



1st Science and Application Workshop
for Germany-Japan Next-Generation SAR
@ Sola City Conference Center

[Session 2]

Challenges on Utilization of Current SAR Data and Expectation for Next-
Generation SAR (Science & Applications Users)

- Natural Resource -

Application Studies of Natural Resource Exploration and
Management using SAR data

27th June, 2013

Nittetsu Mining Consultants Co., Ltd. (NMCC)
Tomonori Deguchi



Objective of Natural Resource Team

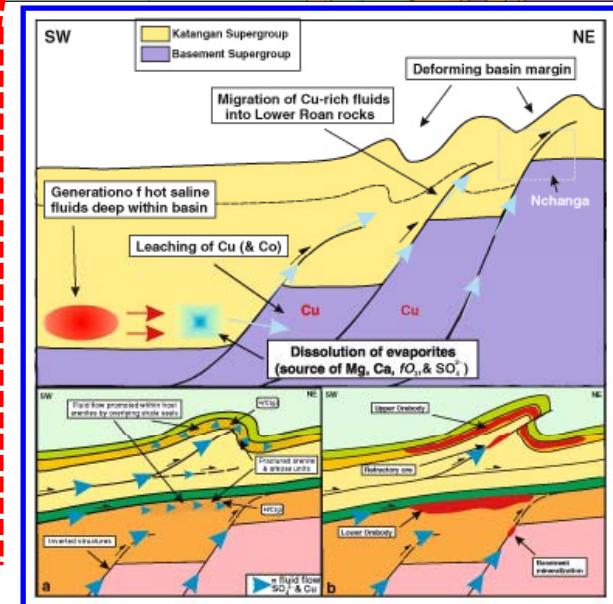
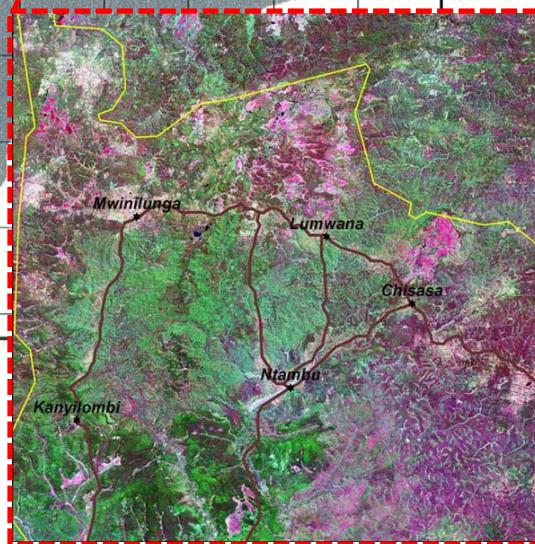
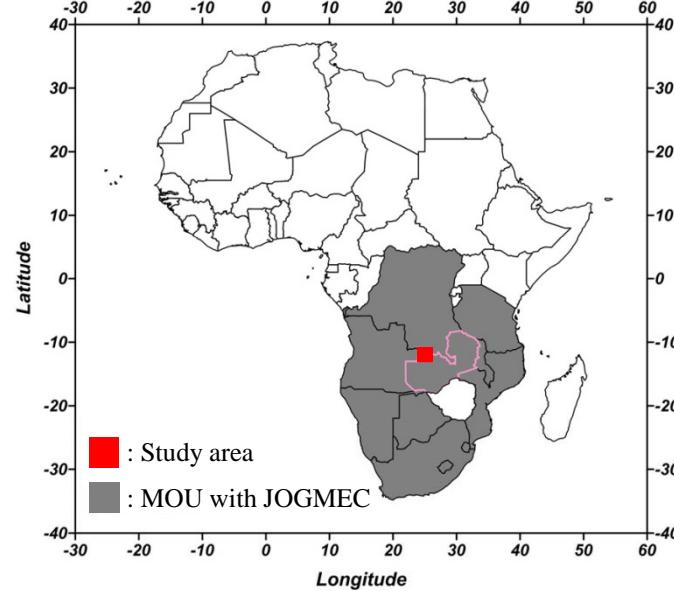
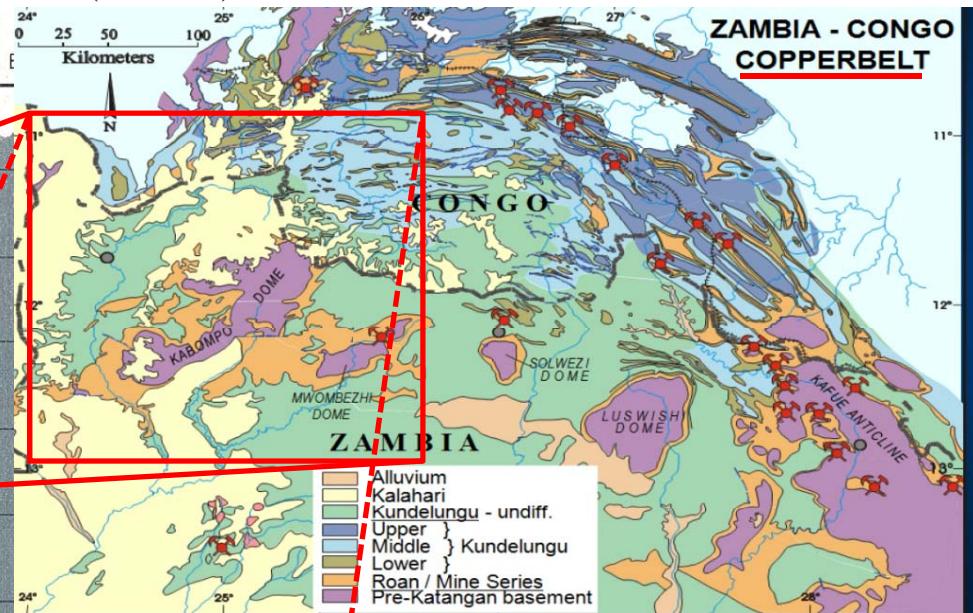
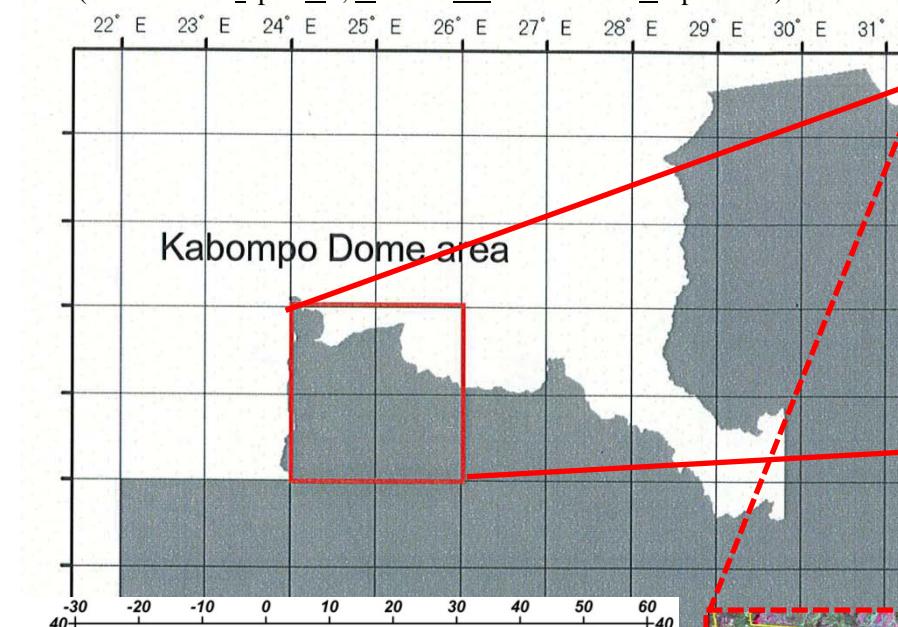
- ☞ Geological Mapping for Mineral Exploration
- ☞ Geological Interpretation for Unconventional Oil/Gas and Coal Exploration
- ☞ Detection of Natural Oil Seepage (Conventional Oil/Gas)
- ☞ Deformation Monitoring of onshore Oil/Gas Field, Geothermal Field and Mining Area
- ☞ Deformation Monitoring of Coalfield
- ☞ DEM Generation



Geological Mapping for Mineral Exploration, Zambia NMCC

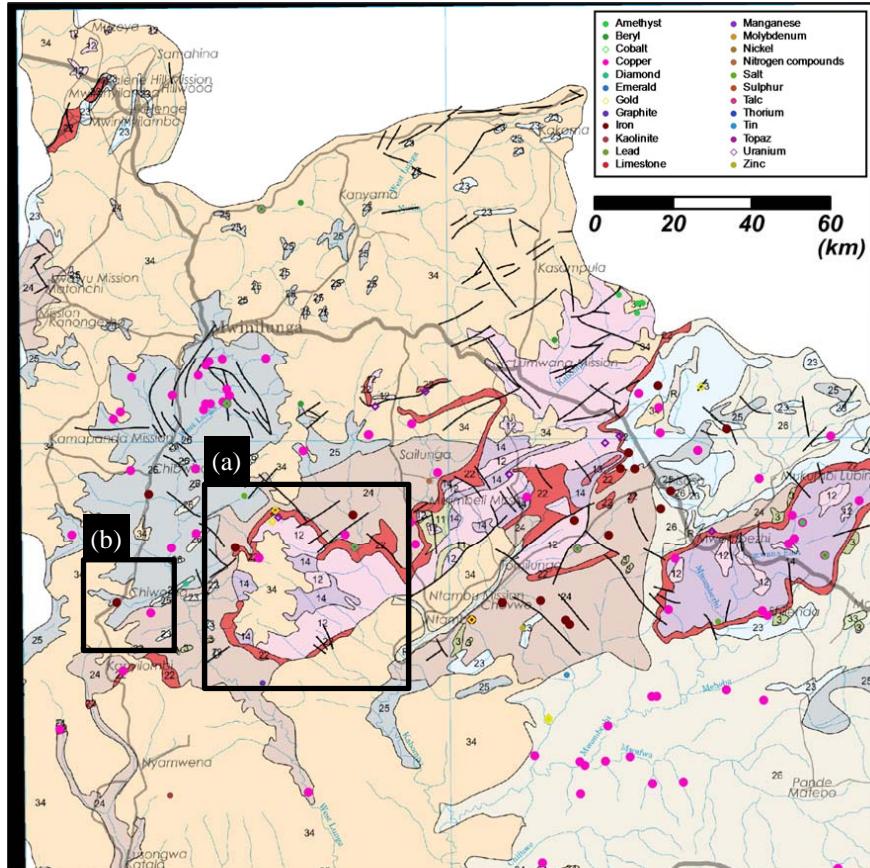
JOGMEC's project : R&D on Mining Exploration in Africa (FY2010)

(*JOGMEC : Japan Oil, Gas and Metals National Corporation)





Geological Mapping for Mineral Exploration, Zambia **NMCC**

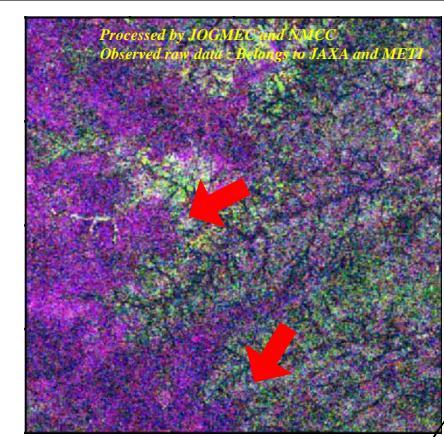
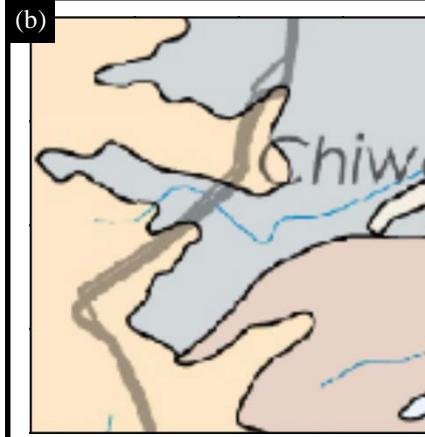
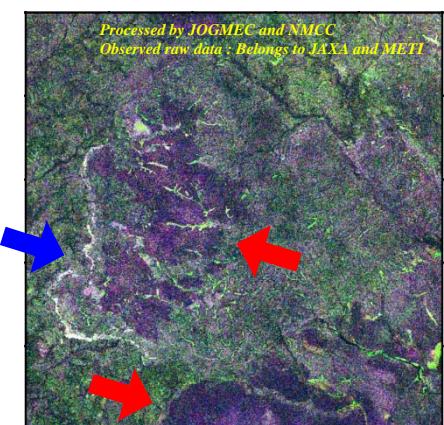
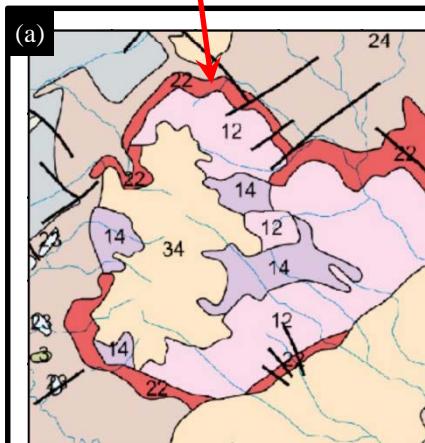


Kalahari Sand	Dolomite and argillite (Upper Roan)	Granitic gneiss and migmatites
Basalt		
Carbonate rock	Quartzites, conglomerates, argillite, arkose and dolomite (Lower Roan)	Volcanics and Meta-volcanics
Shale, siltstone, sandstone		
Carbonaceous shale and argillite	Schist	Igneous and Meta-igneous



- ☺ *Swath width : 350 km*
 - ☺ *Spatial resolution : 3 m*
 - ☺ *Full-polarimetry*
 - ☺ *Dry and rainy season every year*

R:HH Coherence (Dry - Dry)
G:HH Coherence (Rainy - Dry)
B:HV Coherence (Dry -Dry)

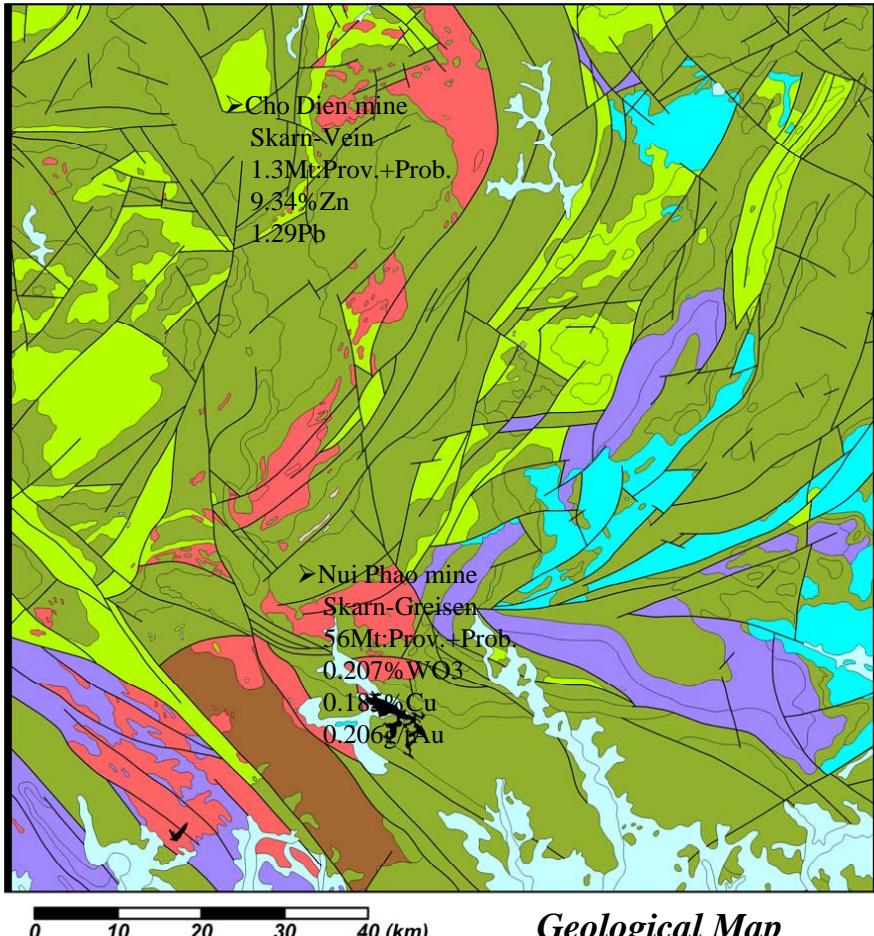




Geological Mapping for Mineral Exploration, Vietnam

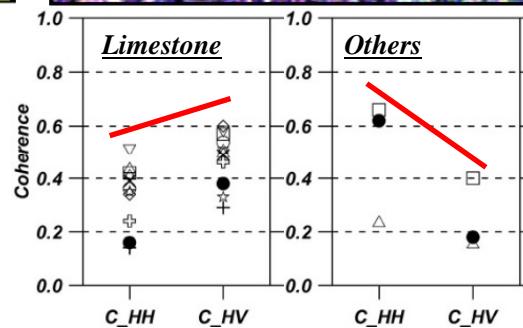
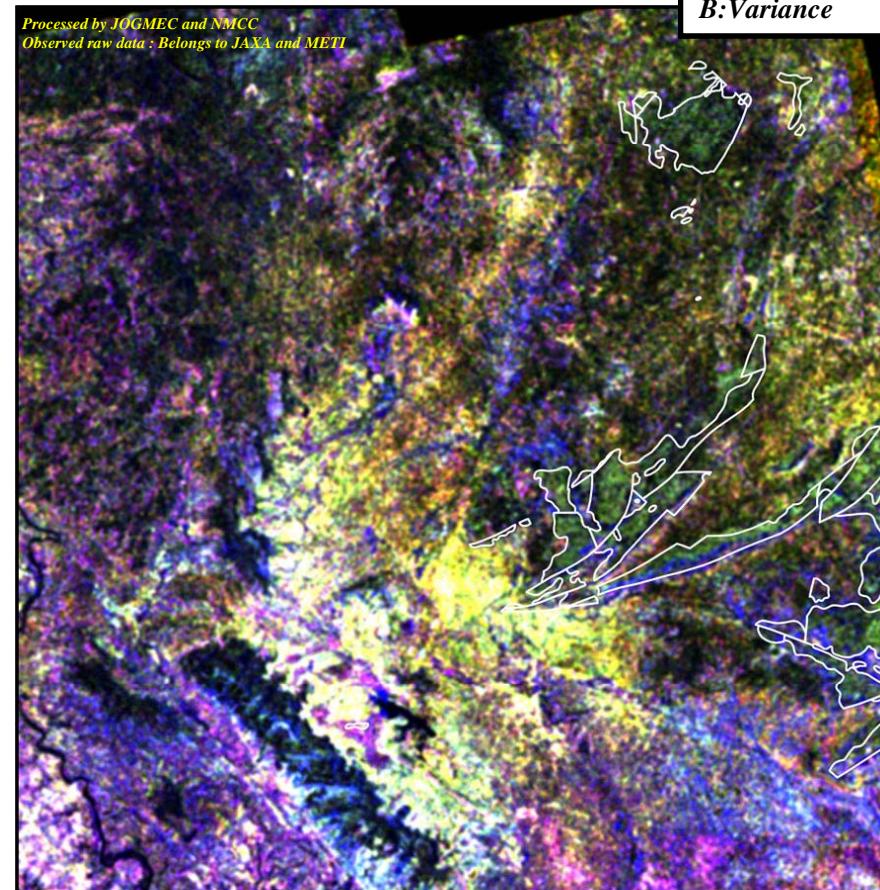
NMCC

JOGMEC's project : R&D on Mining Exploration using "ALOS (Daichi)" data (FY2008)



Geological Map
Lithofacies

- Sedimentary rocks
- Limestone
- Volcanic rocks
- Metamorphic rocks
- Plutonic rocks
- Alluvial

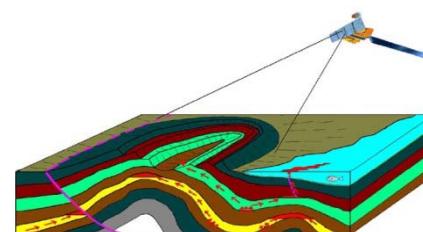
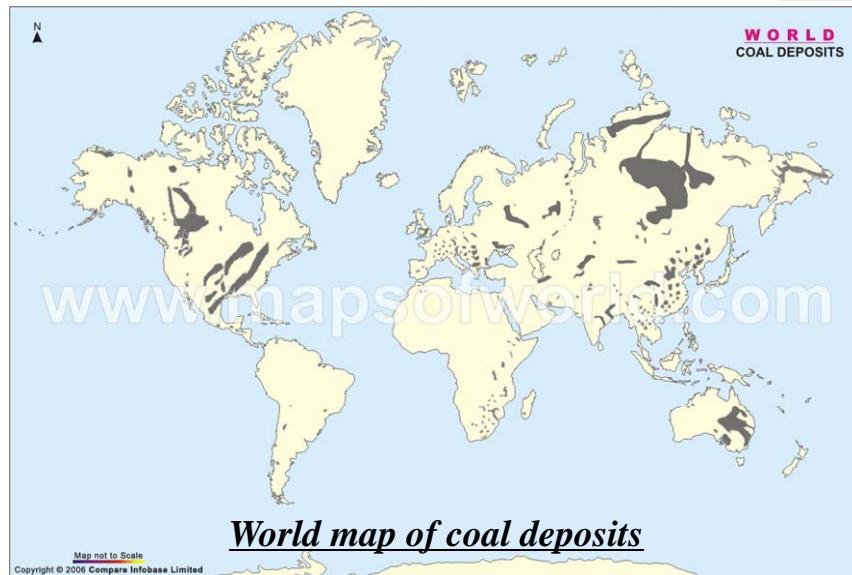
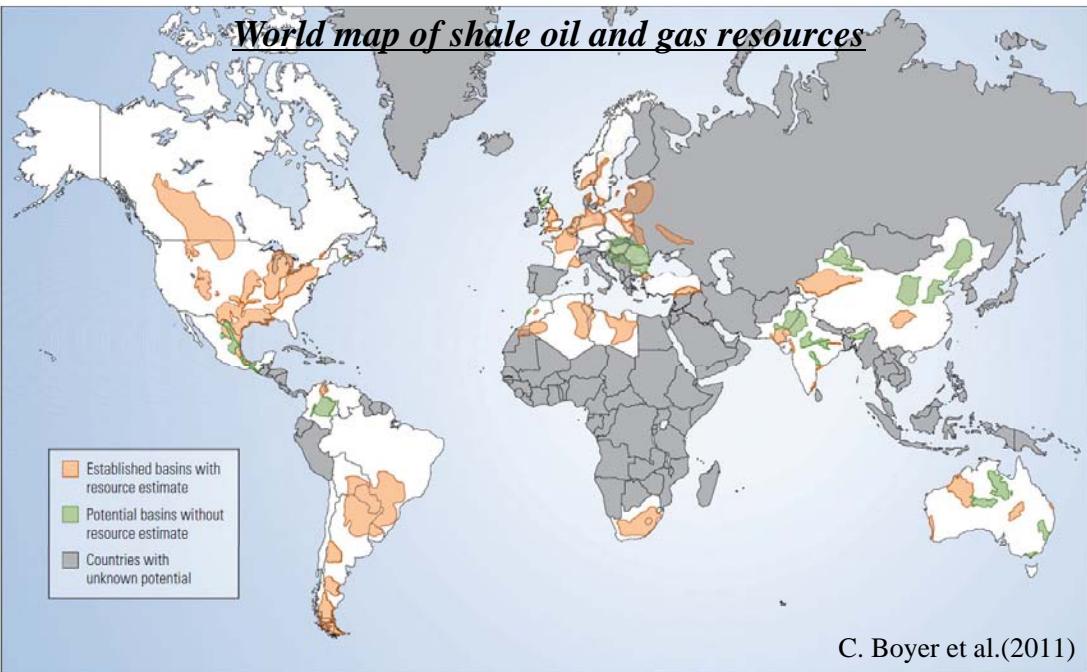
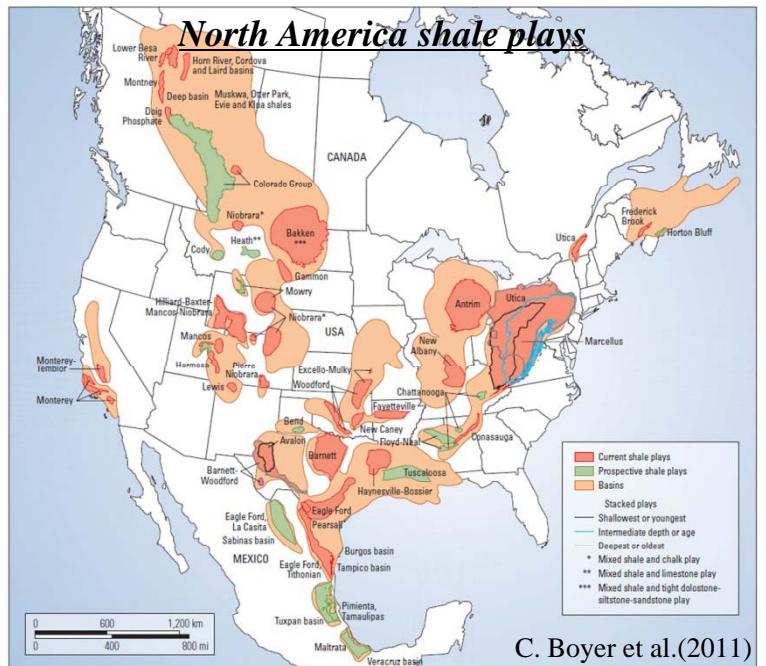


Coherence Image

- Swath width : 350 km
- Spatial resolution : 3 m
- Full-polarimetry
- Temporal resolution : 1-2 times every year



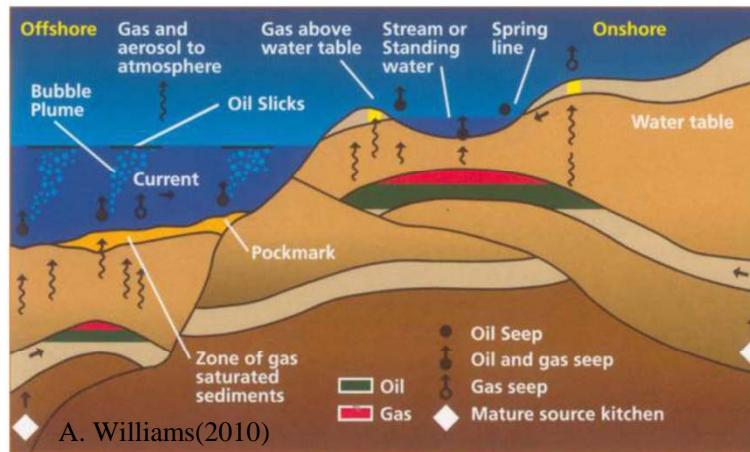
Unconventional Oil/Gas and Coal Exploration NMCC



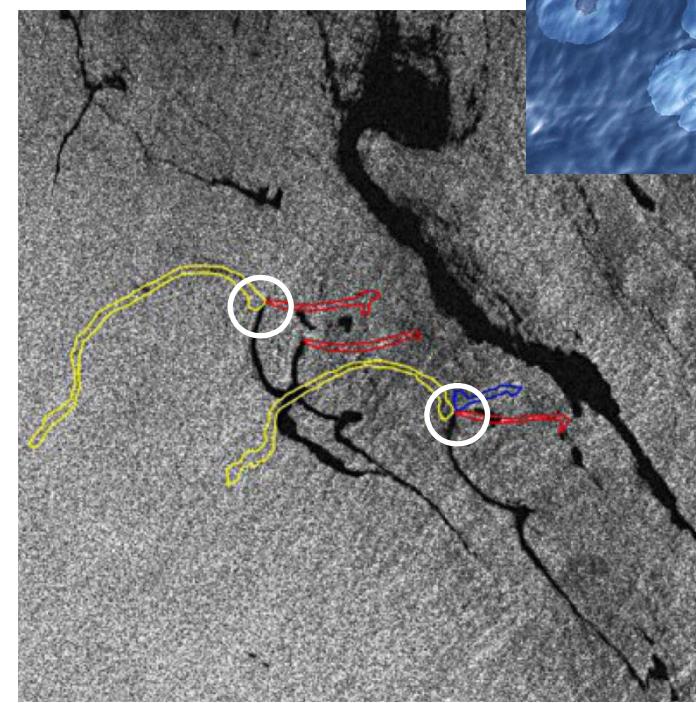
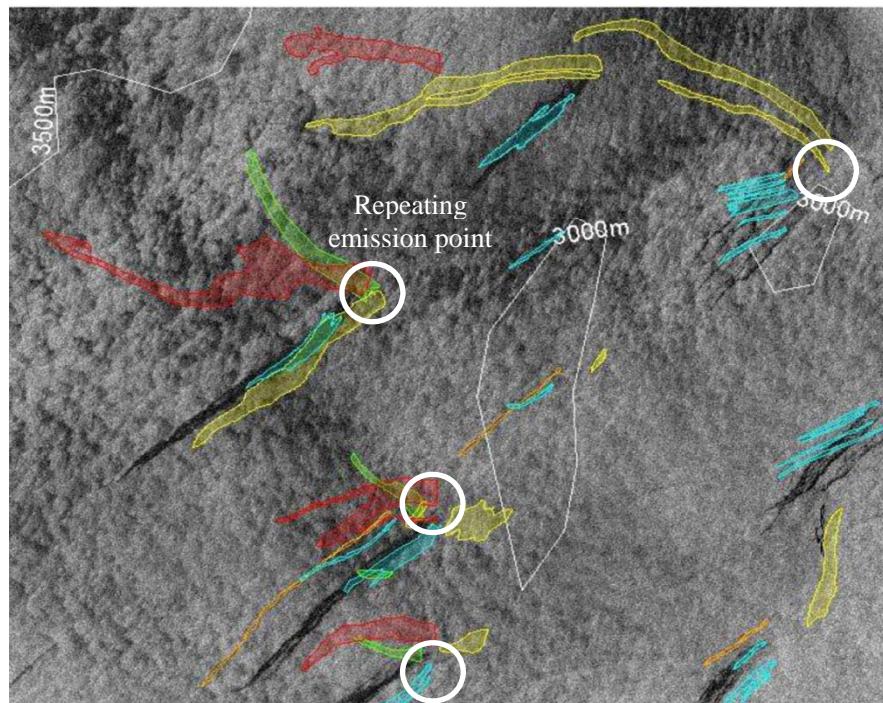
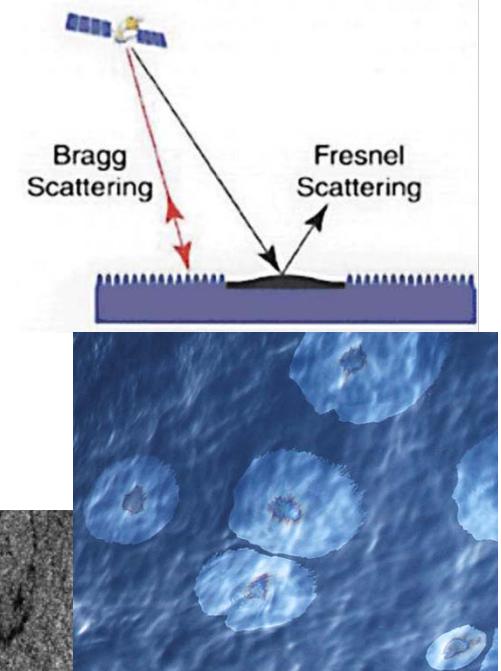
- Source rock
- Reservoir rock
- Cap rock
- Trap
- Fault, lineament
- Topography

- ☺ 350 km in swath width and 3 m spatial resolution
- ☺ 50 km in swath width and 1 m spatial resolution
- ☺ Single polarimetry
- ☺ 1 time during operation

Detection of Natural Oil Seepage



☺ A short temporal resolution
☺ Any observation mode



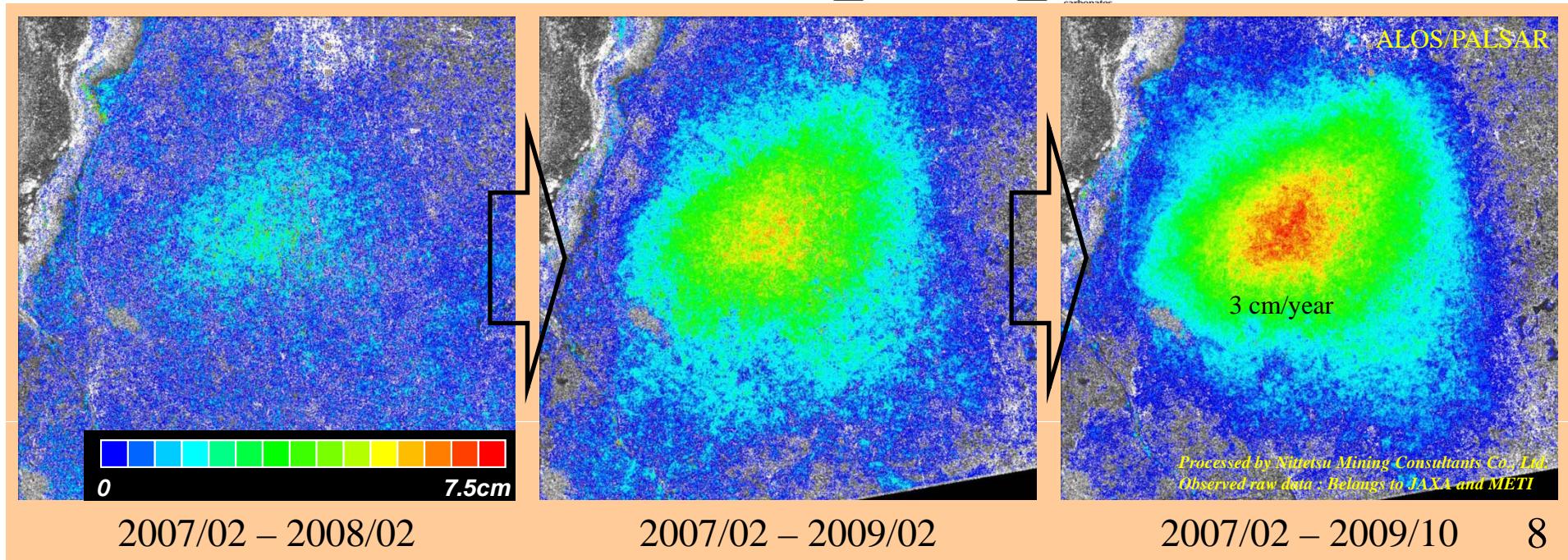
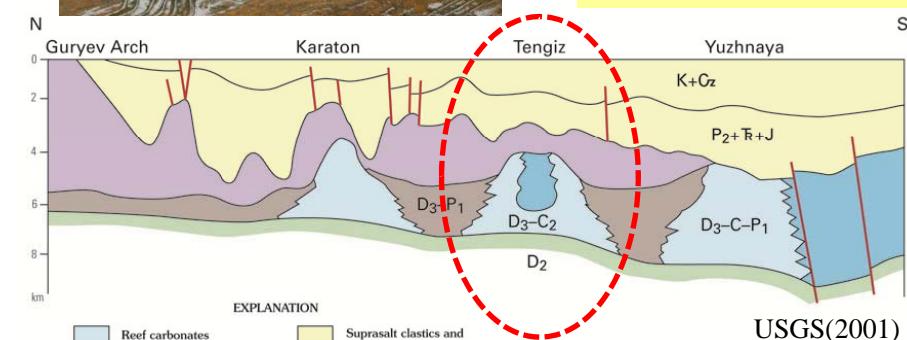


Deformation Monitoring of onshore Oil/Gas Field, Kazakhstan

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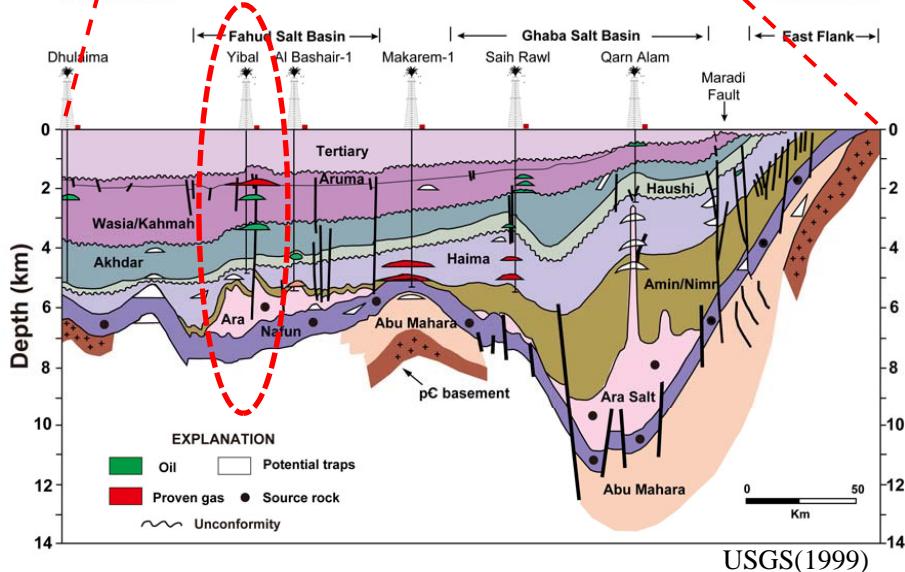
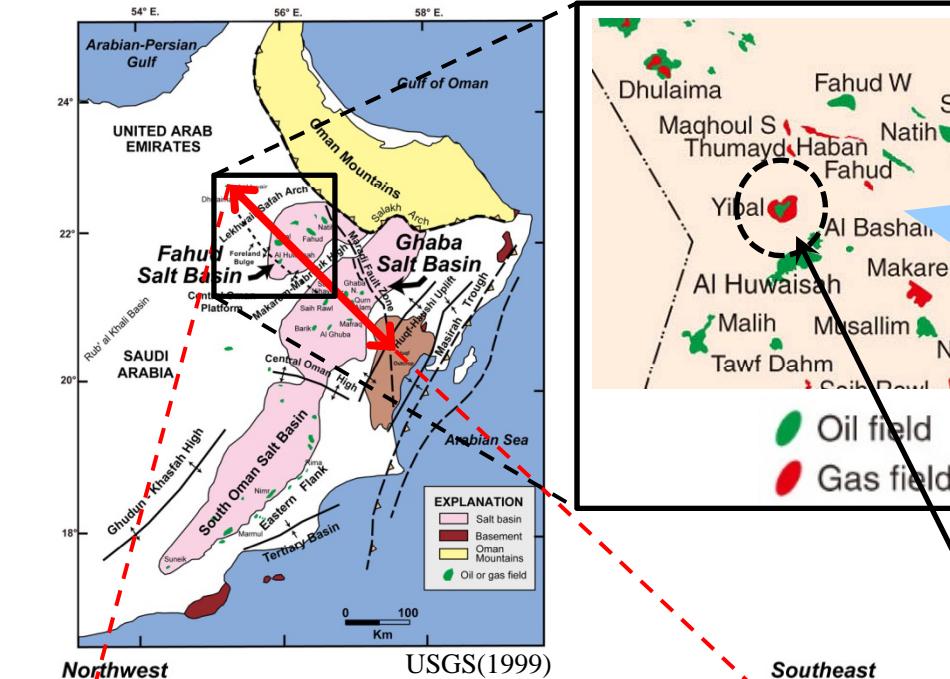
[Tengiz]
*Discovery : 1979
 Started Production : 1993
 Peaked : 2010
 Recoverable (bb) : 26 – 40
 Production (kb/day) : 200*



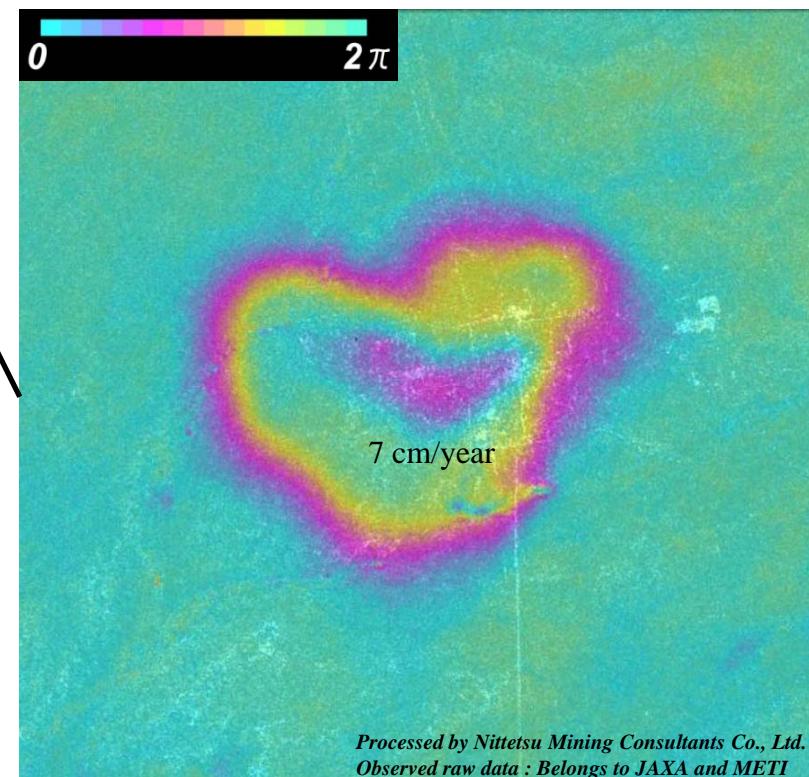


Deformation Monitoring of onshore Oil/Gas Field, Oman

NMCC



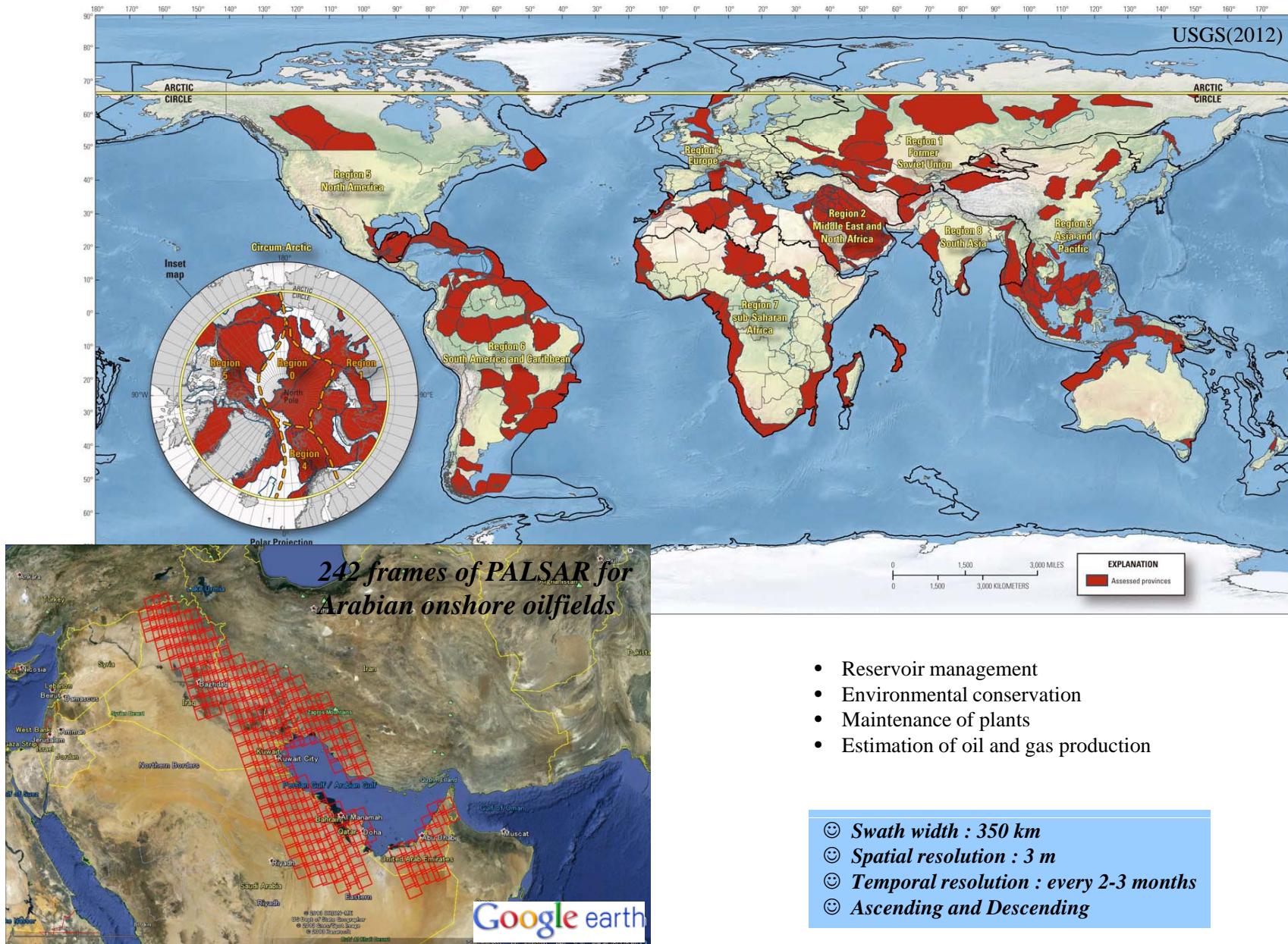
[Yibal]
Discovery : 1963
Started Production : 1968
Production (kb/day) : 110



ALOS/PALSAR
(2008/05 – 2010/12)

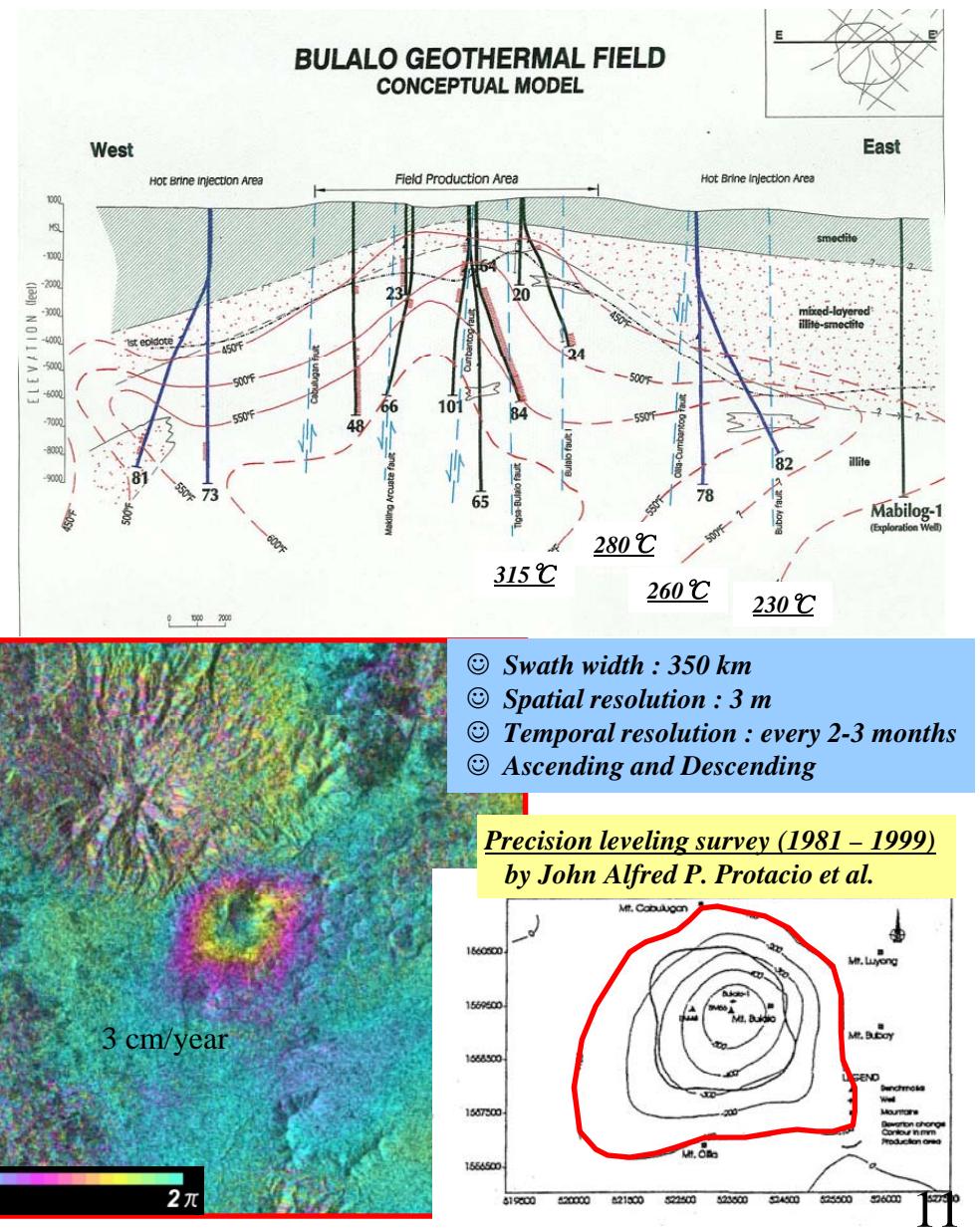
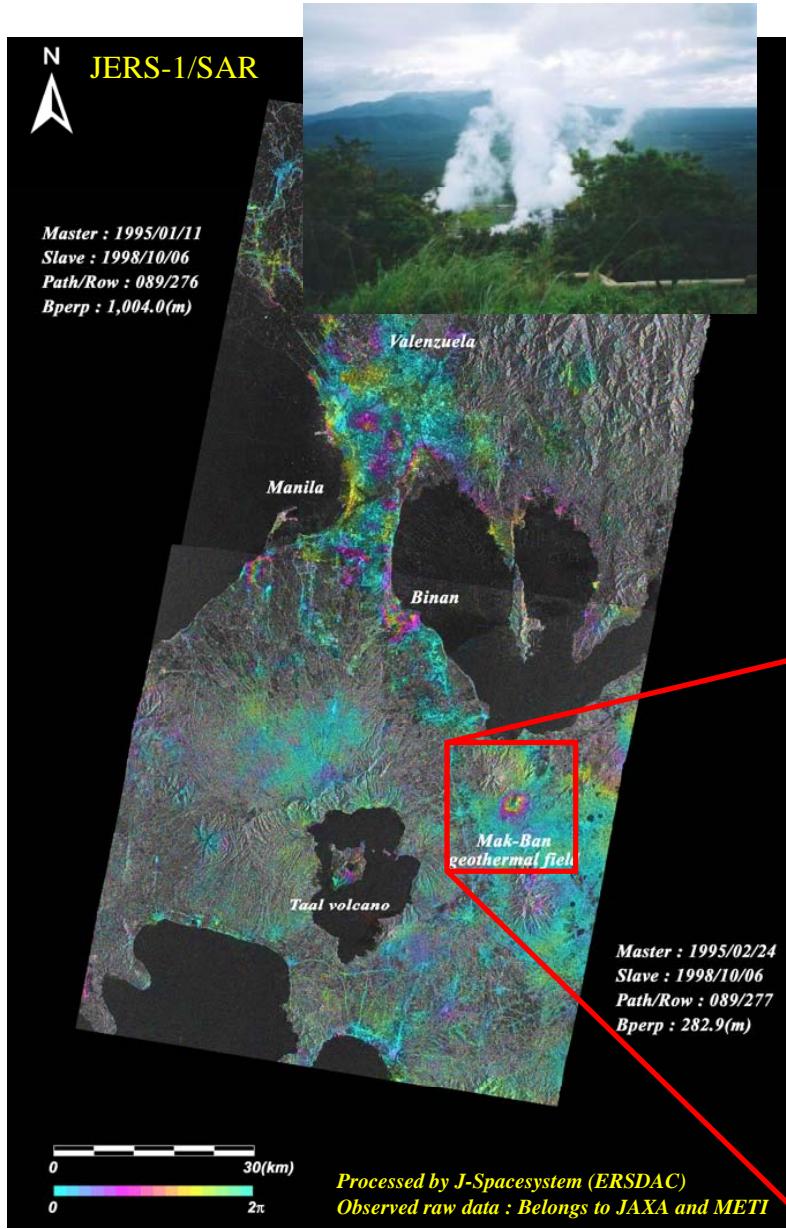


Deformation Monitoring of onshore Oil/Gas Field NMCC





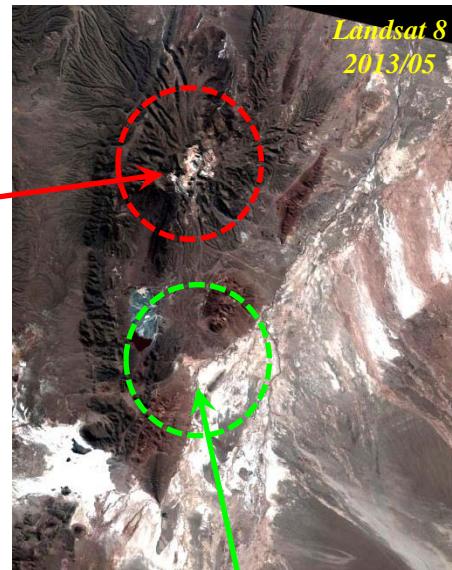
Deformation Monitoring of Geothermal Field, Philippines **NMCC**



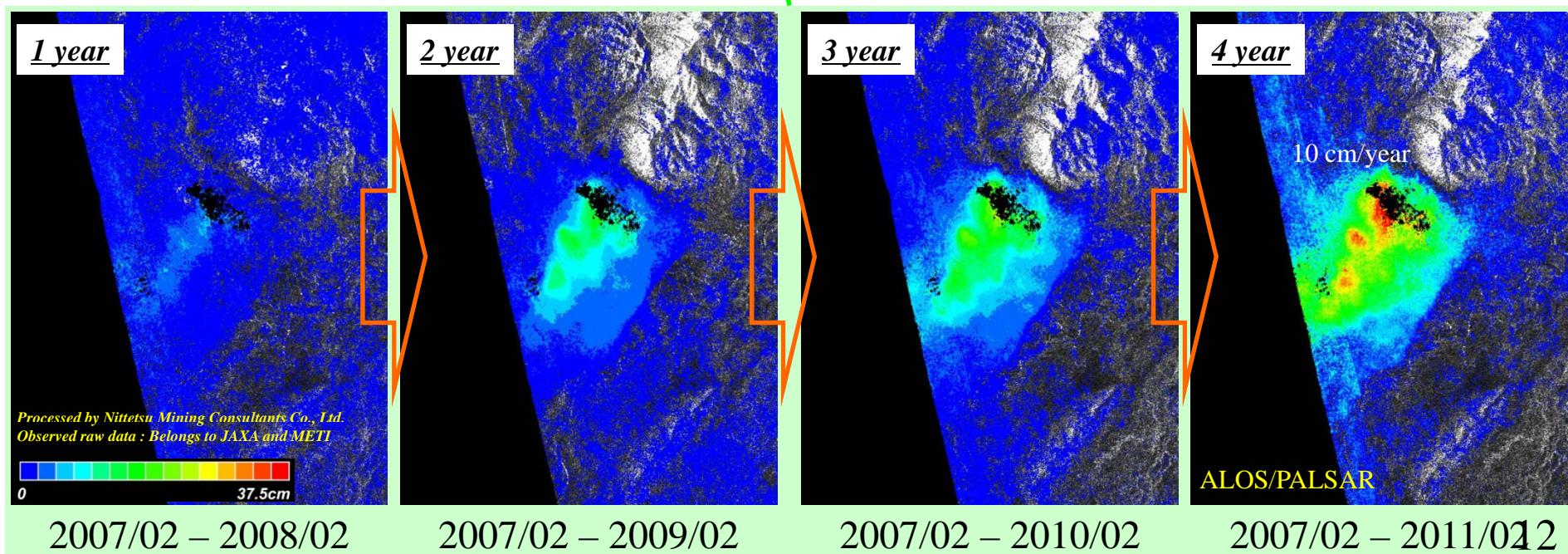


Deformation Monitoring of the Mining Area

NMCC



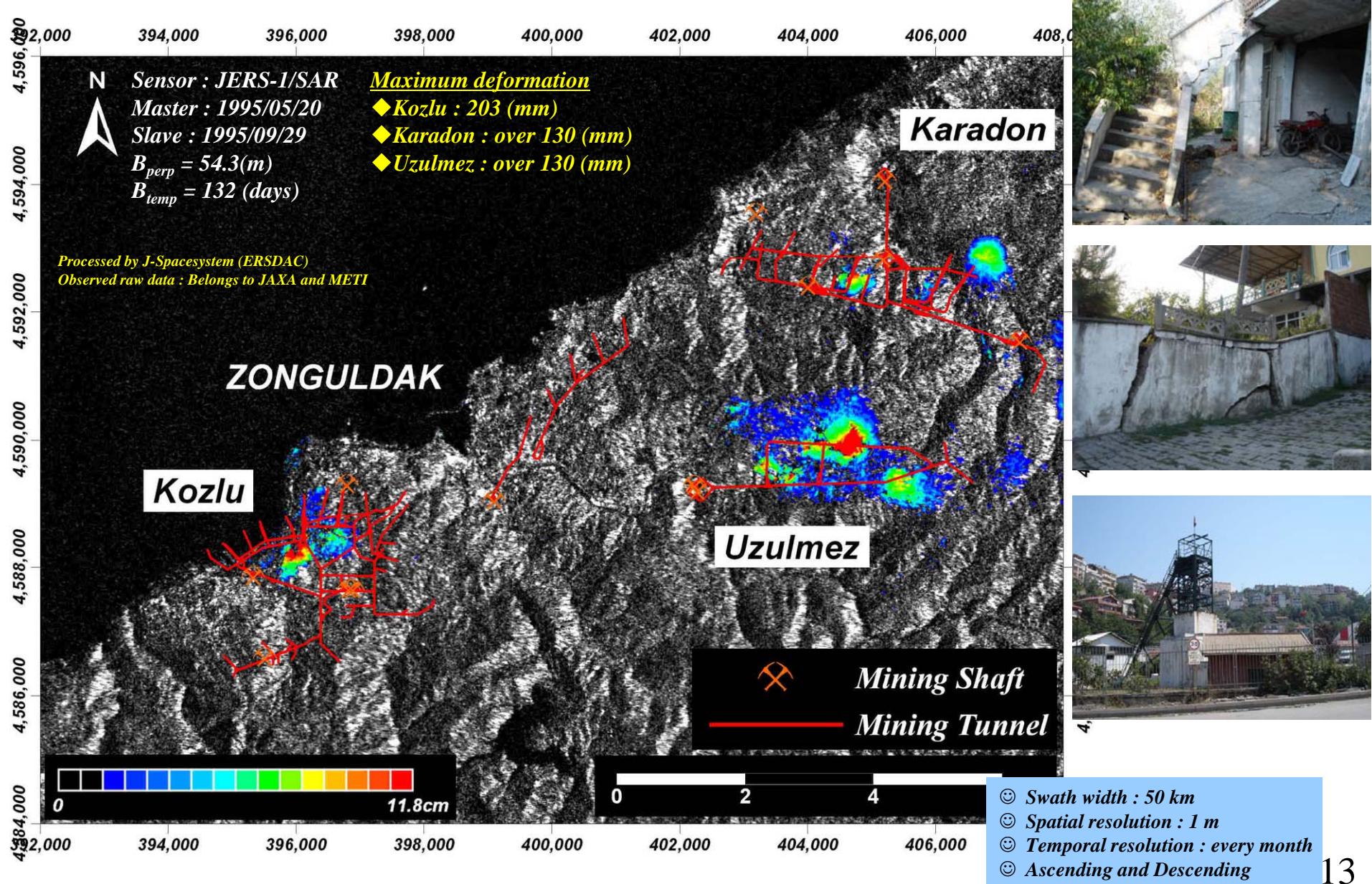
- ⌚ Swath width : 350 km
- ⌚ Spatial resolution : 3 m
- ⌚ Temporal resolution : every 2-3 months
- ⌚ Ascending and Descending





Deformation Monitoring of Coalfield, Turkey

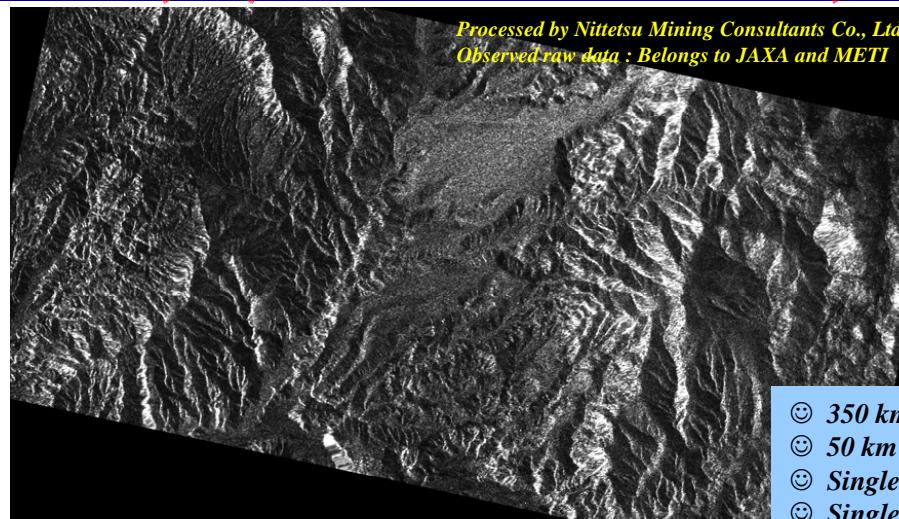
NMCC





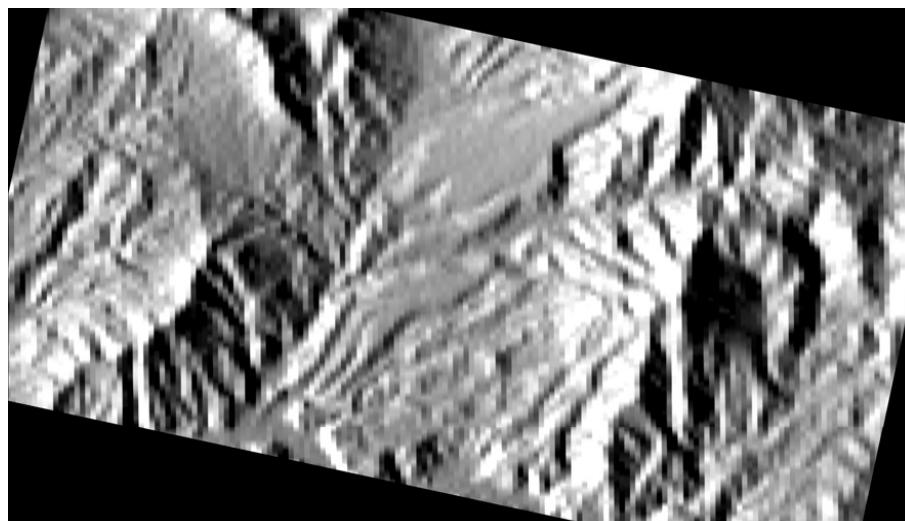
DEM Generation

(phase difference) = ~~(orbit)~~ + ~~(topography)~~ + ~~(deformation)~~ + ~~(noise)~~

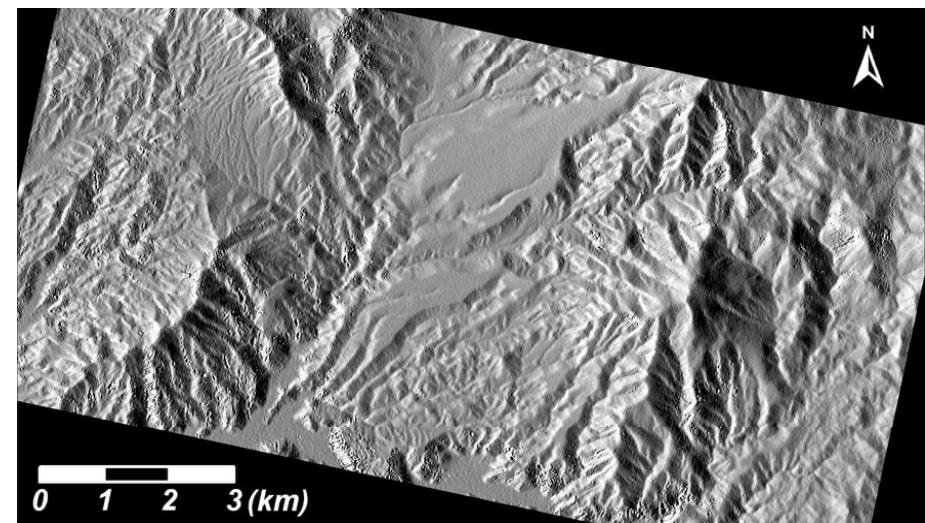


PALSAR Power Image

- ☺ 350 km in swath width and 3 m spatial resolution
- ☺ 50 km in swath width and 1 m spatial resolution
- ☺ Single polarimetry
- ☺ Single-pass FF InSAR
- ☺ Ascending and Descending



SRTM (3 sec.)



InSAR DEM using PALSAR



Summarized Table of Data Acquisition

Prior ity	Objective	Observation time/target	Temporal resolution	Area	Swath width	Spatial resolution	Method/comments
◎	Geological mapping for mineral exploration	Dry and rainy season	1-2 times every year	Global	350 km	3 m	Full-polarimetry
◎	Geological interpretation for unconventional oil/gas and coal exploration		1 time during operation	Onshore oil/gas field	350 km 50 km	3 m 1 m	Power image Single-polarimetry
◎	Detection of natural oil seepage (Conventional oil/gas)		Every revisit	Offshore oil/gas field	any	any	Geometric calibration New observation request
◎	Land use mapping, infrastructure	Land use, pipeline, drainage system	Every year	Global	350 km	3 m	Full-polarimetry
◎	Deformation monitoring	Oil/gas, geothermal, ground water	Every 2-3 months and more	Global	350 km	3 m	InSAR time series Asc. and Des. Same orbit as ALOS-2
◎	Deformation monitoring of coalfield	Coalfield	Every month	Coalfield	50 km	1 m	InSAR time series Asc. and Des.
◎	DEM generation			Global	350 km 50 km	3 m 1 m	Single-pass FF InSAR Asc. and Des.



Danke Schön !!

Arigato !!

Thank you !!

