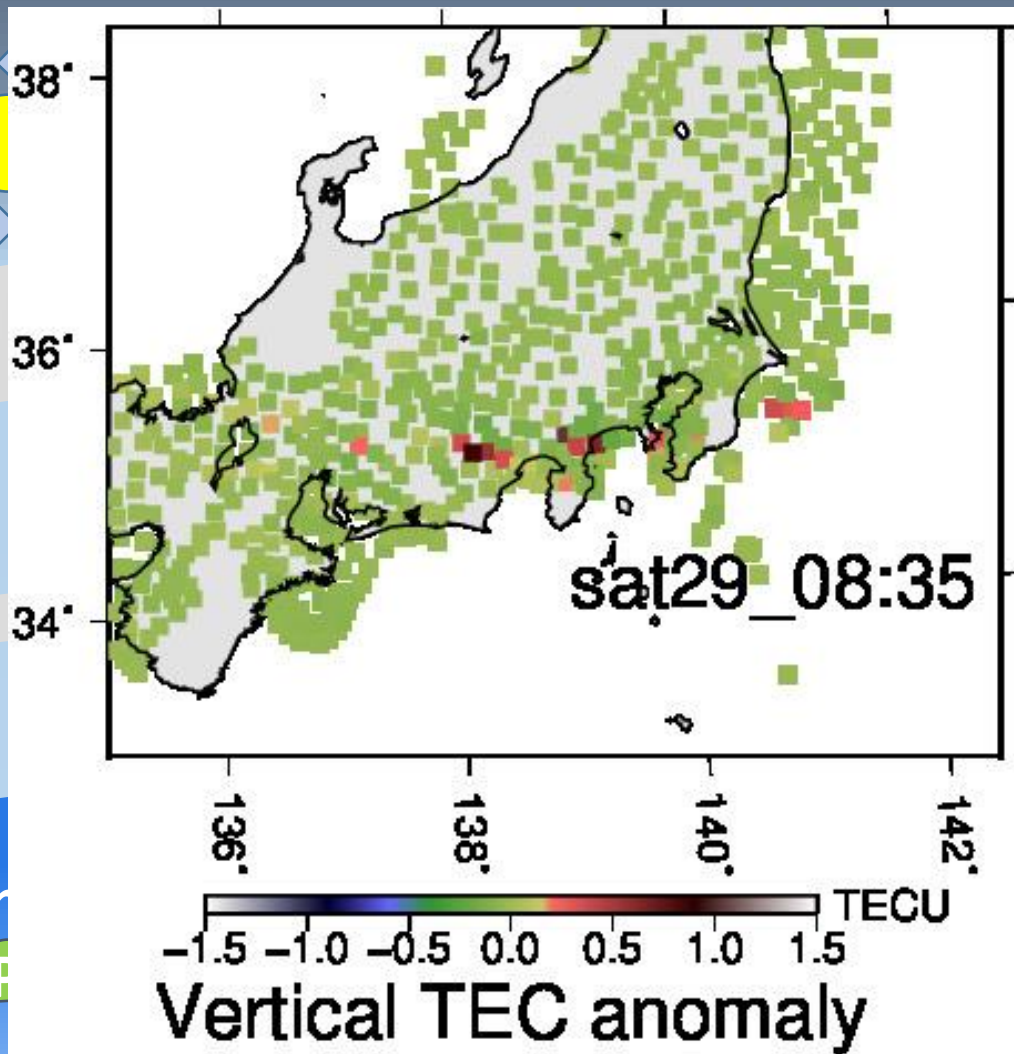


GNSS-TEC

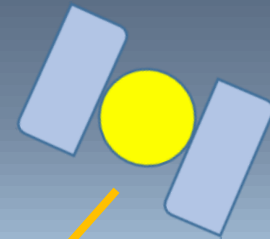
F-region

E-region

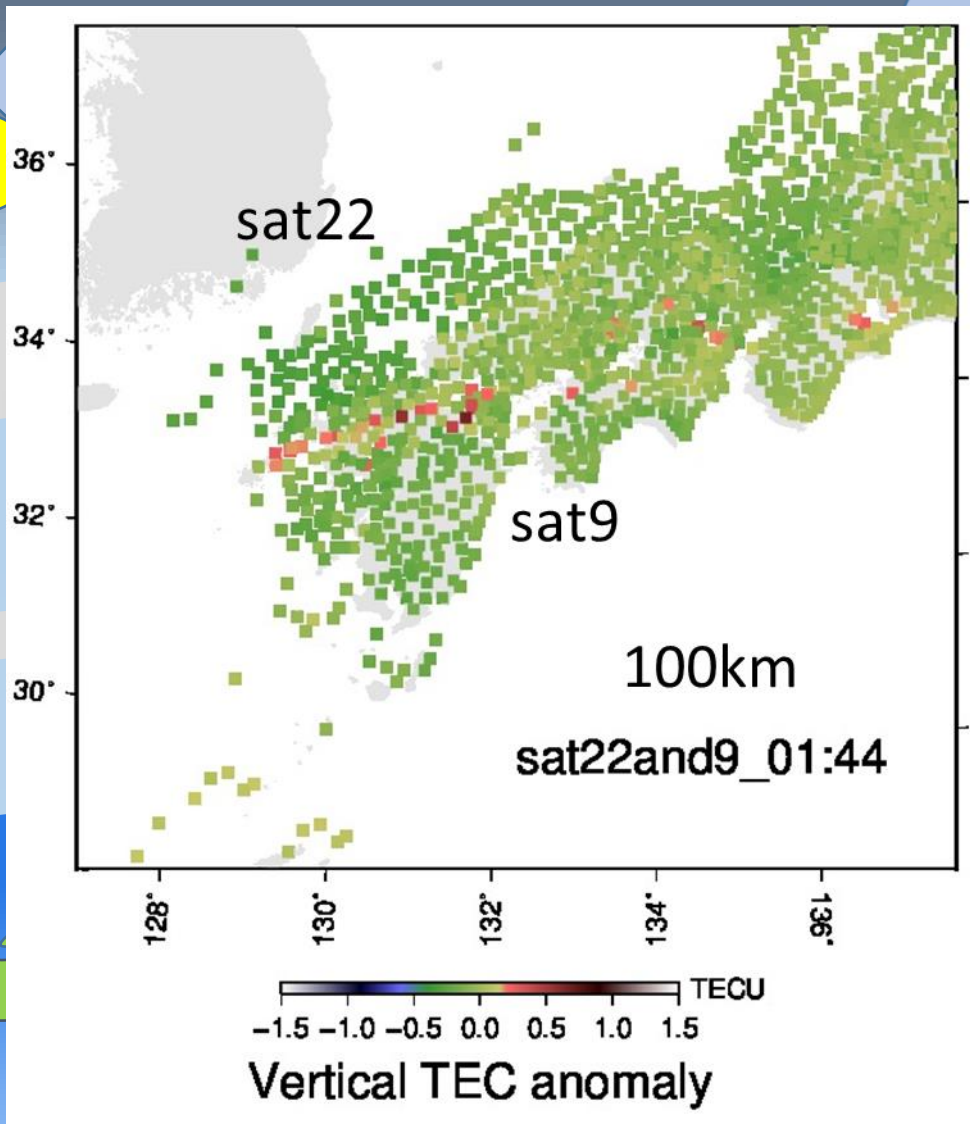
Sub-ionospheric
(SIP)



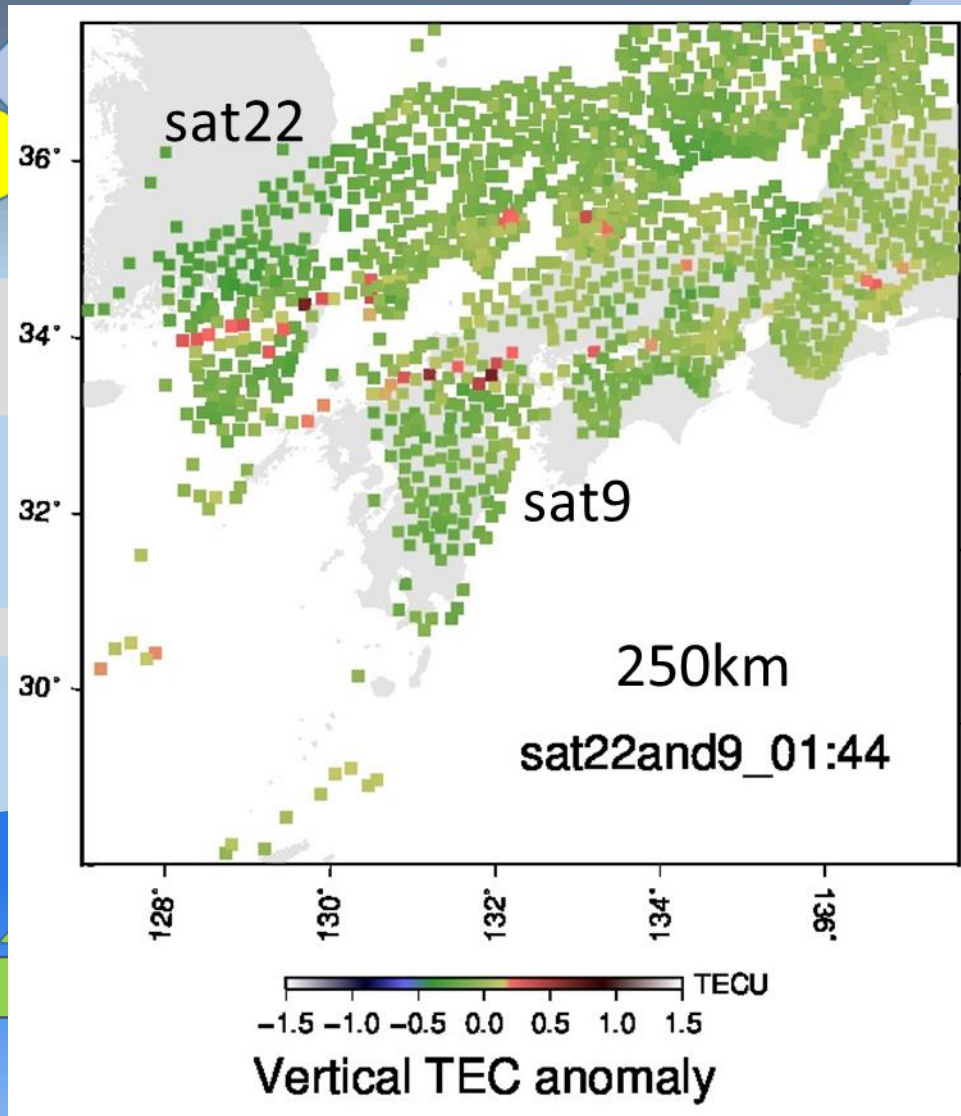
Penetration Point
(PP)



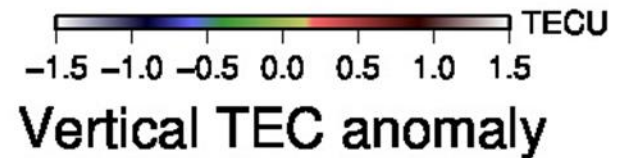
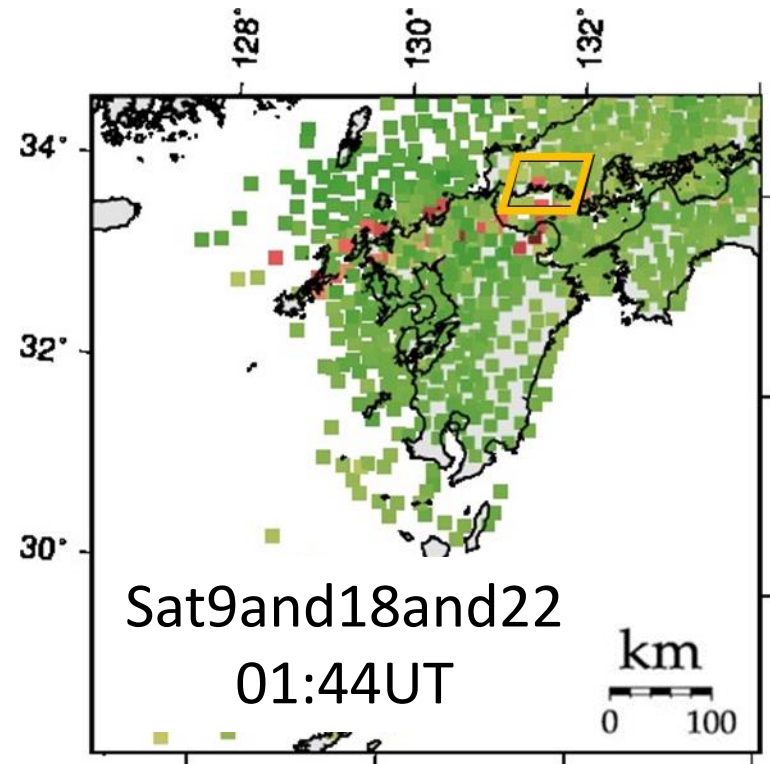
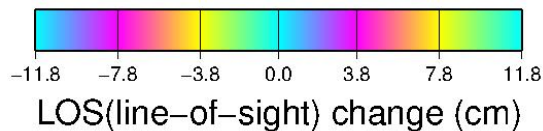
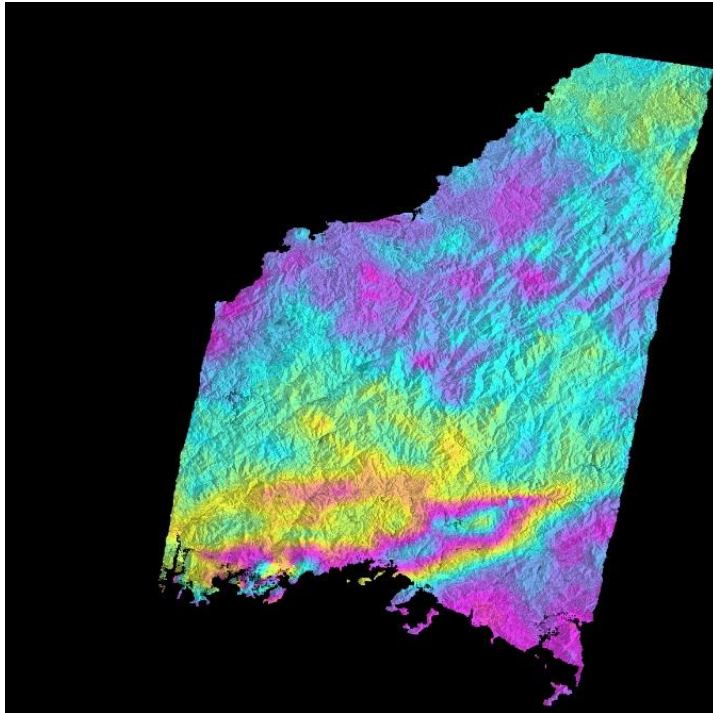
Height constraint (Correct height)



Height constraint (Wrong height)



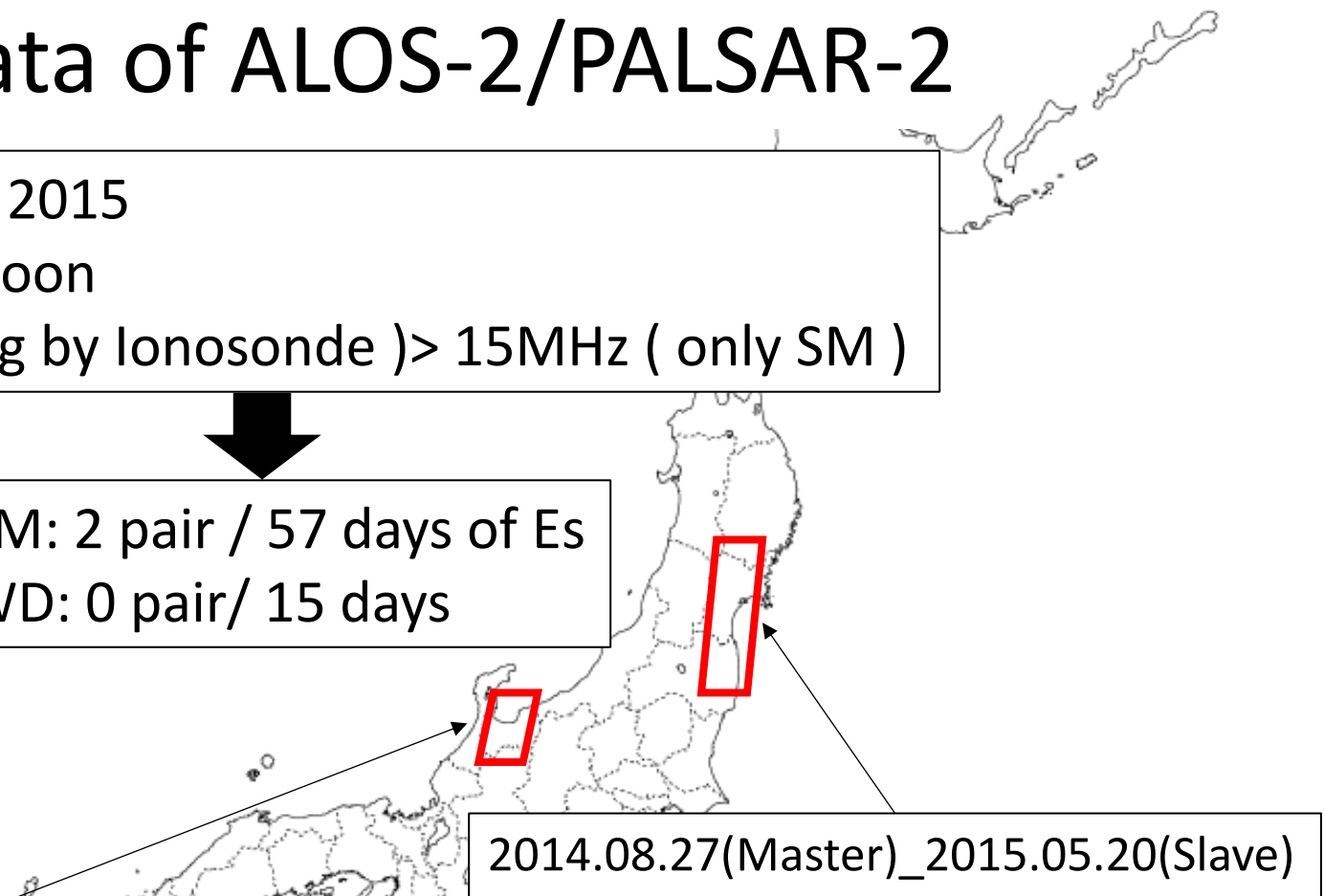
Es on the InSAR image (ALOS-1/PALSAR)



2009.03.28(Master)_2009.06.28(Slave)

Data of ALOS-2/PALSAR-2

- May-August in 2015
- Morning and noon
- foEs (observing by Ionosonde) > 15MHz (only SM)

- 
- SM: 2 pair / 57 days of Es
▪ WD: 0 pair/ 15 days

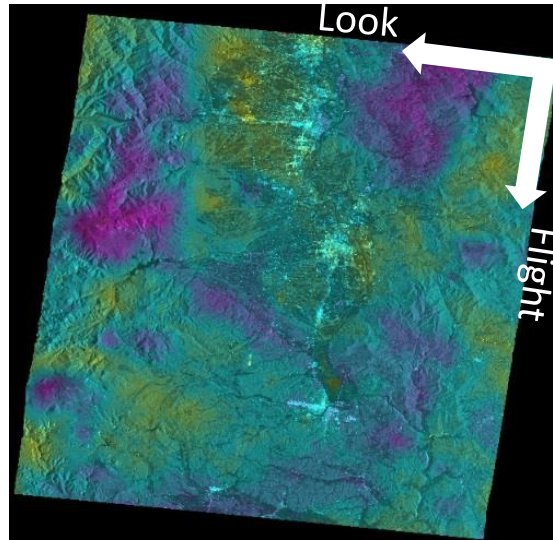
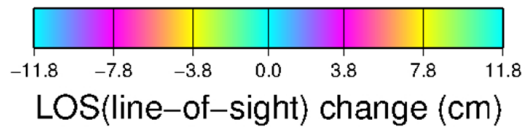
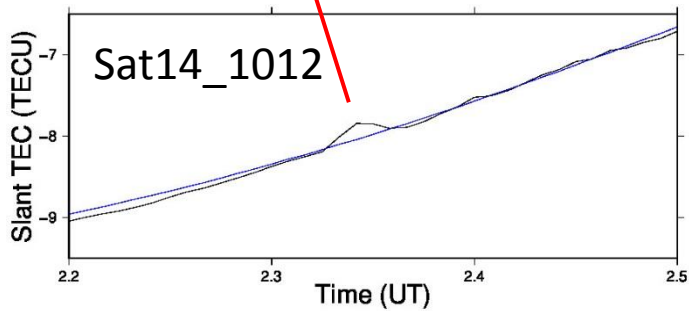
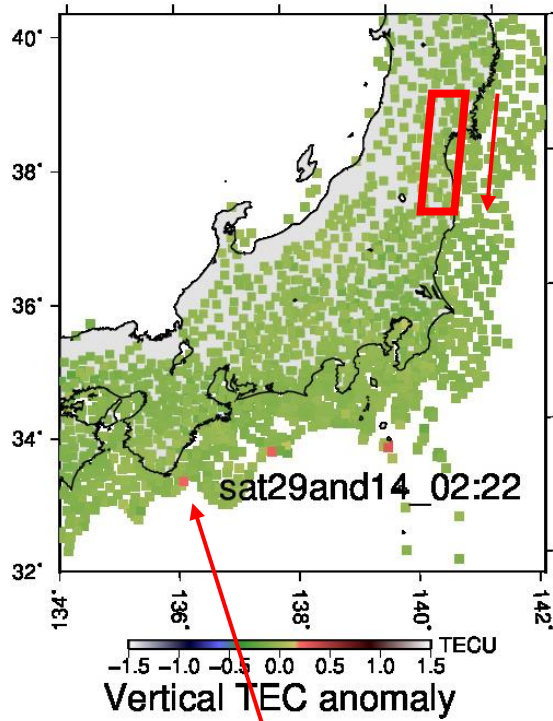
2015.01.13(Master)_2015.08.11(Slave)

- Path: 26 , Frame: 2840-2850
- Observation time: 03:38(UT)
- Mode: SM1 , Descending
- Es appeared on 2015.08.11

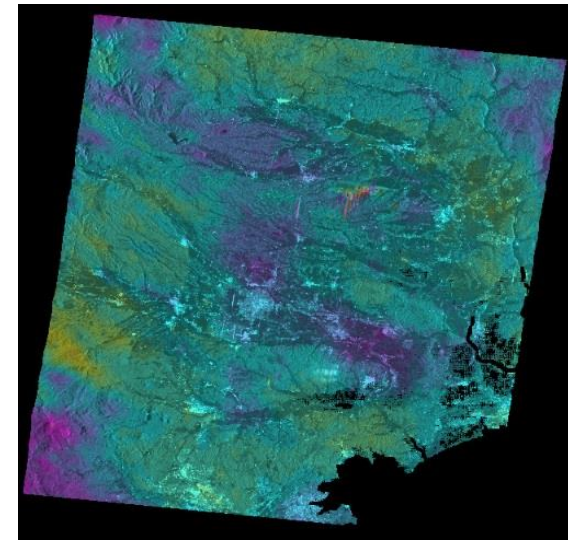
2014.08.27(Master)_2015.05.20(Slave)

- Path: 15 , Frame: 2840-2870
- Observation time: 02:21.5-22(UT)
- Mode: SM1 , Descending
- Es appeared on 2015.05.20

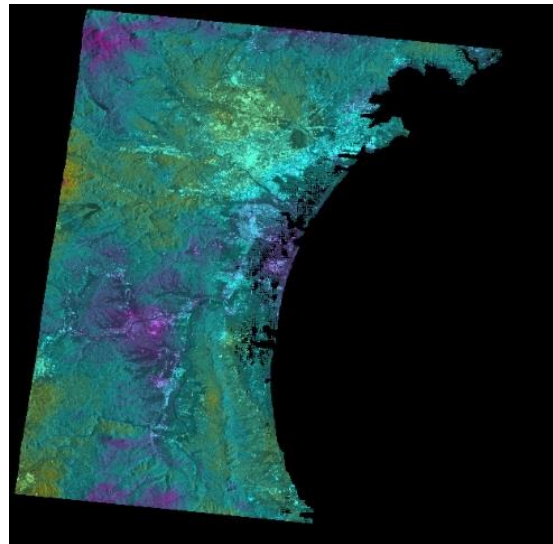
2014.08.27(Master)_2015.05.20(Slave)



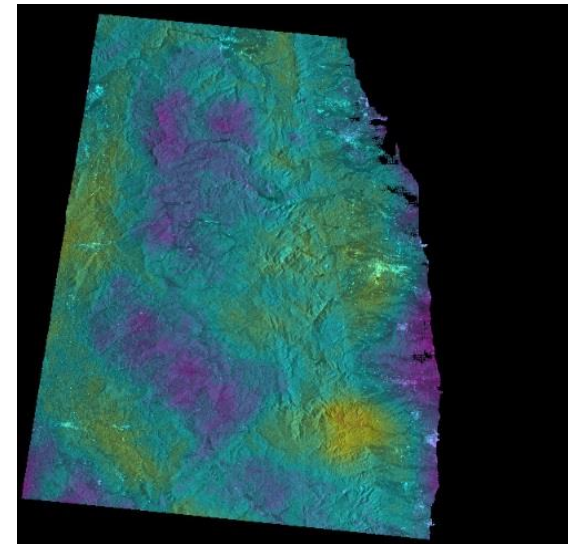
Frame: 2840



Frame: 2850

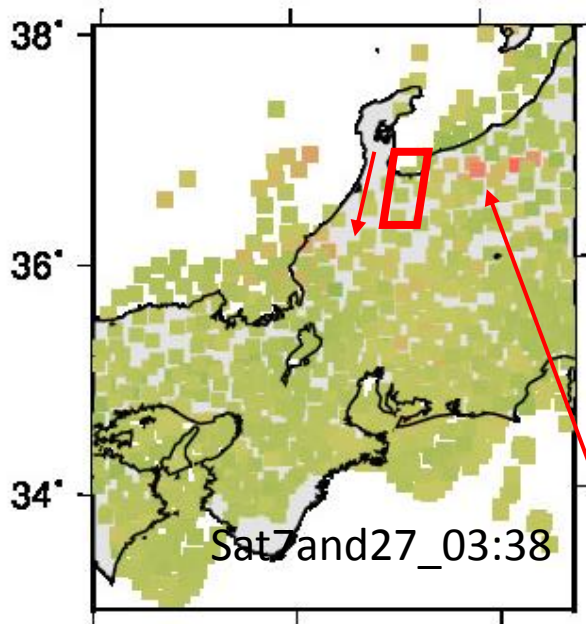


Frame: 2860

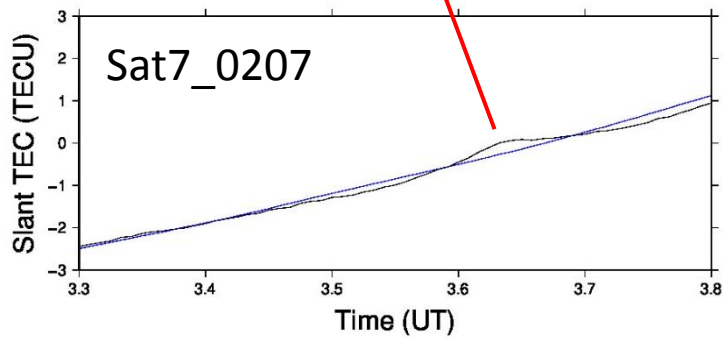


Frame: 2870

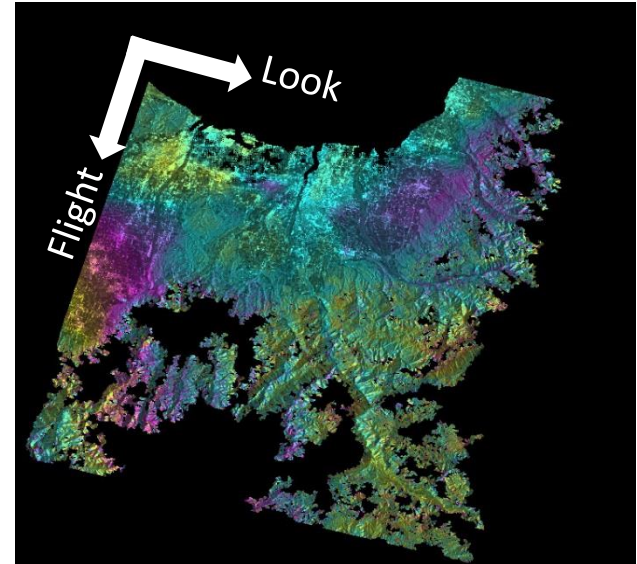
2015.01.13(Master)_2015.08.11(Slave)



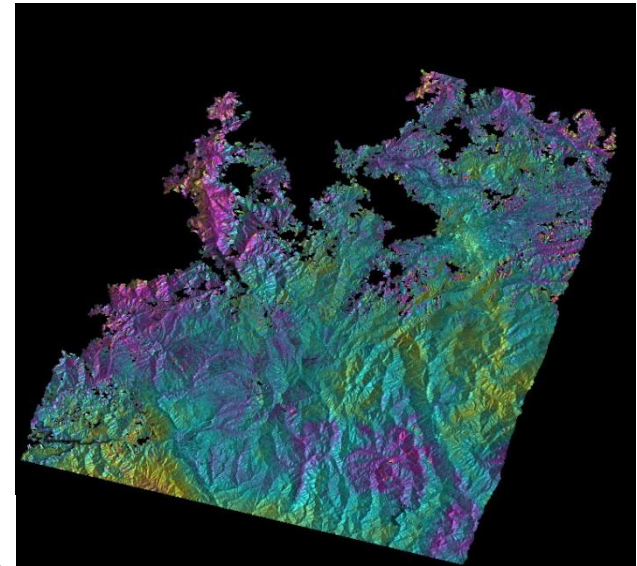
Vertical TEC anomaly



LOS(line-of-sight) change (cm)



Frame: 2840

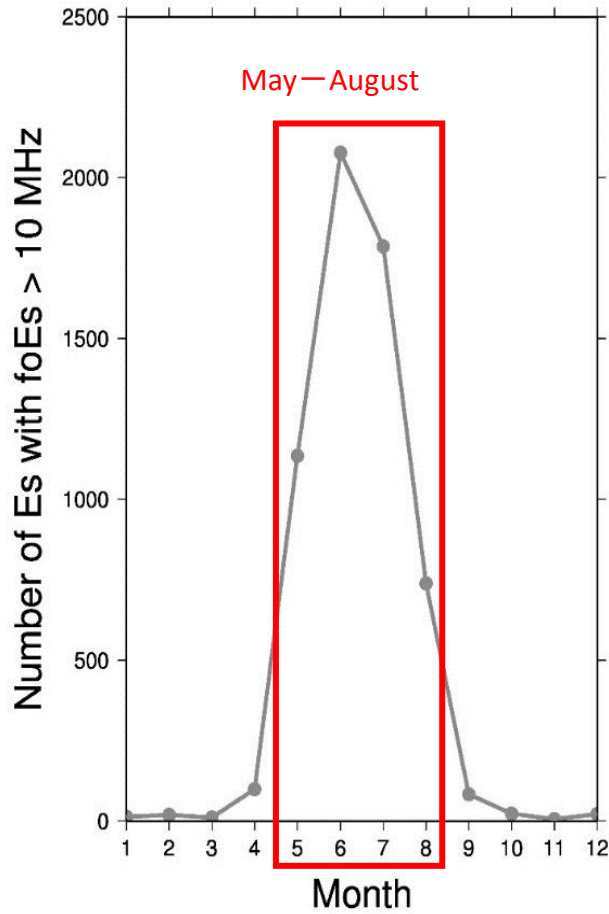


Frame: 2850

Summary

- We could not detect Es by InSAR (ALOS-2).
The area of Es on the GNSS-TEC map didn't match the observing area of ALOS-2.
If ALOS-2 observes in the morning, the probability that we can detect Es may rise.
- We will search Es not only over Japan but also America.

Kokubunji 2003–2012



Kokubunji 2003–2012

