

ALOS/PALSARによる電離層異常の観測 PALSAR and Ionospheric disturbances

Masanobu Shimada¹, Yasushi Muraki², and Yuichi Otsuka³

1 Earth Observation Research Center, Japan Aerospace
Exploration Agency, Sengen 2-1-1, Tsukuba, Ibaraki, 305-
8505, Japan

2 Department of Physics, Konan University, Kobe, 658-0073,
Japan

3 Solar-Terrestrial Environment Laboratory, Nagoya
University, Toyokawa

Shimada.masanobu@jaxa.jp

[2009/12/21@NICT](#)

電離層変動のSARへの現れ方

筋状雑音

- 1) Scintillation in range
- 2) Ion Density variation : Azimuth shift

位相量の変動(屈折率の変化)

ファラデー回転角の変化(信号の混合)



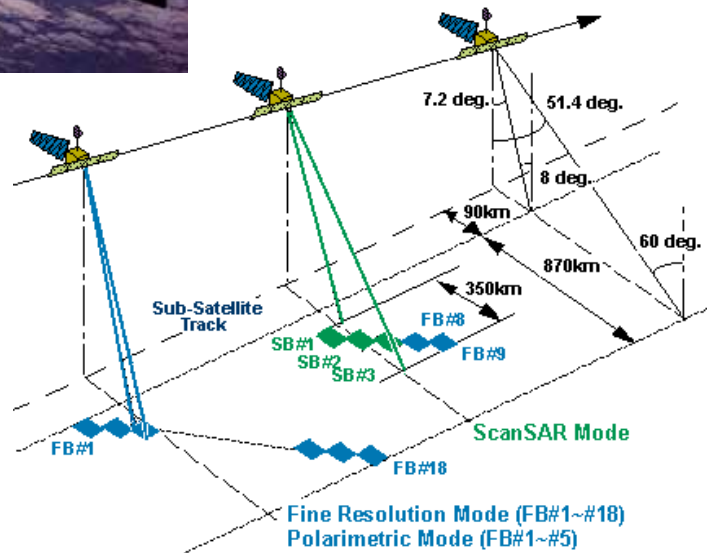
The Advanced Land Observation Satellite - ALOS



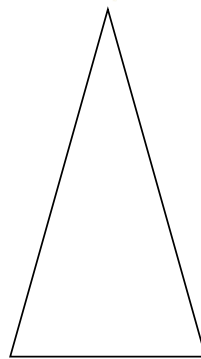
PALSAR
 L-band (23.6 cm)
 Synthetic Aperture Radar
 Polarimetry
 Dual Polarization
 SCANSAR



Launch:
 24 Jan. 2006

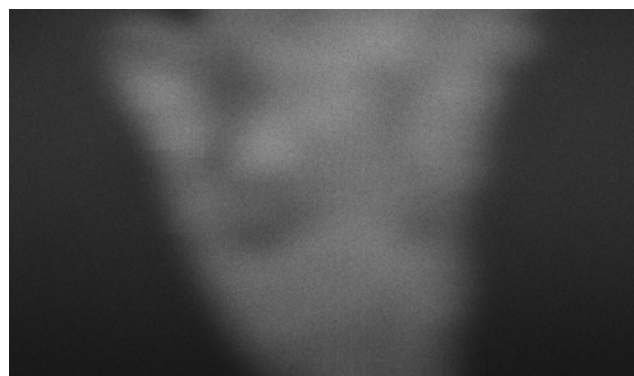


合成開口レーダーとは？



小さなレンズ

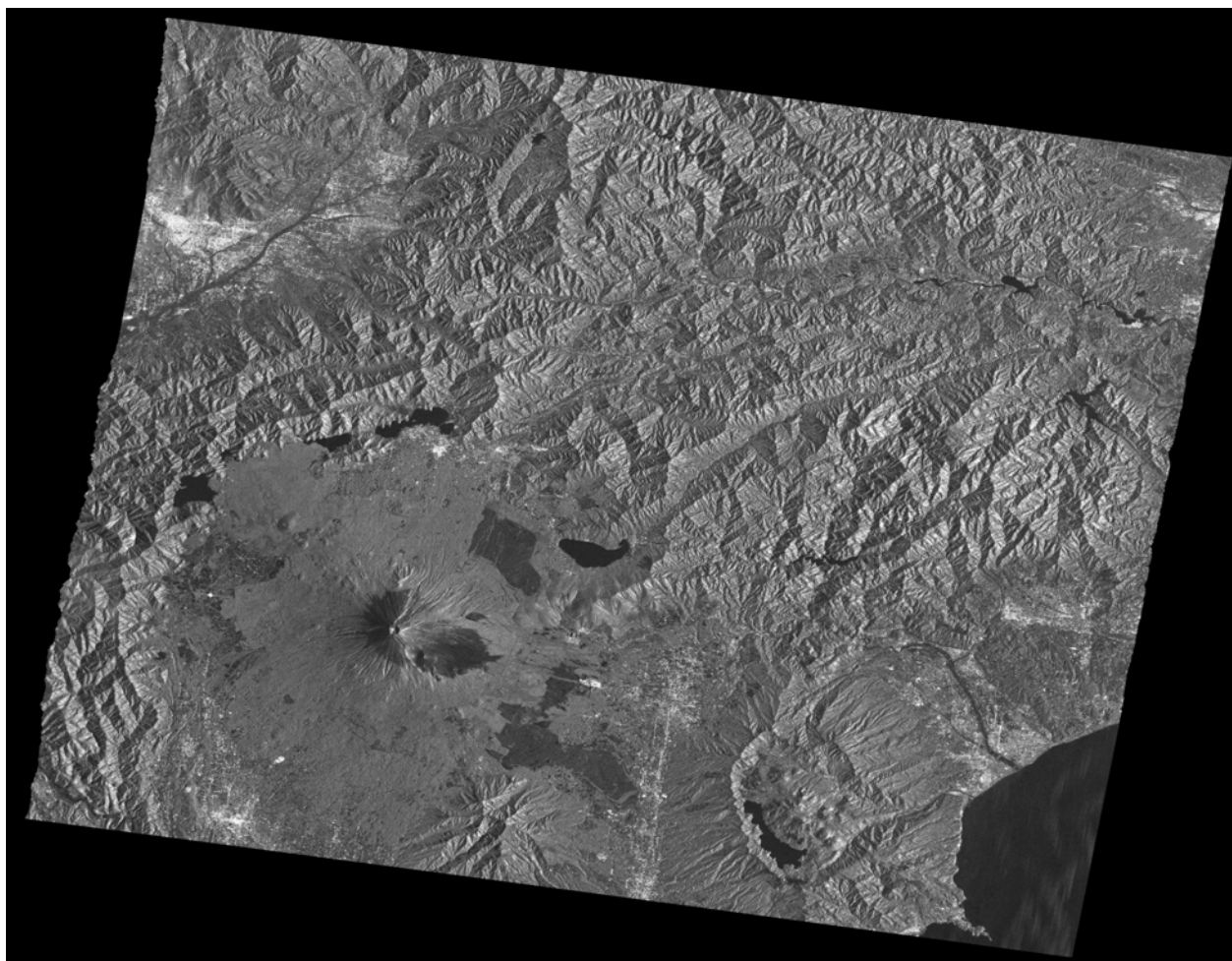
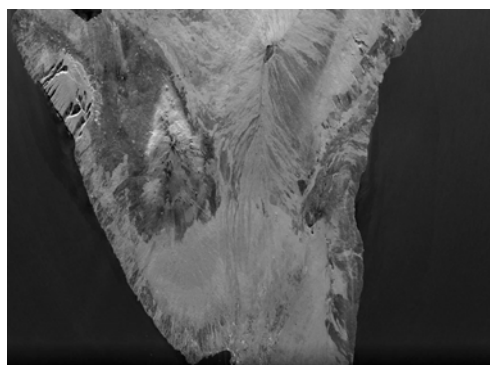
分解能荒い



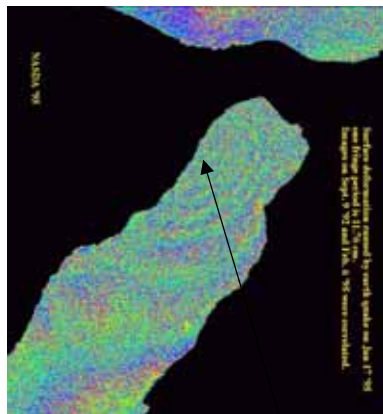


大きなレンズ

分解能がよい



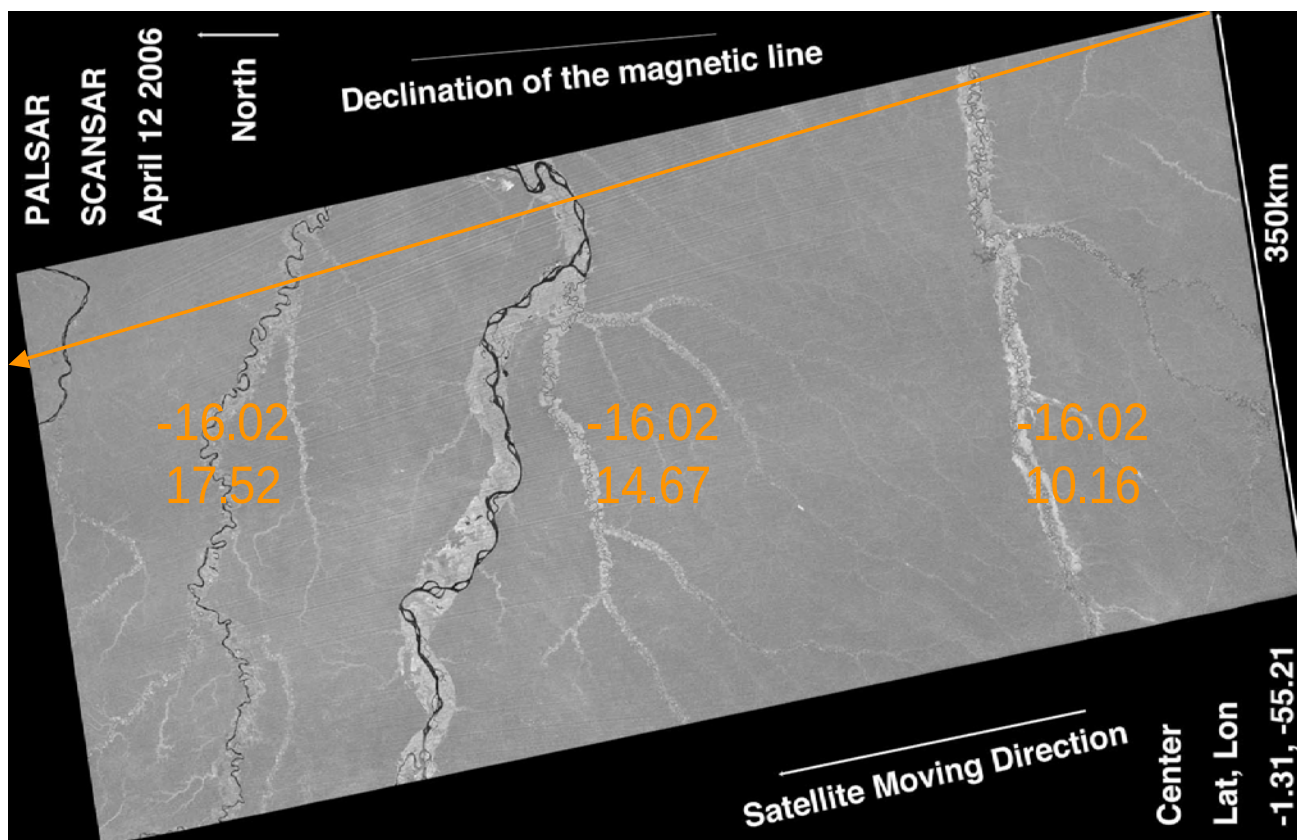
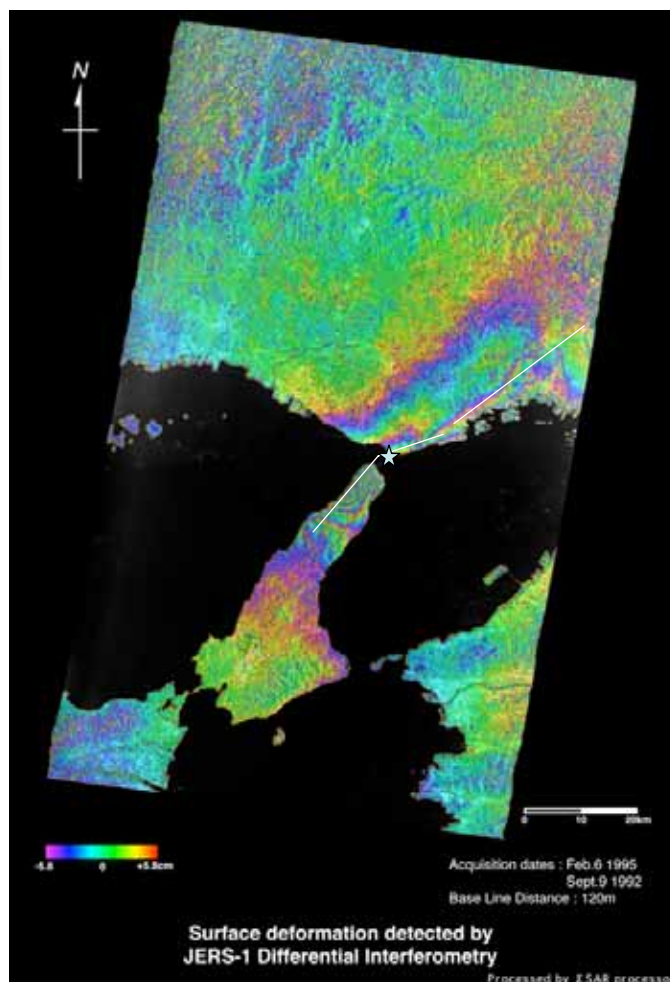
阪神淡路大震災（1995年1月17日）の地殻変動マップ：
JERS-1 SARによる差分干渉
主画像：1995/2/6
従画像：1992/9/9



1996年
の初画像

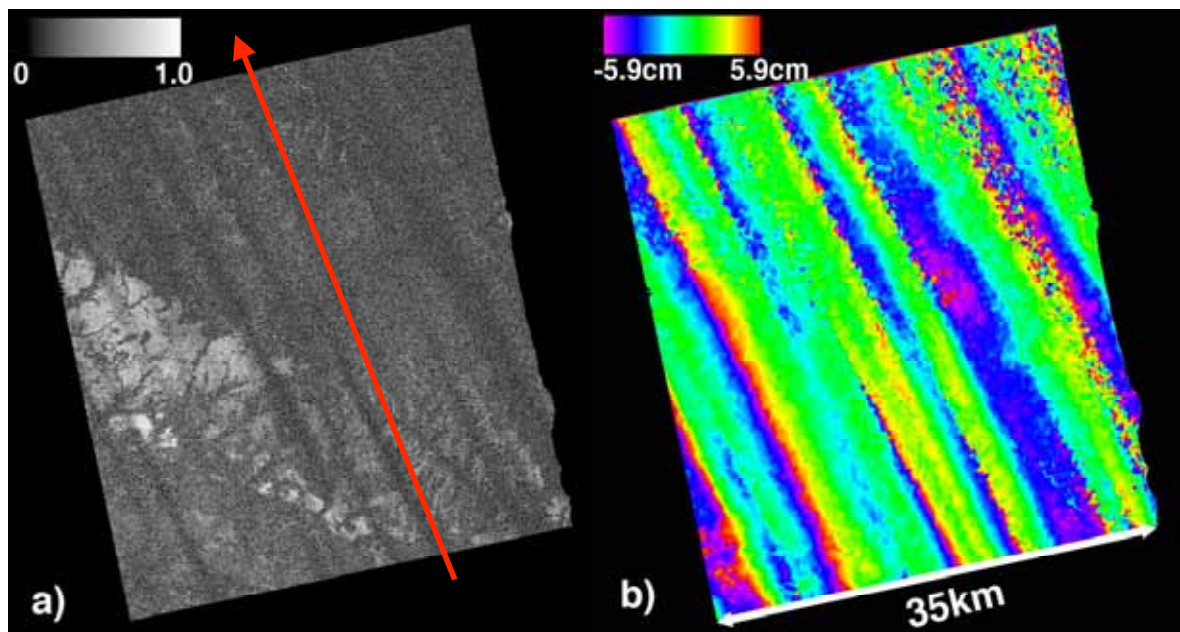


北丹町の断層



First PALSAR image detected the scintillation

Coherence drop due to the distance deformation

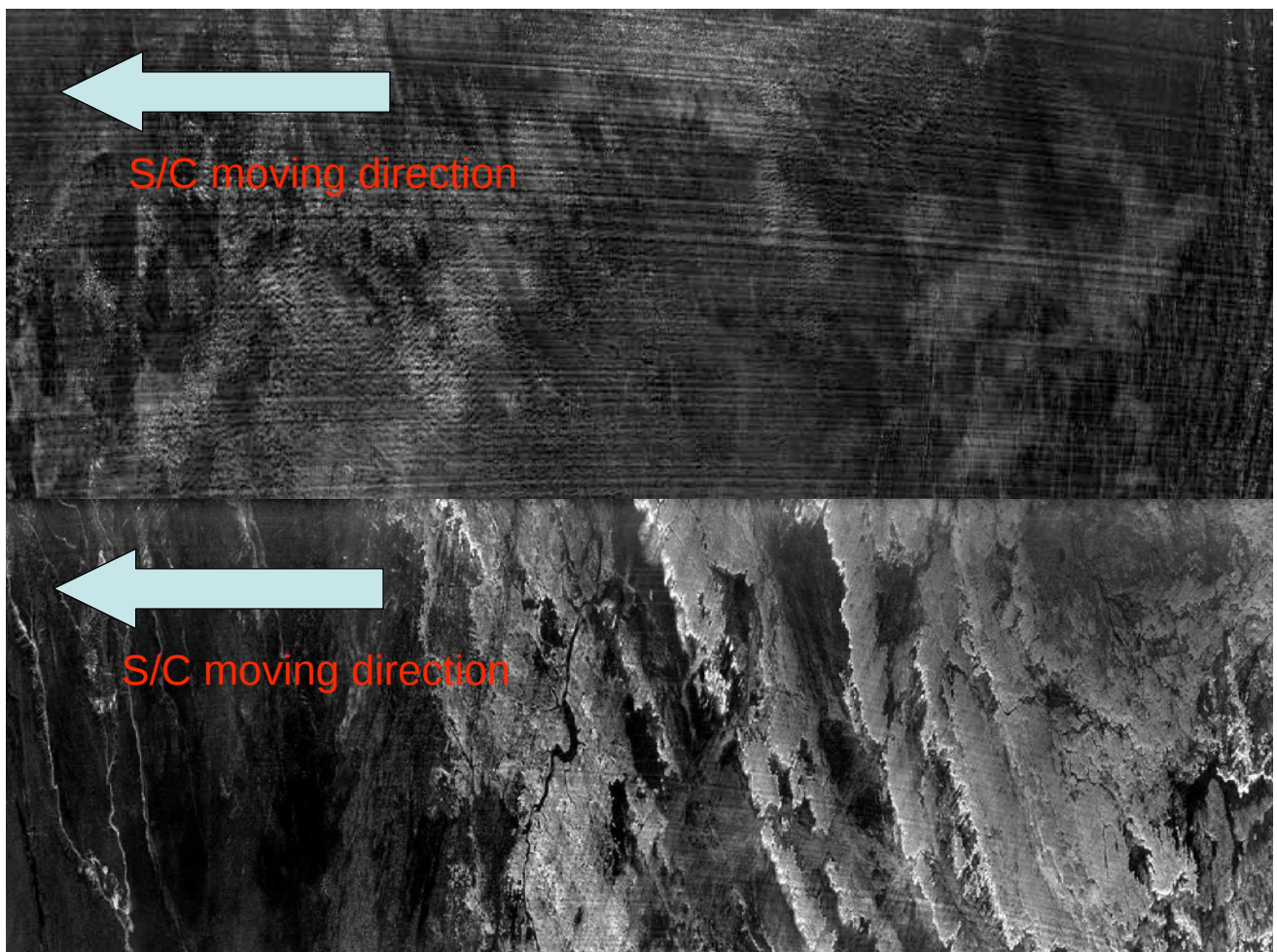


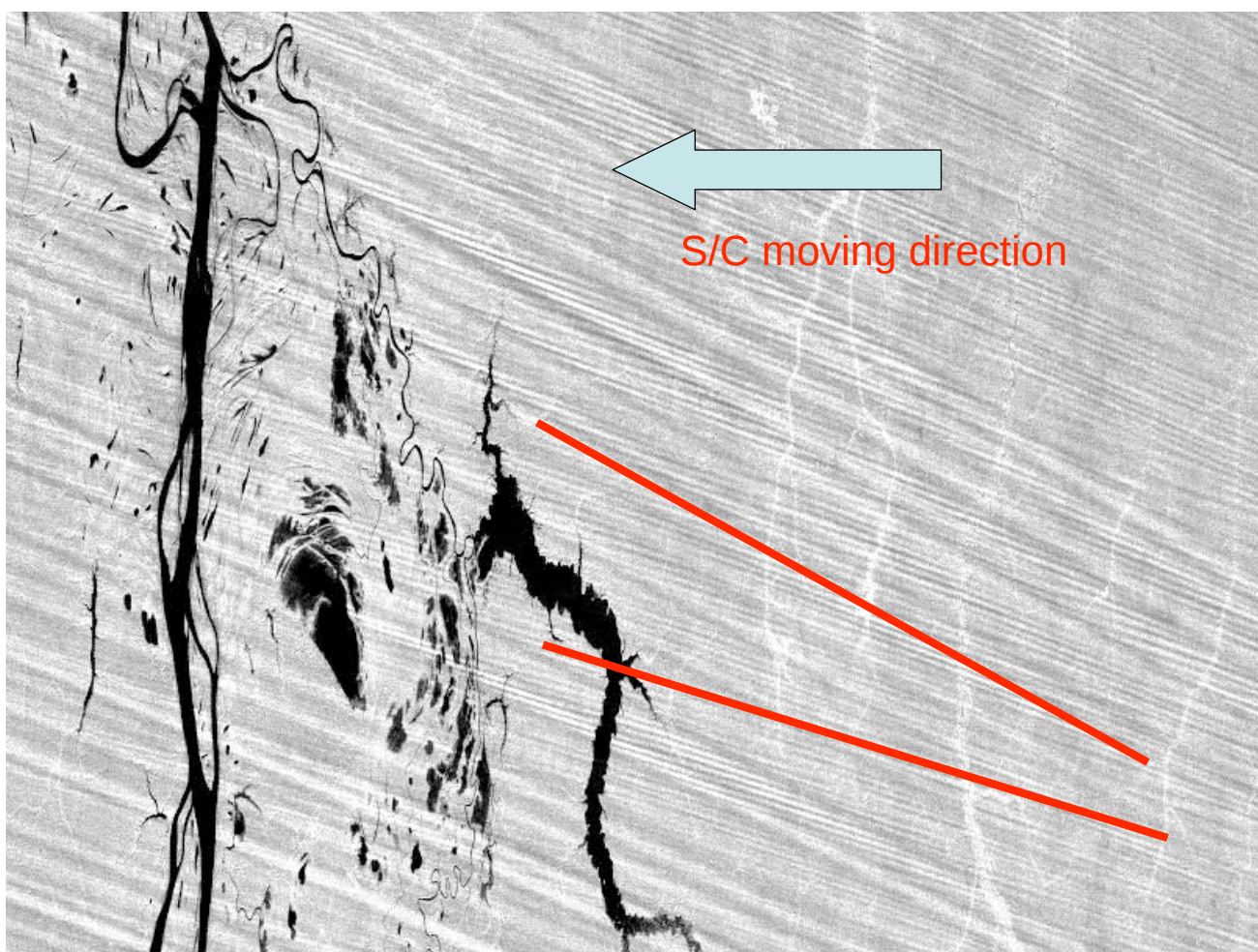
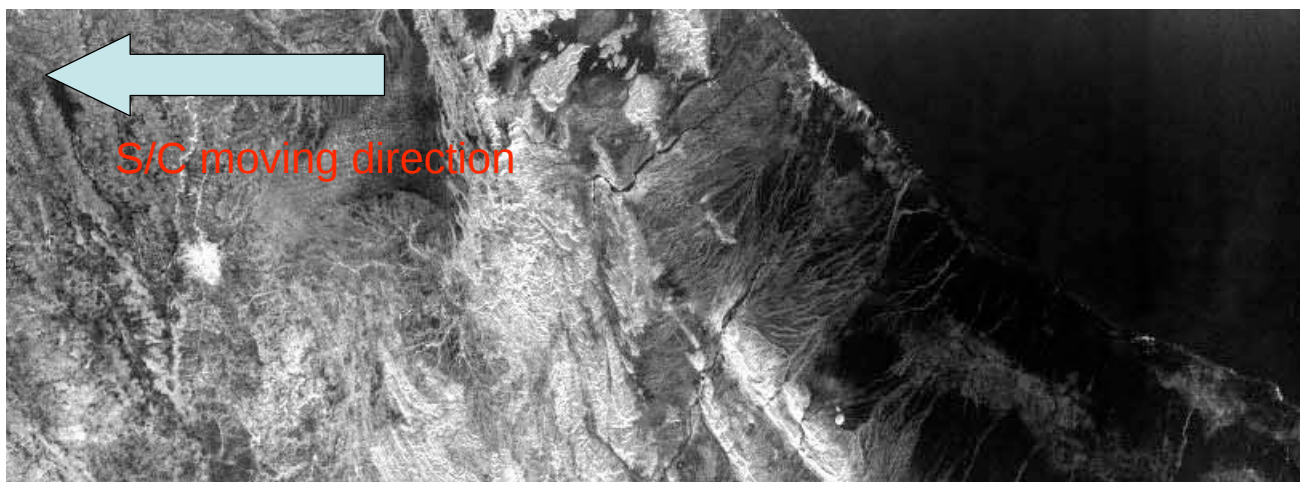
Coherence

Geomagnetic line

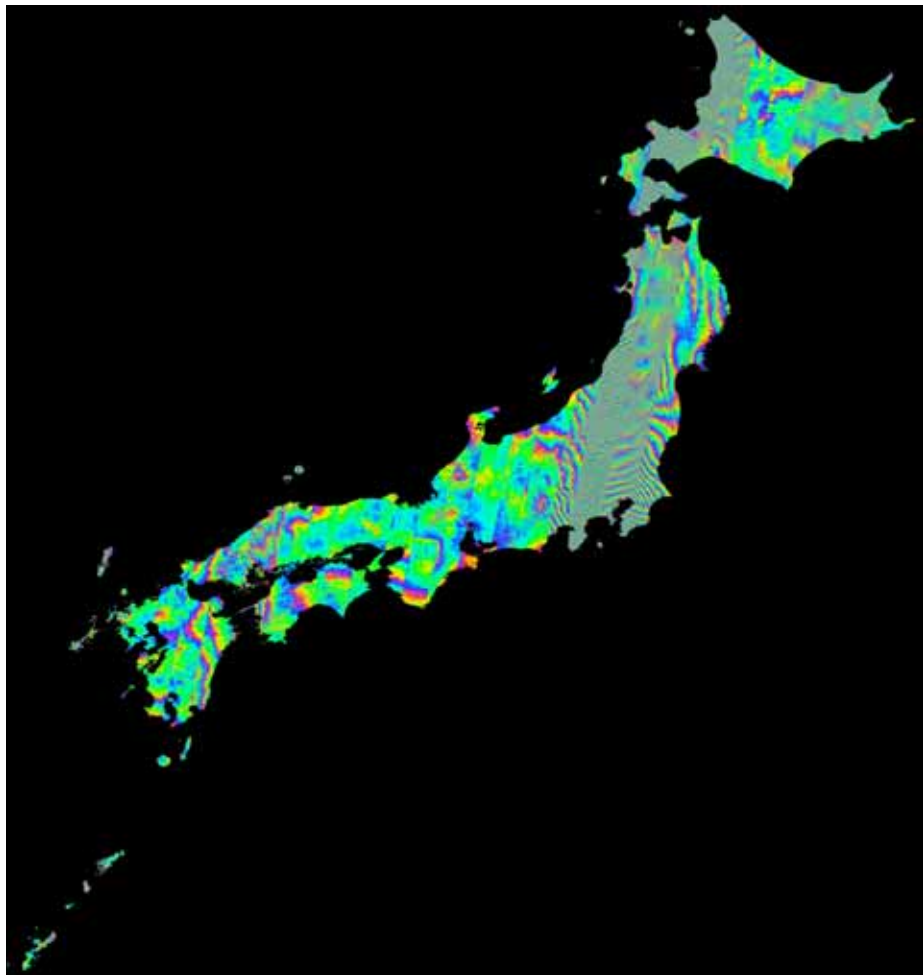
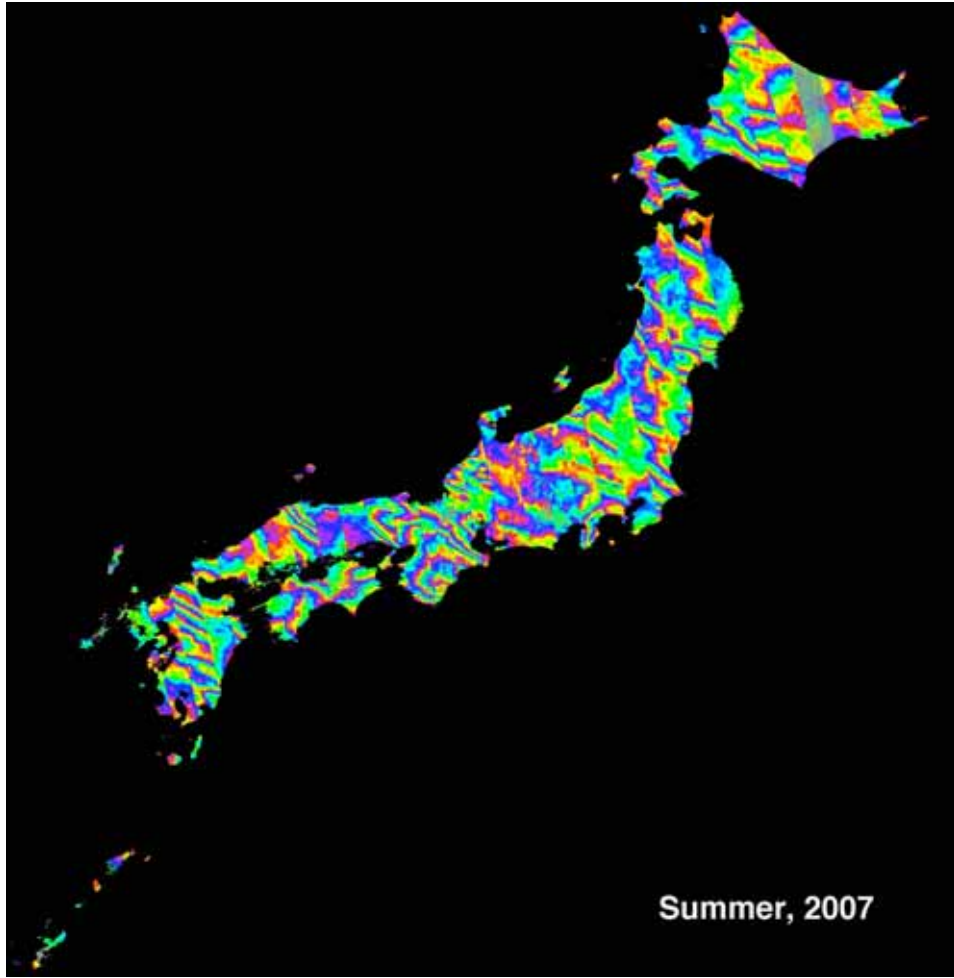
Phase difference

6 cycles $\rightarrow$ 3 TECU



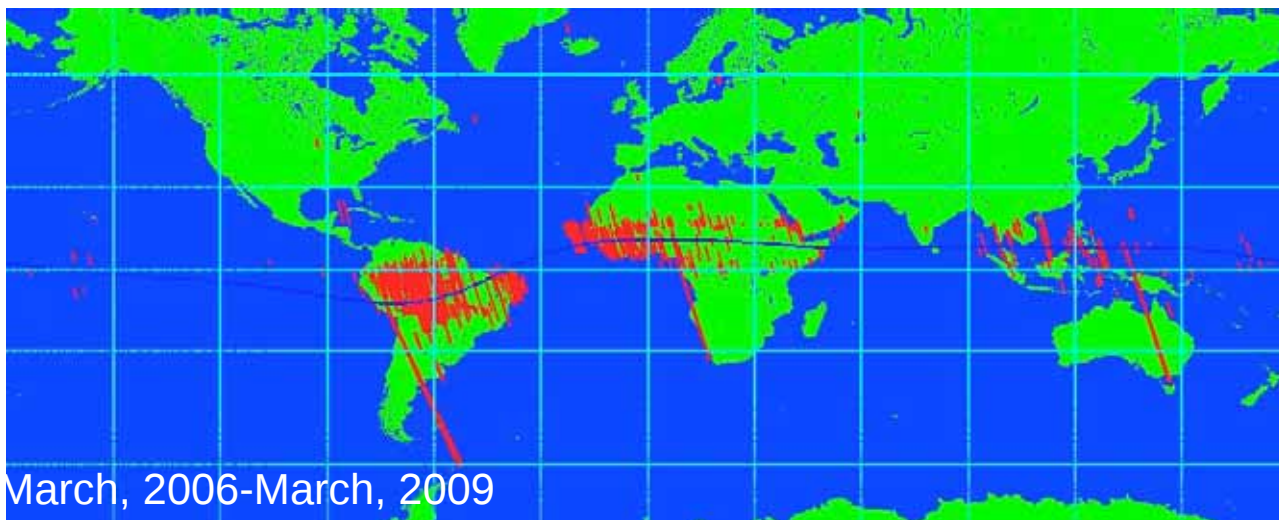


2007夏

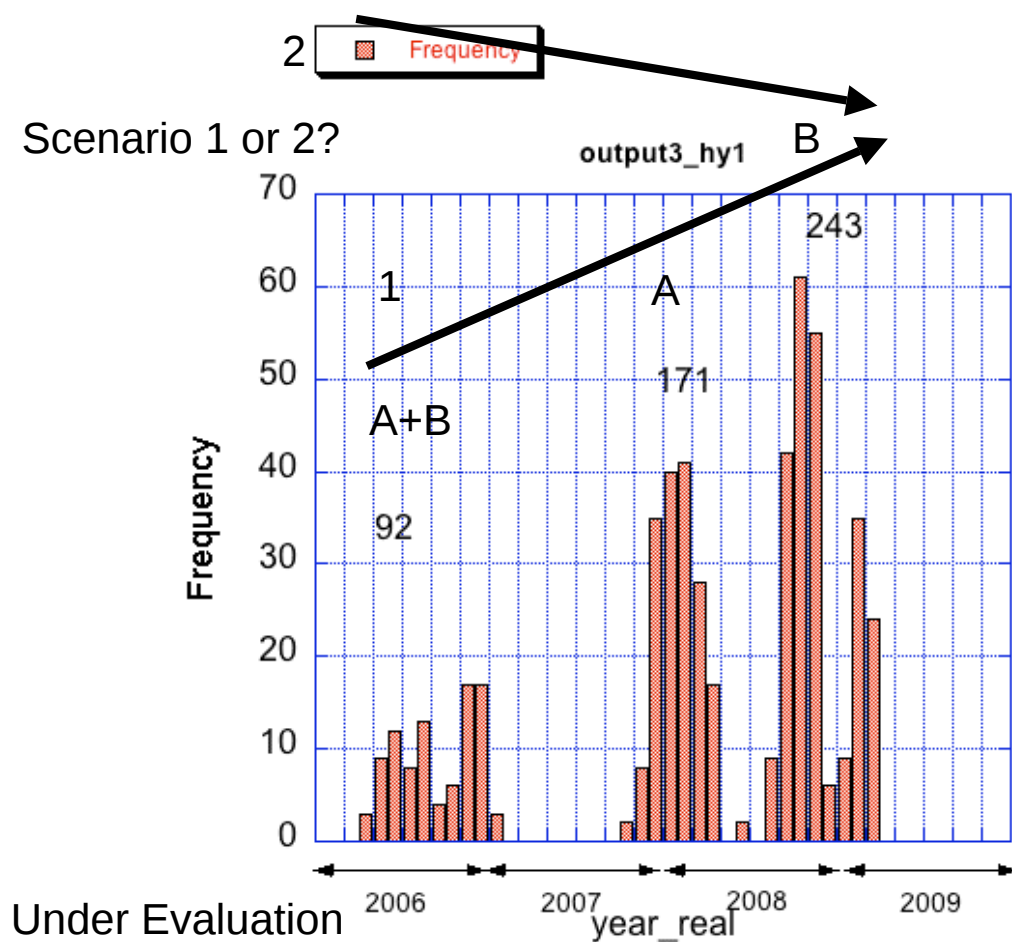


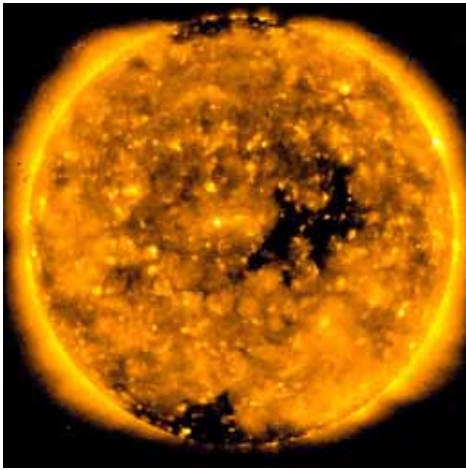
JERS-1

Area of PALSAR streaks appearance

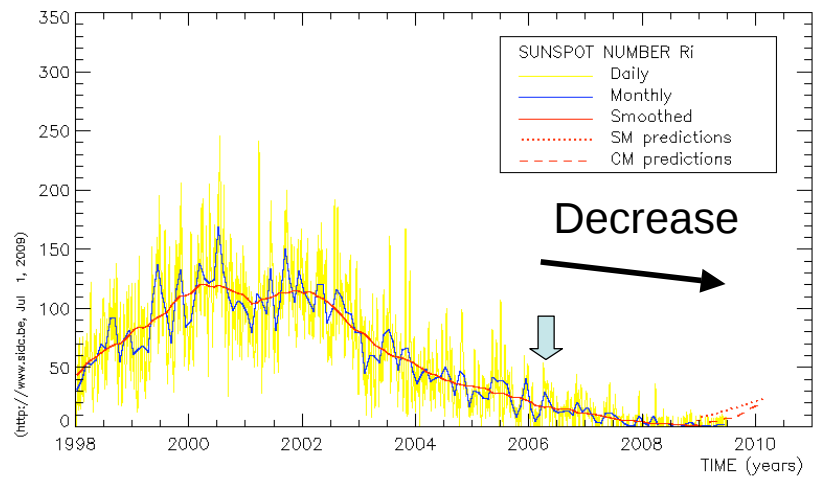
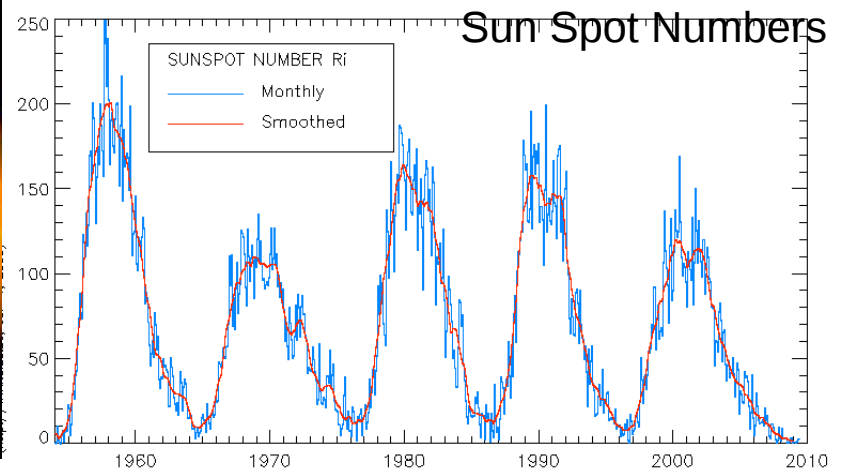


Total number of appearance : 506 : June 2006~March. 2009

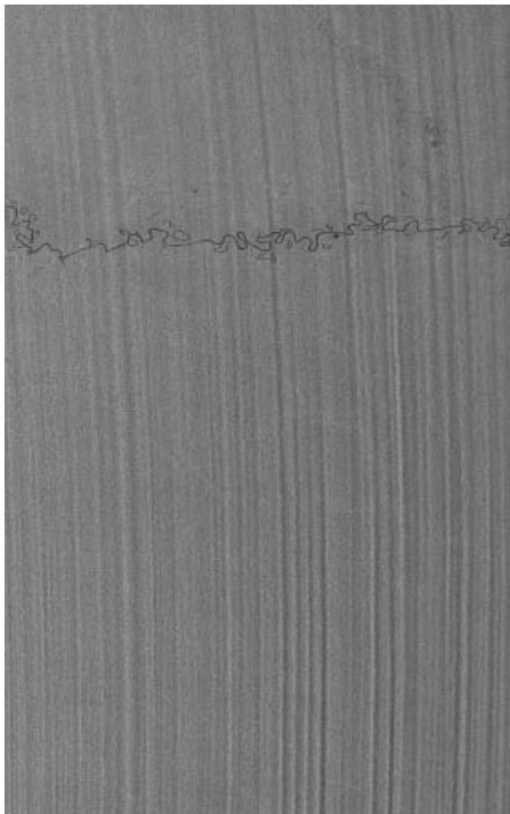




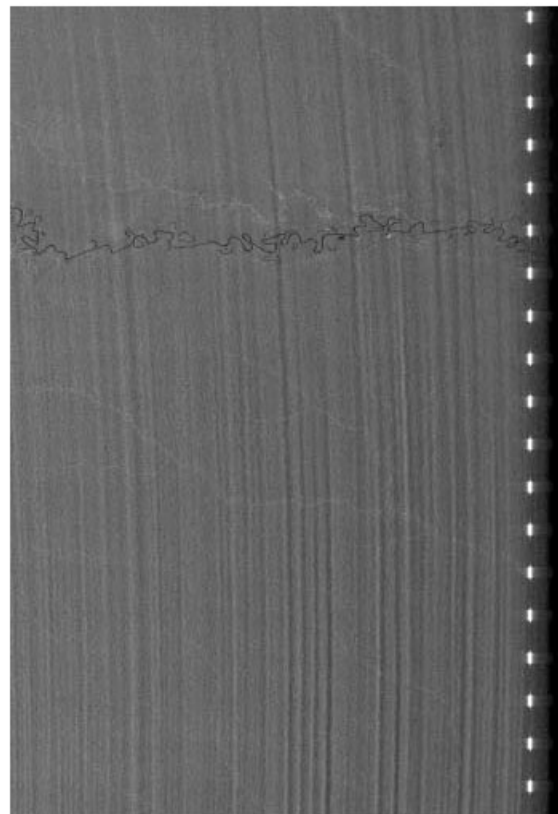
Sunspot image
By "Hinode" satellite
March 2009



RSP103_BRS20061126FBD415HHV0_W0307149001-03_001



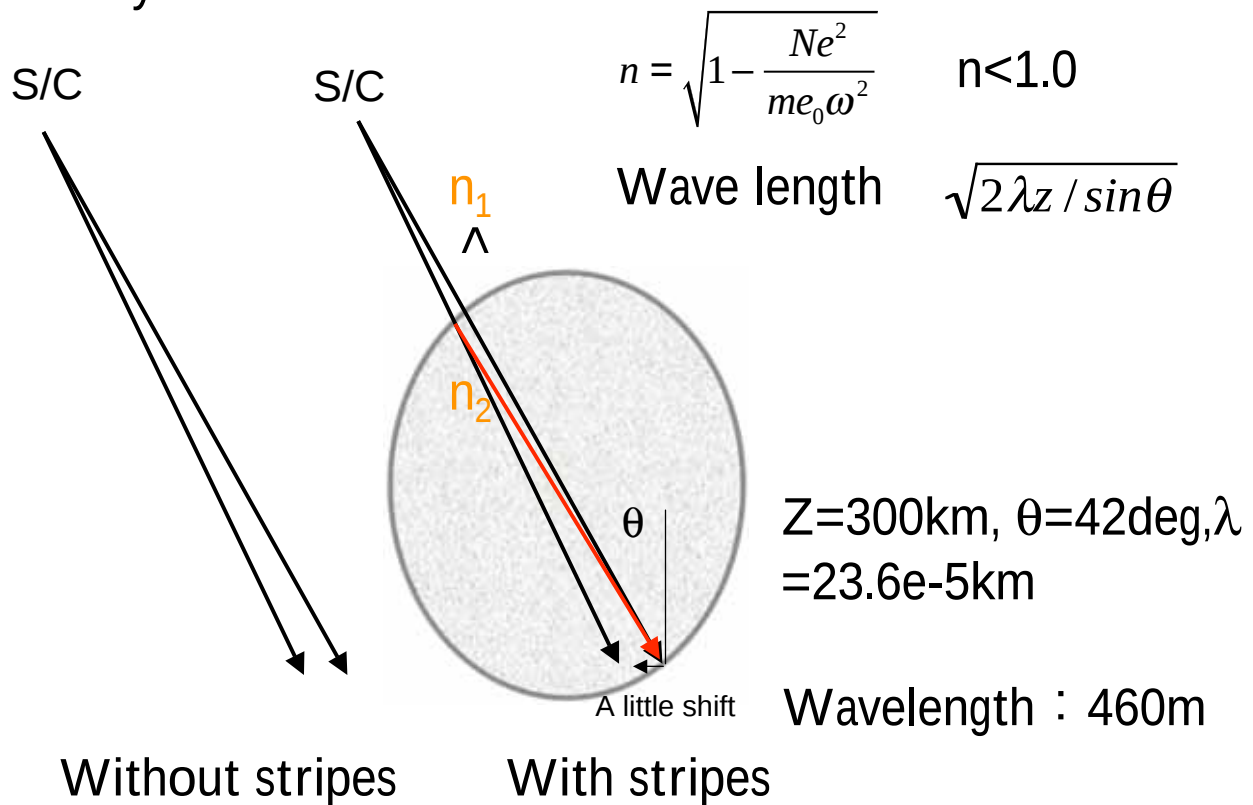
HV



HH

RSP103_BRS20061126FBD415HH0_W0307149001-03_001

Analysis as the scintillation

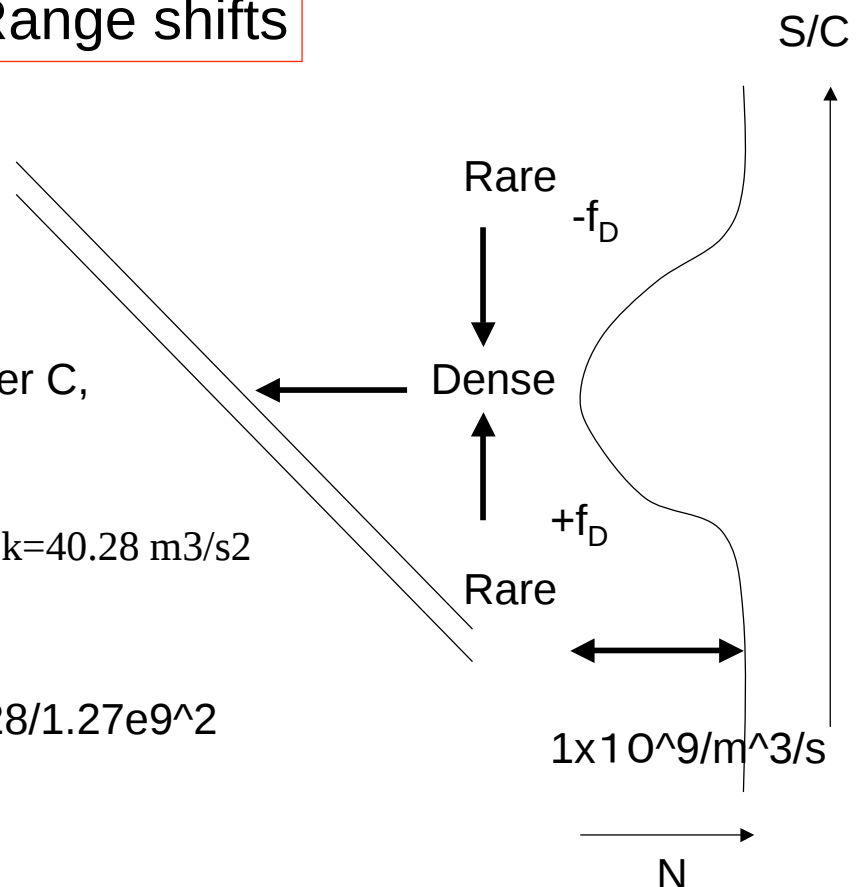


Azimuth and Range shifts

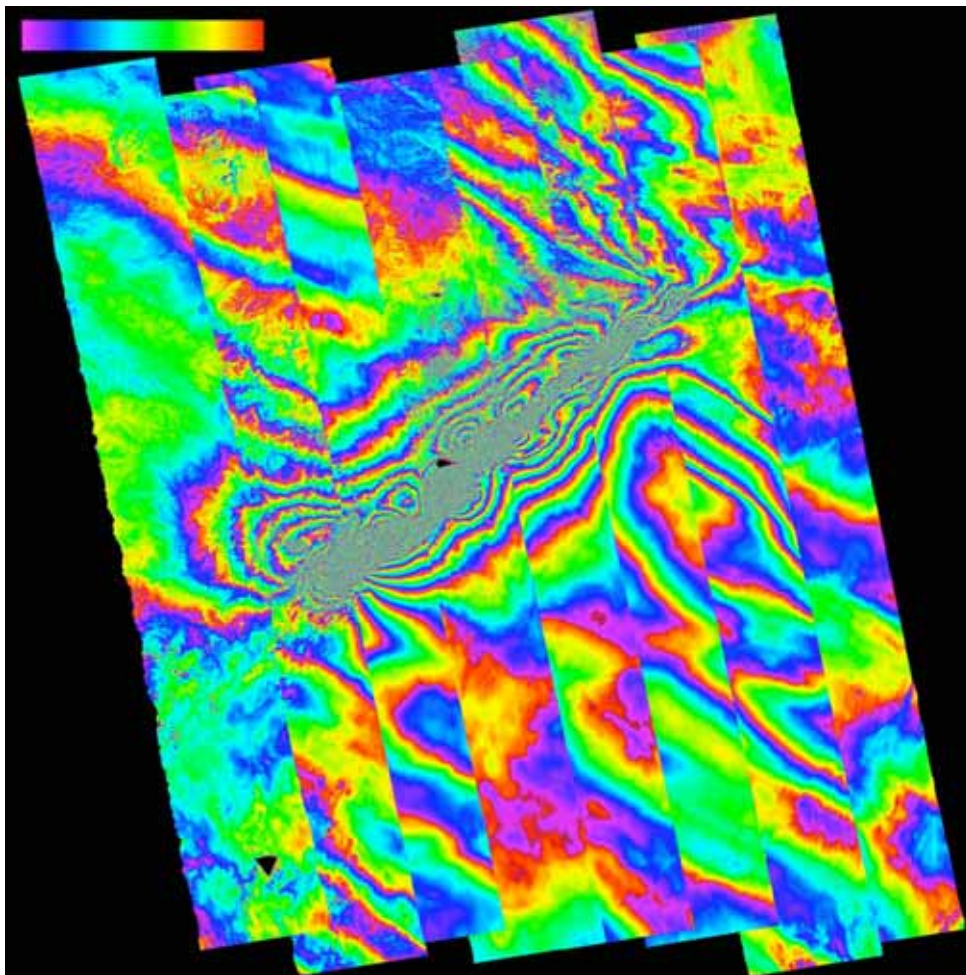
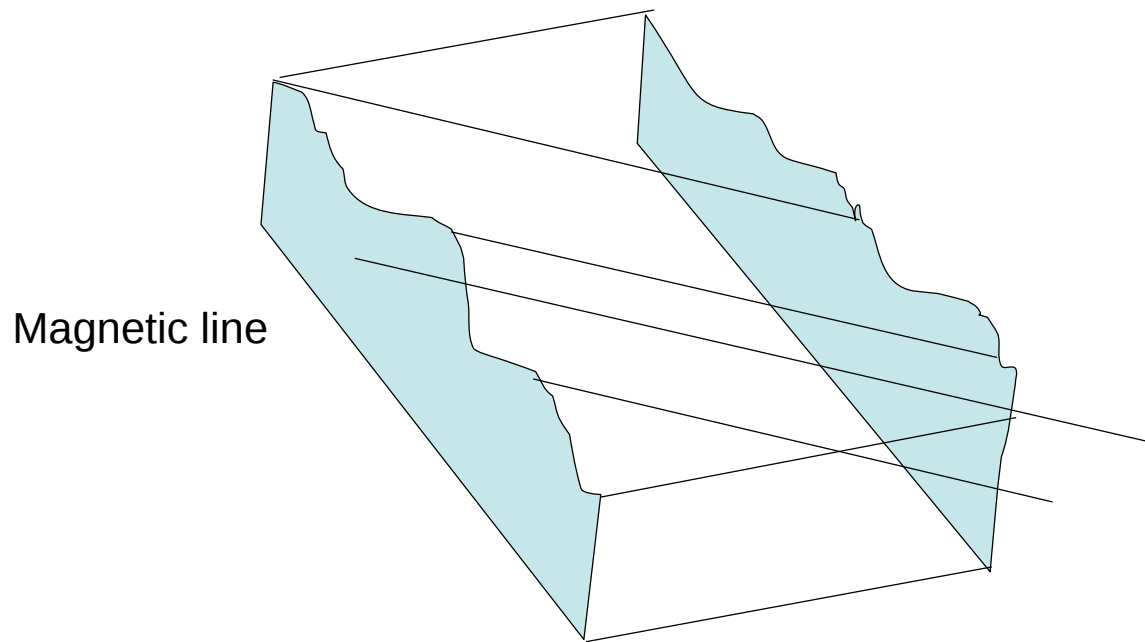
Smaller TEC, slower C,
projected nearer

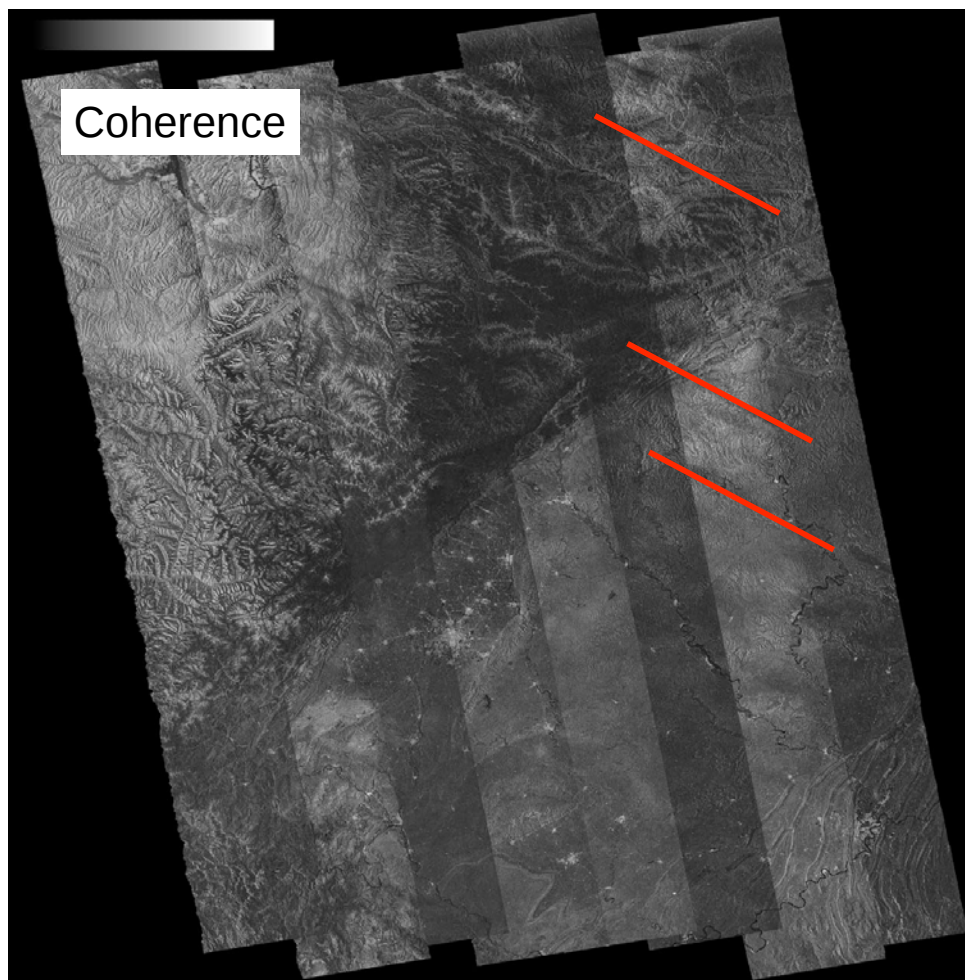
$$\delta r = \frac{k}{f^2} \Delta \text{TEC} \quad k=40.28 \text{ m}^3/\text{s}^2$$

$$\frac{10^9 \cdot 500000 \cdot 40.28}{1.27 \cdot 10^9} = 12.4 \text{m}$$



Guess for the Ionospheric structure

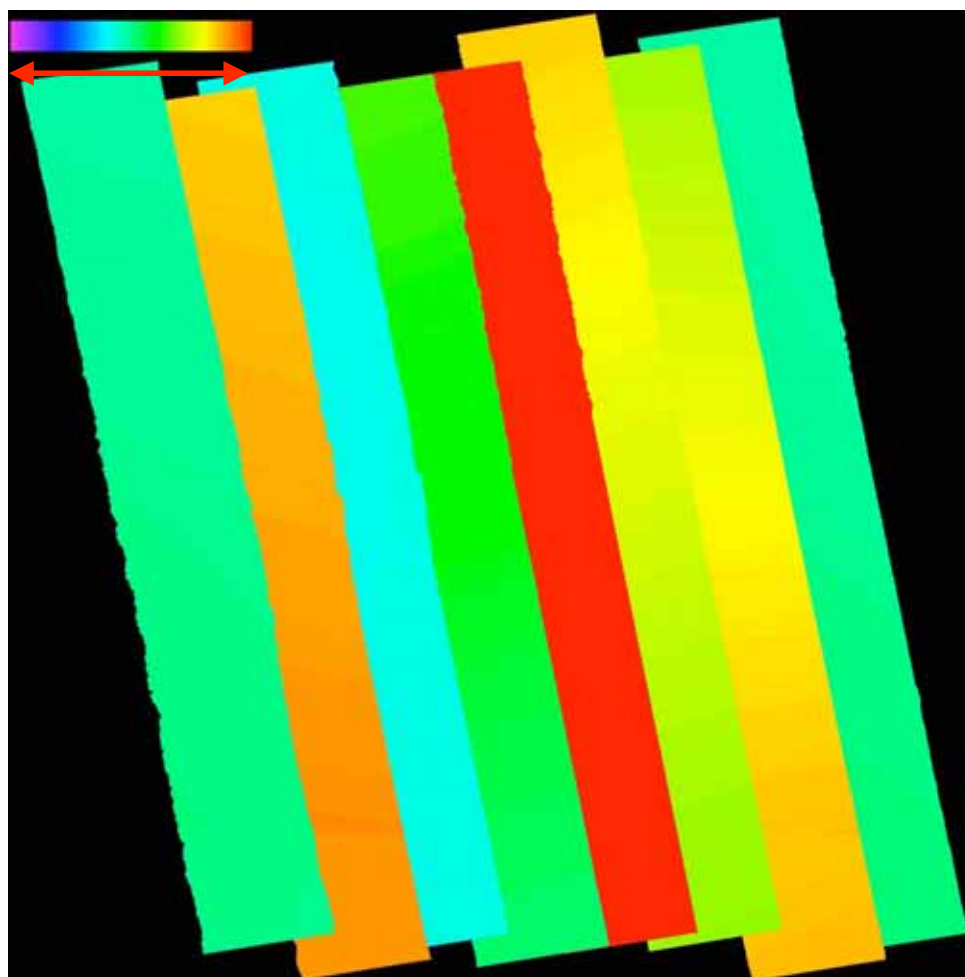


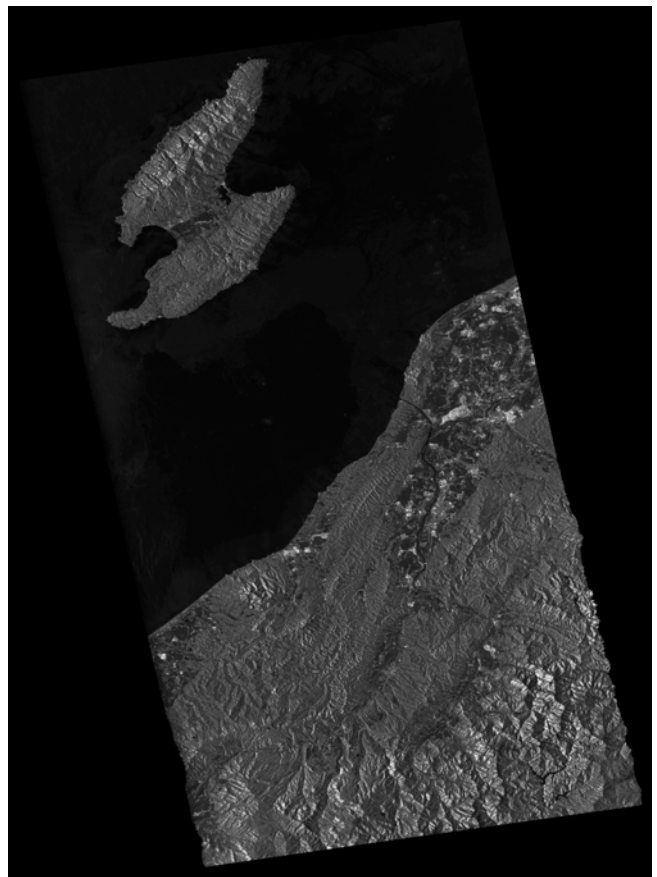
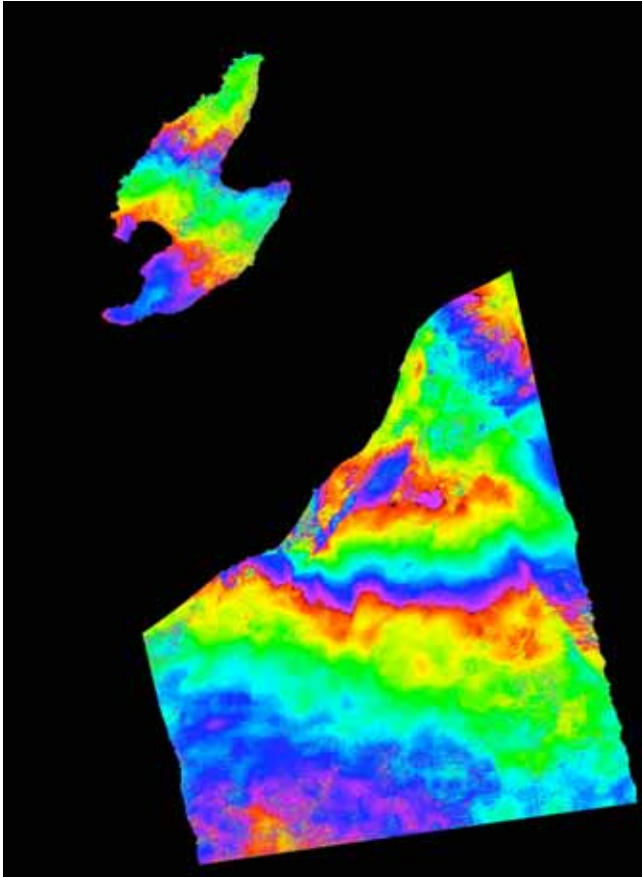


10TEC
U

From

Bern
Unive
rsity





夜間のデータに変動が大きい
(10m程度の距離の変動、ファラデー回転角の変動)

SARとして期待すること

高分解能(10m程度)のTEC情報が時間送れ3時間くらいでもらえること。

1) 地殻変動量の補正

2) ファラデー回転角: Polarimetryモードで補正