Summery Session of 4th ALOS PI symposium and workshop, Tokyo, 2010

Date: Nov. 17
Place : Tokyo, Sankei Plaza Hall

In this session, session summaries and the recommendations were presented from the session chairmen.

OPT CAL/VAL
Land Use and Land Cover
Geography
Agriculture
Vegetation Mapping, Forest & Wetland
Hydrology & Water Resource

SAR CAL/VAL
Geology
Disaster Management
Snow & Ice
Ocean Processes & Monitoring

Followings are the report from each session.
M. Shimada, ALOS science manager

Optical Image Processing (OPT)

Land Cover Classification of Forest Area using AVNIR-2

> Algorithm development of LC classification

> Image segmentation, decision tree classification and modification.

Summary of Calibration results for PRISM and AVNIR-2

> Current status of geometric and radiometric accuracy

> Revision histories and plans of calibration parameters

> PRISM and AVNIR-2 are healthy.

> Onboard fuel is enough.

Optical Image Processing (OPT)

Result of the questionnaire

	Radiometric		Geometric	
	PRISM	AVNIR-2	PRISM	AVNIR-2
Good	3	3	5	1
Acceptable	2	2	0	4
Poor	0	0	0	0

Comm.: JPEG noise is serious in the early phase. But it is OK after software update.

PRISM Ocean Application with the ATSSG Technique

> ATSSG: Along Track Stereo Sun Glitter, new technique for the detection of water surface motion using PRISM.

> Evolution of an internal wave field on sub-minute timescales.

> Request to JAXA: Please consider the OCEAN more!!

Report Session Cal-Val PALSAR :Summary & Recommendations

- The session includes 2 sub-session:
  - Cal/Val1 with 6 presentations (R.Touzi & Y.Yamaguchi)
  - and Cal/Val2 with 7 presentations (W.Boerner and T. Moriyama)
- The 13 presentations cover:
  - keys applications that promote the excellent polarimetric capabilities of L-band PALSAR, and the unique added value of the polarimetric and Pol-InSAR information in key applications: Wetlands, Forest, Urban, and glacier mapping and monitoring
  - New algorithms for the optimum extraction of polarimetric and Pol-InSAR information.

Seed Question

1. What is the added value of PALSAR Polarimetric information?
2. Users requirements on polarimetric ALOS2 design

- **Wetlands: long-wave penetrating and polarimetric** PALSAR unique capabilities ⇨ enhanced monitoring of wetland hydrology and peatland subsurface water flow variations. Key information for the monitoring of wetland health, and their transformations related to environment stress in general, and Climate Change in particular

Added value of Polarimetric PALSAR information

- **Forest:**
  - Polarimetry enhanced mapping and monitoring of forest
  - Pol-InSAR ⇨ Forest structure, might be affected by temporal decorrelation

- **Urban:** Polarimetric Target scattering mechanisms ⇨ enhanced urban feature characterization

- **World coverage** is necessary ⇨ operational temporal + spatial polarimetric coverage

L-band PALSAR
Excellent polarimetric data quality
(Thanks JAXA & Shimada)

- PALSAR an excellent SAR with unique polarimetric capabilities:
  - Antenna of high isolation (better than -35 dB)
    - Pure HV at single and dual-pol (low Faraday)
  - Well calibrated (0.7 dB in radiometry and 2 degree in phase)
  - Very stable
  - Low noise floor (better than -34 dB)
  - 32-bit floating point => No loss of polarimetric information related to the Look-Up-Table

  ⊖ Experimental => limited window for PLR!!!

  ⊖ 20km swath

Requirements on polarimetric PALSAR2

- At least as good as PALSAR1 in terms of polarimetric Data quality
- PALSAR2 with more operational polarimetry:
- PALSAR2 with operational polarimetry:
  - 4.5 m and 9 m resolution with 35km swath ⇨
  - 20m resolution with larger swath (80-100 km)
  - Multiple incidence angle (between 10°and 70°) ALOS-PI 09
- Pol-Insar application:
  - 14-day repeat pass good news
  - Forest height/true surface topography estimation: generate deliberate offset baselines of 500m or so (S. Cloude, P. Siqueira)
  - What about ALOS1-ALOS2 in Tandem mode for single-pass interferometry?

Land Cover/Land Use

4th ALOS Joint PI Symposium

Chairpersons

- Ke-Sheng Cheng
- Yasunori Nakayama
- Kanako Muramatsu
- Scott Arko

Session Overview

- 14 Presentations
- All ALOS sensors were used in research

- Great Breadth of Topics
  - Classification
  - Forest Changes/Fires
  - Glaciers
  - Urban monitoring and mapping
  - Landscape/Ecological studies
  - Elevation Modeling

Themes

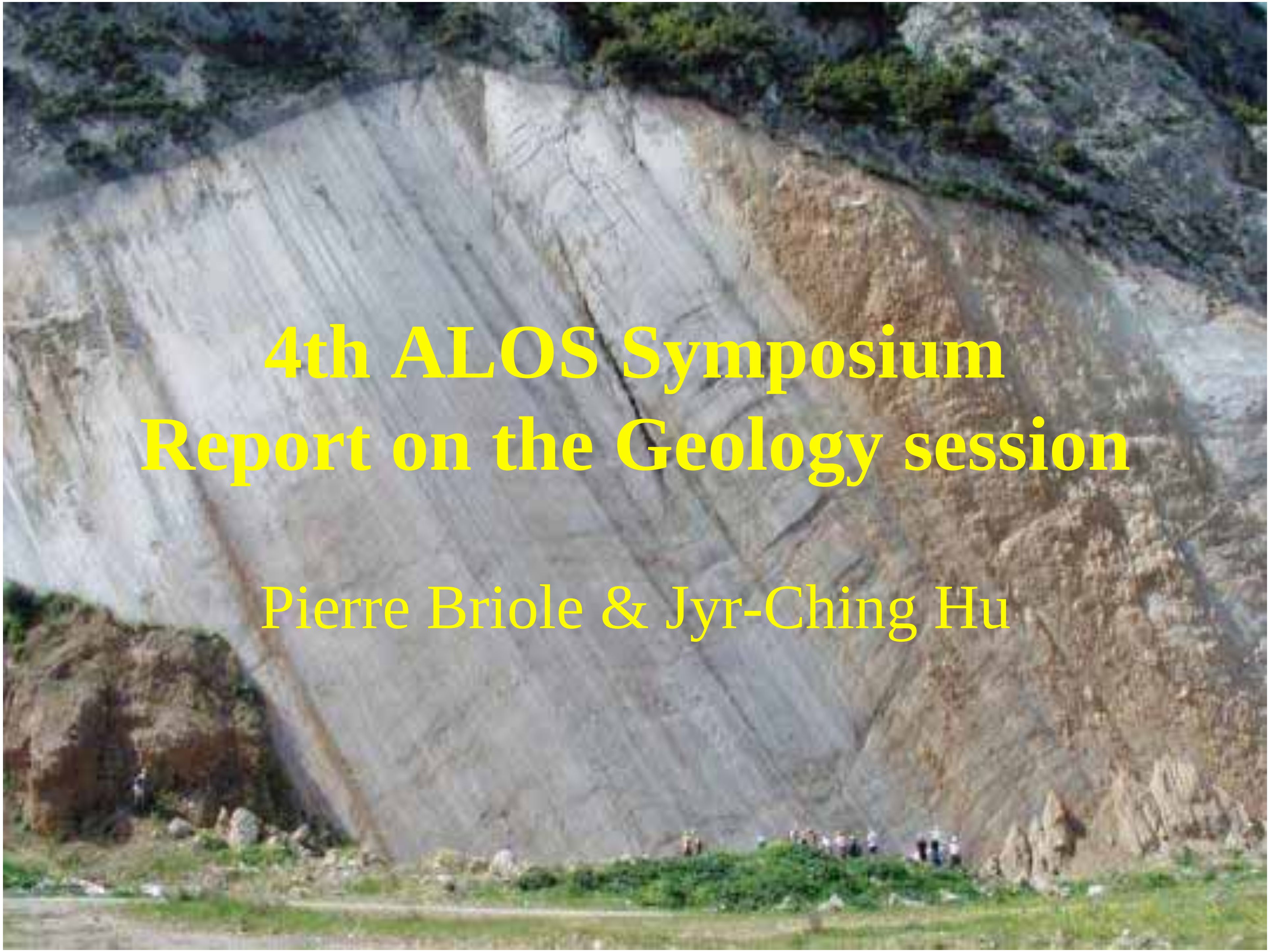
- Use of multiple sensors in classification
  - AVNIR-2 and PRISM for Bamboo mapping
  - PALSAR, AVNIR-2 and PRISM for forest degradation
  - PALSAR and AVNIR-2 for land-cover classification
- More use of polarimetric SAR for both urban and non-urban classification
- Polarization orientation angle being used in new ways for new analysis

Themes

- Use of GIS environments to facilitate new types of analysis with ALOS data
- Usage is moving from technique and algorithm development to application of data addressing real world problems

Summary

- ALOS research in land cover and classification has advanced greatly over the past 5 years
- Many new techniques and methods for using ALOS data
- Incorporation of data into GIS environments presents new tools for analysis
- Community looks forward to new capabilities in ALOS-2 and ALOS-3



4th ALOS Symposium
Report on the Geology session

Pierre Briole & Jyr-Ching Hu

Session content

- 3 oral presentations
  - Volcanoes
    - Etna
  - Seismic zones
    - Corinth rift, Greece
    - Tibet
- 2 posters
  - Baikal
  - Eastern Taiwan

Geology

- Geodynamics, long term stress accumulation (leading to natural hazards), seismic cycle
  - *Addressed in sessions DISASTERS and GEOLOGY of this ALOS meeting*
- Natural resources
  - Mining activities
  - Oil activities
  - Water
  - *First two topics not addressed in this ALOS meeting. They are people working on that but not only for science applications*
- Geomorphology - Erosion
  - *Talks on landslides and during the meeting*

How RS data can meet Geology needs

- Needs
  - Range of pixel size depending on the application
  - Long time series and global coverage (archive)
  - Filtering of the vegetation signature
  - Hyperspectral data, polarimetry
- Important issues
  - The vertical component is very important (topography and its changes)
  - Need improved merging of space and ground data
- Future growing applications
  - Coastal geology (erosion, sedimentation, …)
  - Others …

Session Summary: Disaster Management

Manabu Hashimoto

(DPRI, Kyoto Univ.)

Statistics

- Papers
  - 16 oral presentations
  - 2 posters
- Topic
  - Earthquake (Coseismic) 3
  - Tectonics (Secular/Long term Deformation) 6
  - Volcano 4
  - Landslide 3
  - Flood 1
  - Land Use/Biosphere/Forestry 1
  - Data management 1

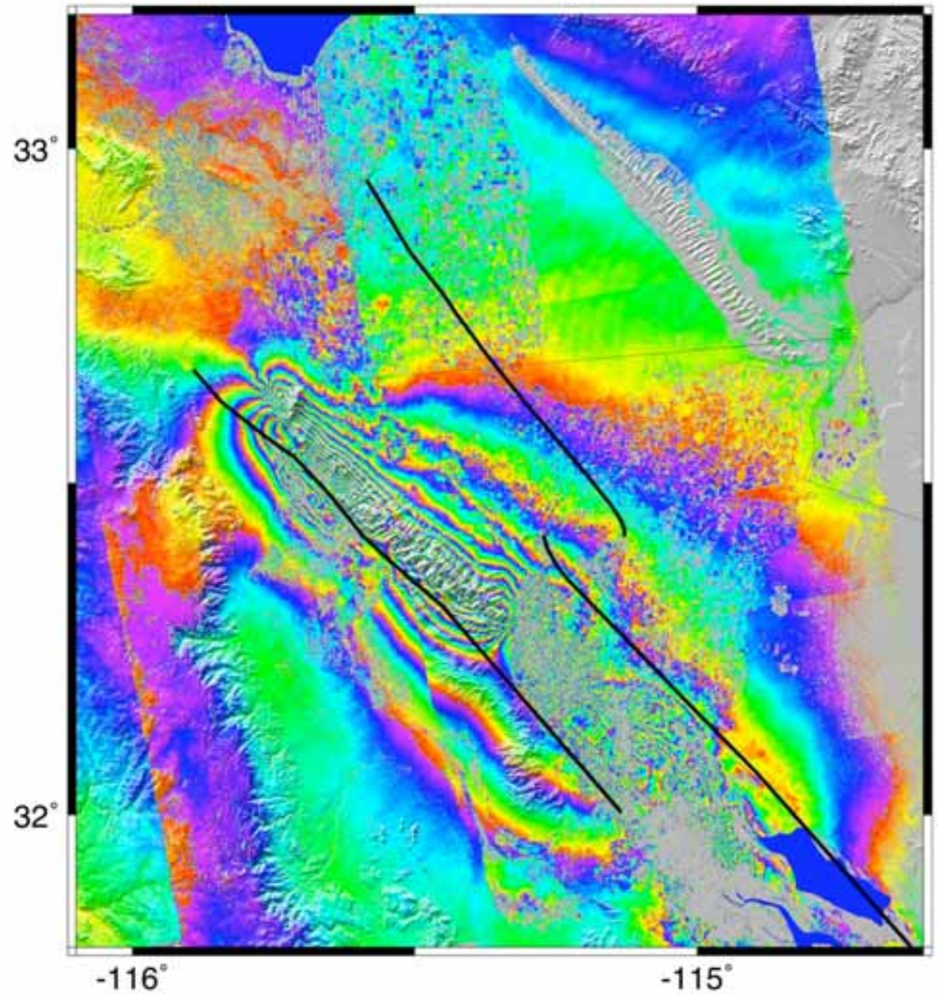
Studied Areas

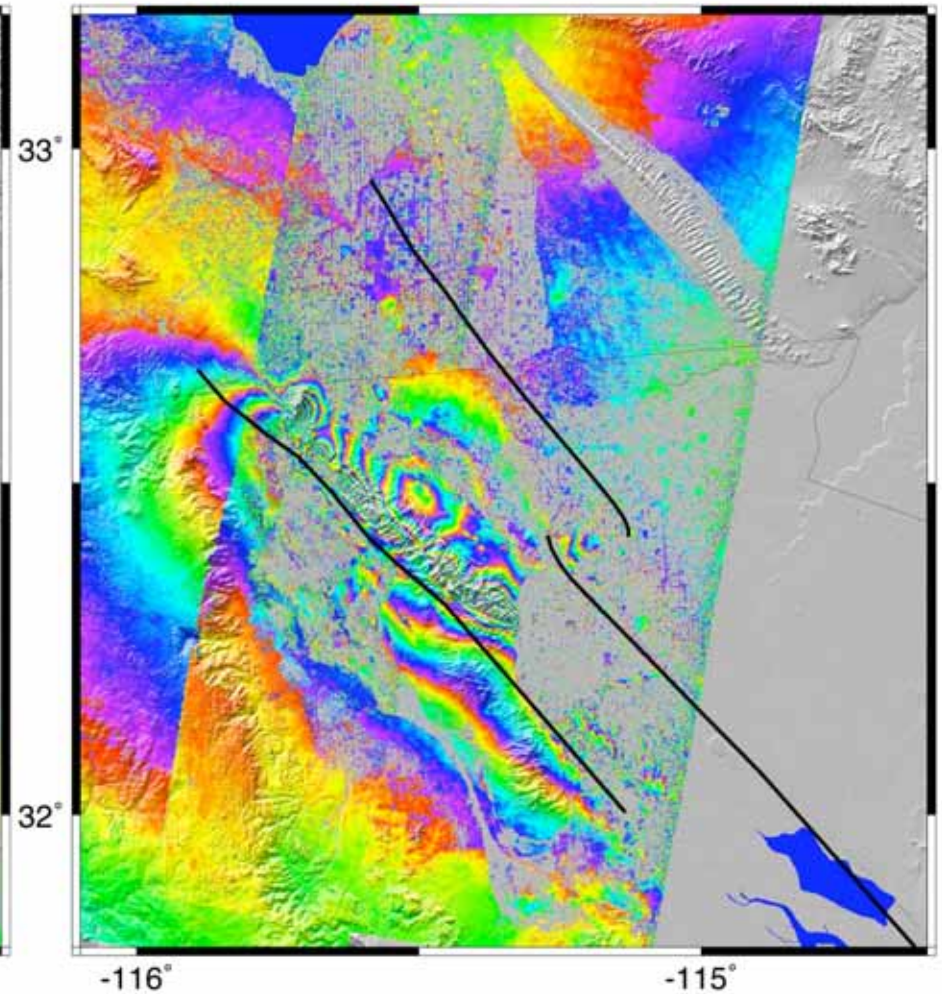
- Earthquake
  - Wenchuan, Baja California, Chile
- Volcano
  - Hawaii, Etna, Iceland
- Flood
  - Vietnam
- Landslide
  - Japan, China
- Long term Deformation
  - Indonesia, LVF Taiwan, Shikoku & Kyushu, Bay Area
  - Thanks to little temporal decorrelation

Techniques

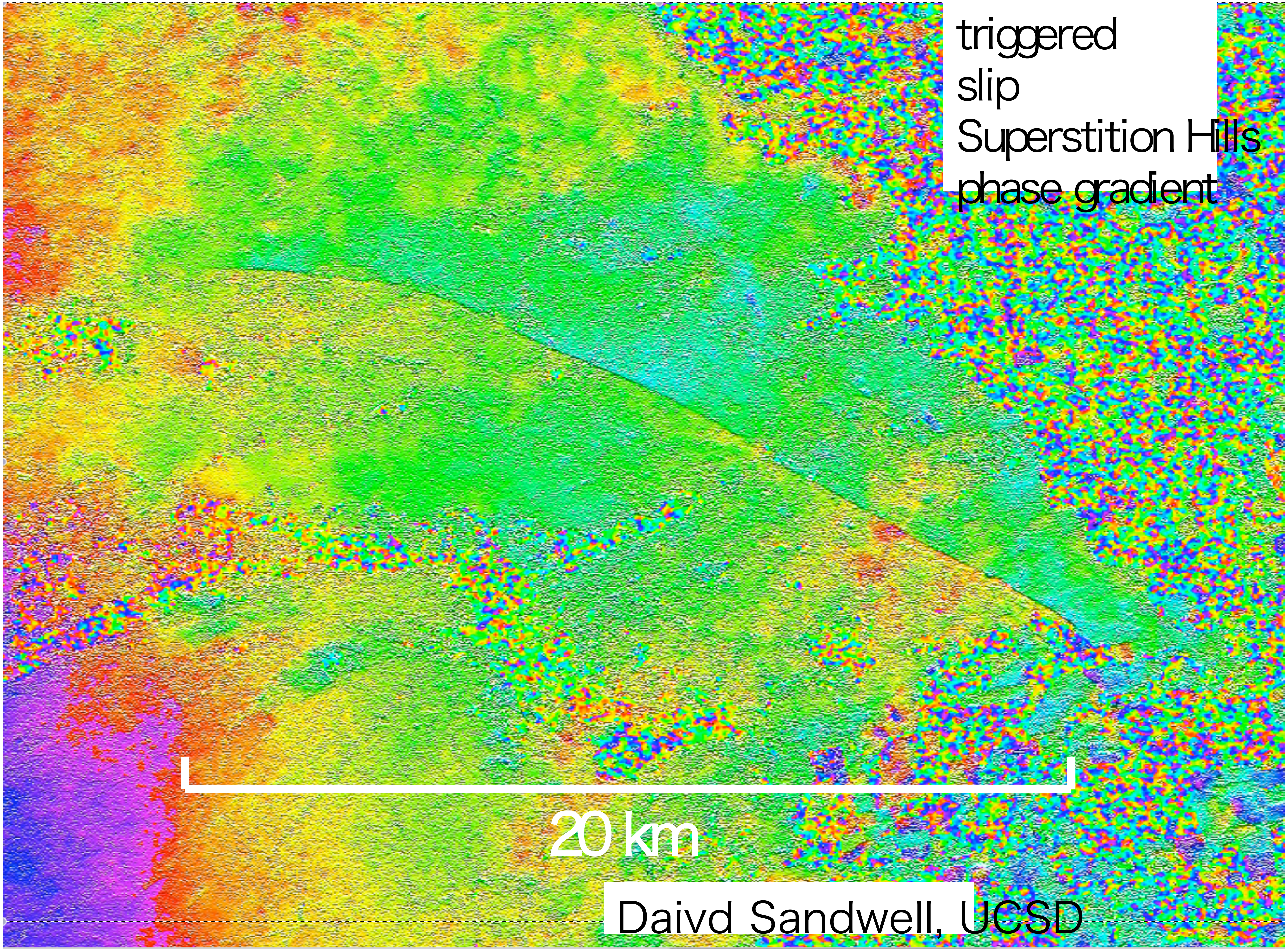
- AVNIR-2, PRISM
  - DSM
- PALSAR
  - InSAR
    - Strip-map mode
    - ScanSAR
    - Pixel offsets
  - Time Series Analysis
    - PS-InSAR, SBAS, Stacking
- Modeling
  - Incorporation of other geodetic data (GPS etc.)

ALOS coseismic: 2010 Baja California



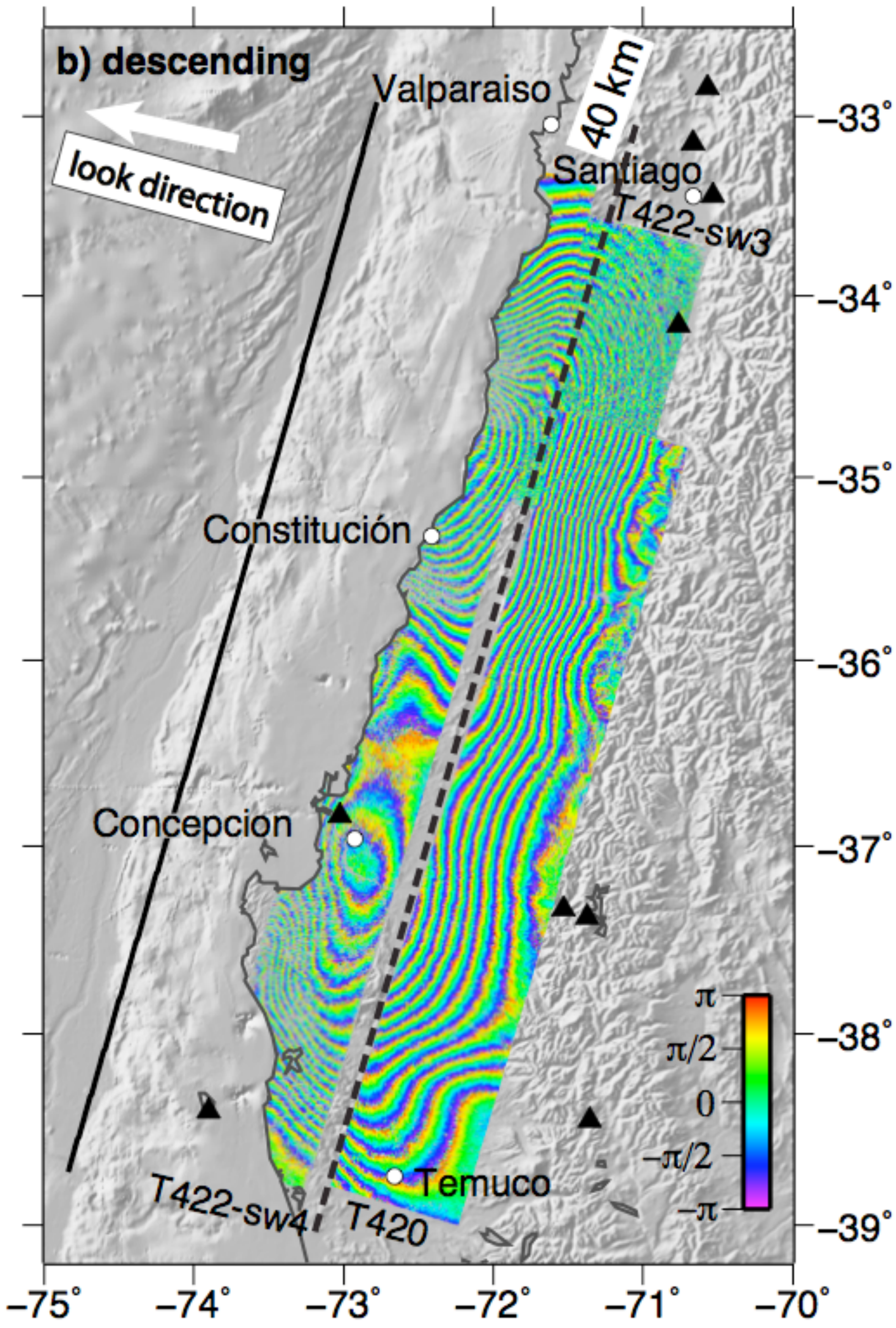


Daivd Sandwell, UCSD


triggered
slip
Superstition Hills
phase gradient
20 km
Daivd Sandwell, UCSD

Descending ALOS:
2010 Chile

- T422 is ScanSAR
- coastal swath is ScanSAR to FBD
- center swath is ScanSAR to ScanSAR
- inland swath T420 is FBS to FBS
- note phase minimum at 40 km depth - dashed line

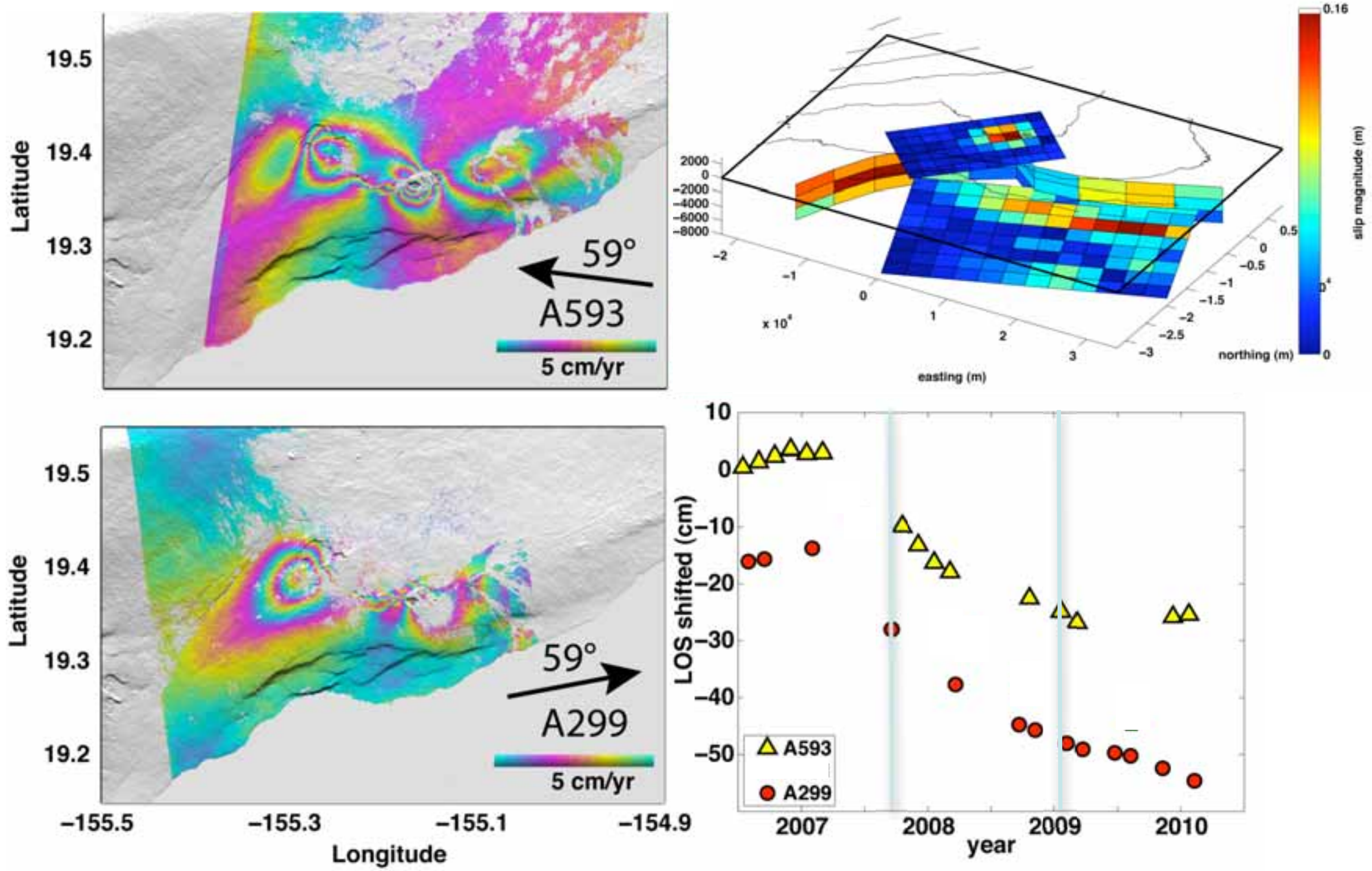


Daivd Sandwell, UCSD

(processed with GMTSAR
see poster Tuesday or
http://topex.ucsd.edu/gmtsar)

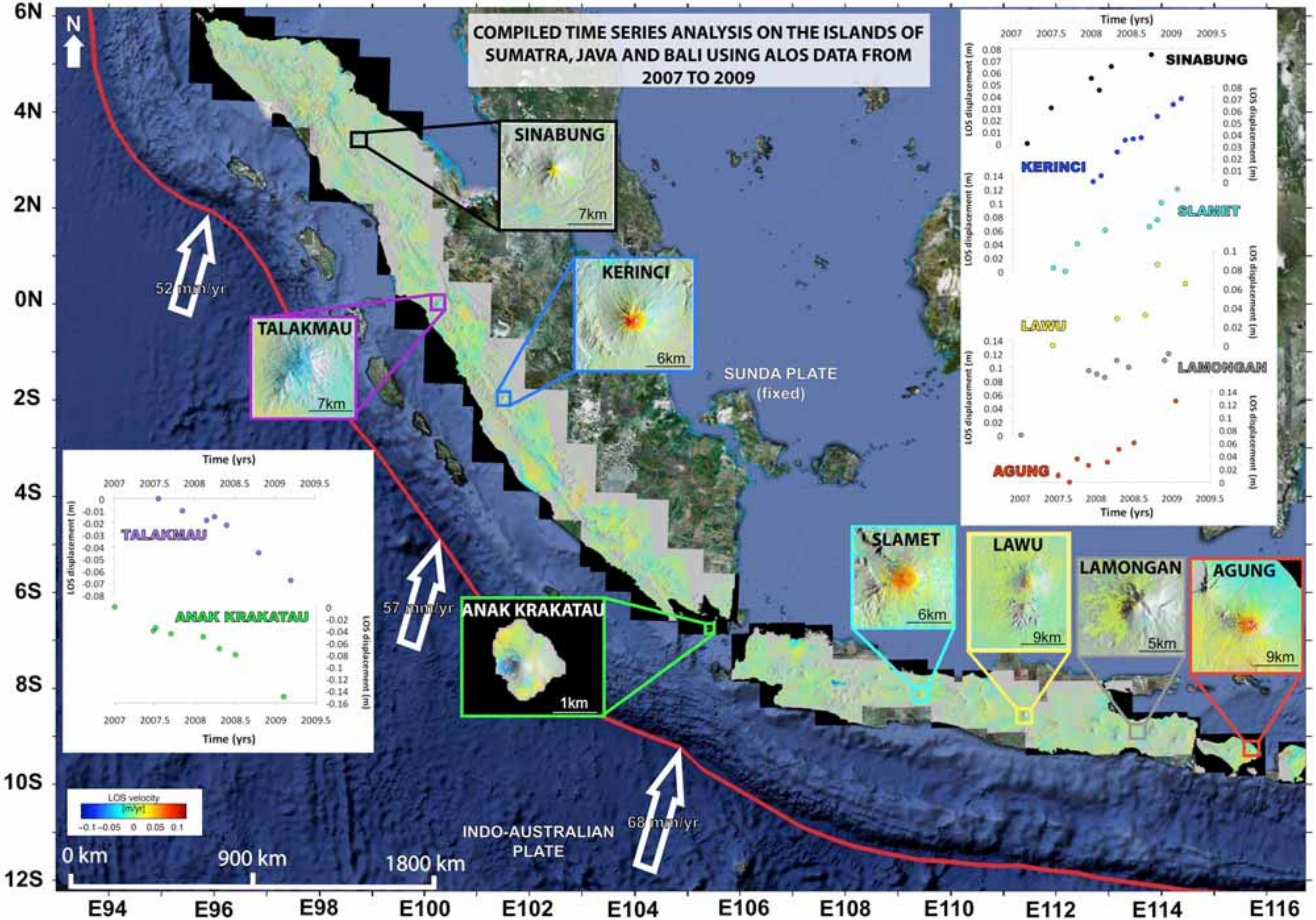
Kilauea Volcano Hawaii

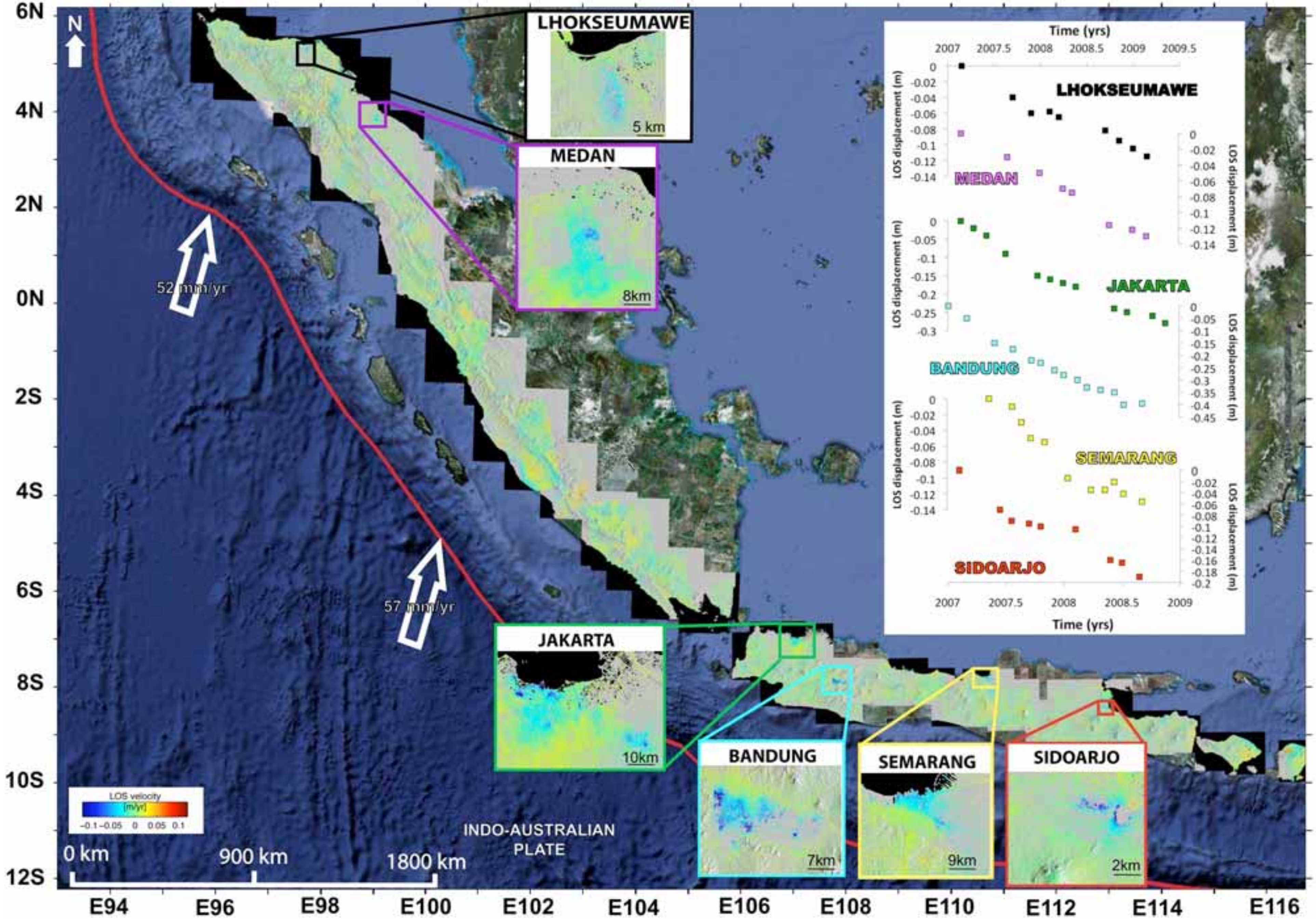
ALOS mean LOS velocity maps and time series (2006-2010) and model for 2007.8-2009 time interval



Shallow (2 km depth) Kilauea sill plus rift dikes and decollement (7-8 km depth)

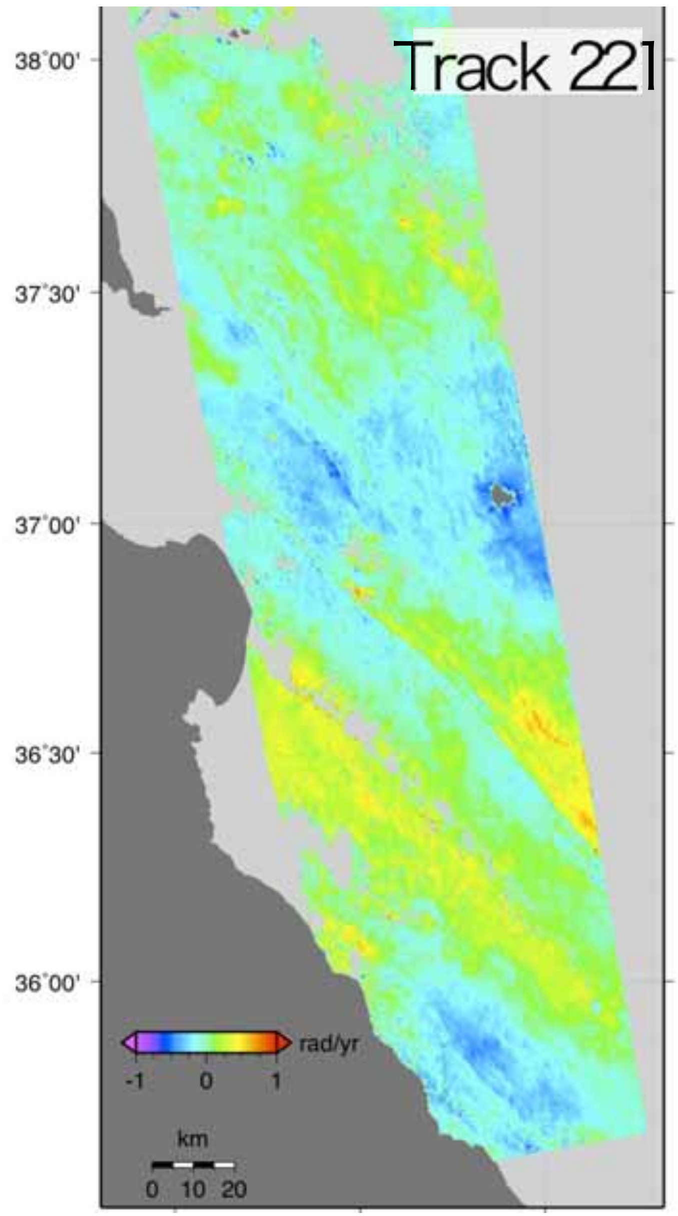
P. Lundgren, Jet Propulsion Laboratory, California Institute of Technolo

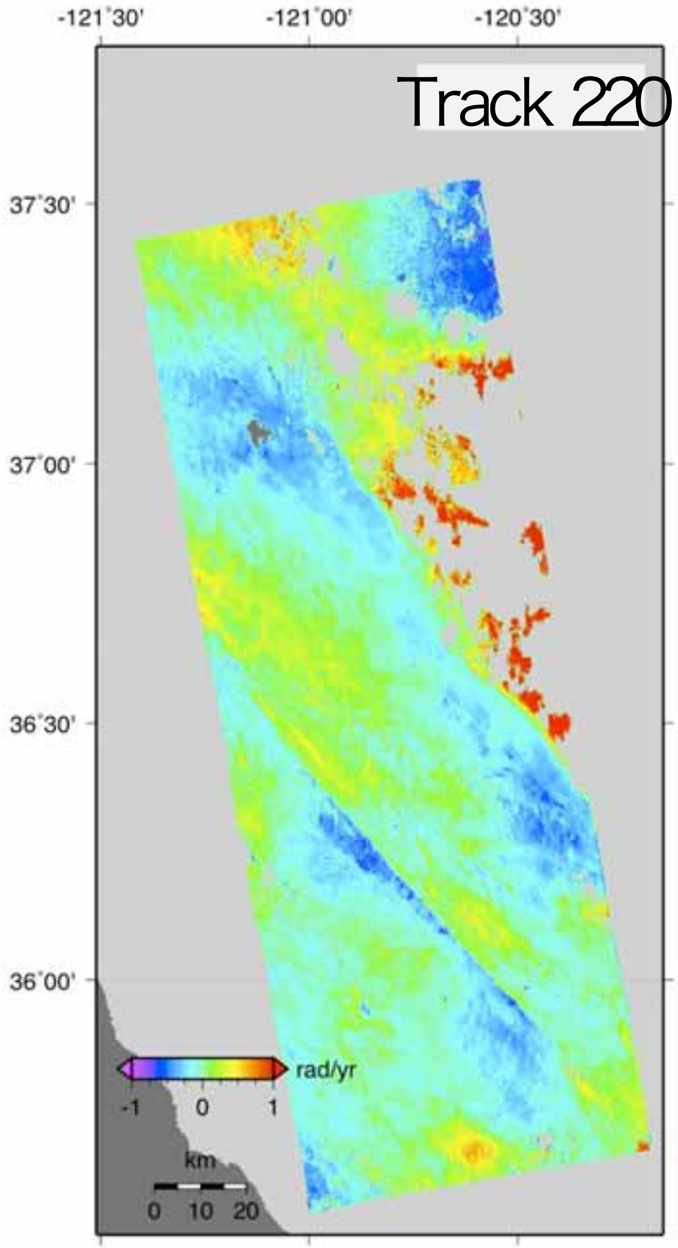

COMPILED TIME SERIES ANALYSIS ON THE ISLANDS OF SUMATRA, JAVA AND BALI USING ALOS DATA FROM 2007 TO 2009
SINABUNG
7km
KERINCI
6km
TALAKMAU
7km
ANAK KRAKATAU
1km
SLAMET
6km
LAWU
9km
LAMONGAN
5km
AGUNG
9km
SUNDA PLATE (fixed)
INDO-AUSTRALIAN PLATE
52 mm/yr
57 mm/yr
68 mm/yr
LOS velocity [m/yr]
-0.1 -0.05 0 0.05 0.1
0 km
900 km
1800 km
Time (yrs)
LOS displacement (m)
6N
4N
2N
0N
2S
4S
6S
8S
10S
12S
E94
E96
E98
E100
E102
E104
E106
E108
E110
E112
E114
E116



6N
4N
2N
0N
2S
4S
6S
8S
10S
12S
E94
E96
E98
E100
E102
E104
E106
E108
E110
E112
E114
E116
N
52 mm/yr
57 mm/yr
LHOKSEUMAWE
5 km
MEDAN
8km
JAKARTA
10km
BANDUNG
7km
SEMARANG
9km
SIDOARJO
2km
INDO-AUSTRALIAN PLATE
0 km
900 km
1800 km
LOS velocity (m/yr)
-0.1 -0.05 0 0.05 0.1
Time (yrs)
LOS displacement (m)

Central California – San Andreas fault creep
UC Berkeley Active Tectonics Group

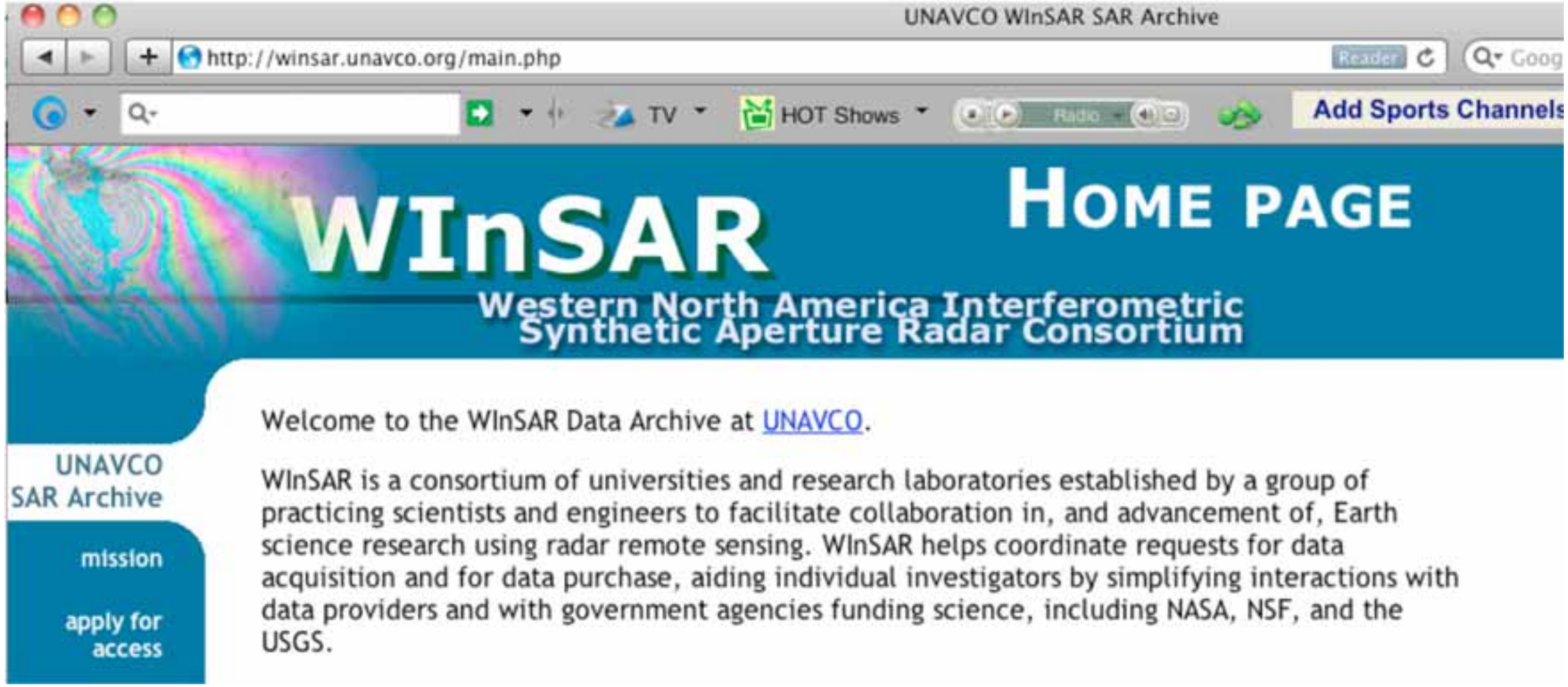




- At left are two stacks of 3 x 2.5 year interfs, scaled to yearly rate
- L-Band provides excellent coherence, even for 2.5 years, over the creeping section.
- Can just begin to make out ~0.3 rad/yr creep signal in ascending interfs.
- More pairs will allow better separation from atmosphere.
- Descending data would show SAF creep very clearly and completely.

International Collaboration

- Data distribution/Sharing
  - WInSAR



Falk Amelung, Univ. Miami

Recommendations to Science Community

- Noise Reduction
  - Ionosphere
  - Atmosphere
- Development of software
  - Time series analysis
  - Processing of ScanSAR images
- Sharing of data

Recommendations to JAXA

- More frequent acquisitions with ScanSAR
  - ScanSAR should be basic mode of ALOS-2 observation.
- Also stable acquisitions of COMMON mode for the purpose of Time Series Analysis
  - Requirement of Short Baseline
- Observation of Volcanoes
  - Optimal incidence angle?

Summary by Falk Amelung

- ALOS-PALSAR ***fantastic*** for earthquake studies (without ALOS we'd know nothing about the Haiti earthquake).
- ALOS-PALSAR **f*antastic*** for volcanoes in tropical areas (could not be studied with C-band) (Hawaii interferometric coherence dissapointing)
- Creep and interseismic deformation studies starting (need longer time series)
- Land subsidence studies in agricultural areas possible (in contrast to C-band)
- Consistent data format is a pleasure!
- Very convenient data access through L-1 data pool at ASF

Recommendation to JAXA
(Falk Amelung)

◆Allow PIXEL members access to ASF’s L1 data pool.
◆Make use of ALOS-1 archive to develop volcano observation plan for Alos-2 (revisit times)
◆ Provide on-line access to global volcano and tectonic data sets.

Summary of agriculture session

5 oral present

- ・Target:agricultural land use, water monitoring for manage eco-system, disaster
- ・Target crop:rice, sugarcane →mapping
- ・Agricultural information shear using OpenGIS sensor
- ・Optical x3
- ・ SAR x3(Full pol x2)

Target area: India, China, Thailand, Japan

Request for ALOS-2/3 in Agricultural session

- More high frequency(revisit time) observation
- More number quad-polarimetric data
- More high resolution full polarimetric data (Asia)
- More rapid data distribution (disaster)
- Continue L-band SAR satellite continuously(without data gap)
- Continue ALOS-1 data distribution and PI(too short for agricultural study)


Thank you for your attention

Summary of ALOS Symposium Snow & Ice Sessions

15–17 November 2010, Tokyo, Japan

10 Oral & 3 Poster Presentations

- Antarctic (& Greenland) Ice-Sheet Ice Velocity Mapping as part of the Earth Science Data Record (ESDR), 2006-2011, using ALOS/Envisat/other SAR/InSAR. Products include Ice motion using speckle tracking & other methods, DEM, and grounding line mapping (**J. Mouginot**, UC Irvine)

- Sea-Ice (extent, thickness, concentration) Monitoring/Observations Using ALOS (ScanSAR/PolSAR/AVNIR-2) & other data (MODIS, etc) in Sea of Okhotsk & Arctic/Sub-Arctic Regions (**K. Cho**, Tokai U.; **H. Wakabayashi**, Nihon U.; **T. Toyota**, Hokkaido U.)

Summary of ALOS Symposium Snow & Ice Sessions

15–17 November 2010, Tokyo, Japan

10 Oral & 3 Poster Presentations

- Glacial Lake & Glacier Inventory, Classification, Monitoring in the Asian High Mountain Region Using ALOS (AVNIR-2, Polarimetric SAR) & Other data (Landsat) (**G. Vienkataraman**, ITT, India; **T. Yamanokuchi**, RSC Japan; **J. Ukita**, Niigata U.; **M. Haq**, SUPARCO, Pakistan; **G. Singh**, Niigata U.; **C. Narama**, Res. Inst. for Human. & Nature)

- ALOS (InSAR, PolSAR) & other Data for Permafrost Active Layer Depth Thickening Rate & Landscape Classification over Tibetan Plateau & Alaska (**C. Shum**, Ohio State U.; **M. Necsoiu**, Southwest Res. Inst.)

- ALOS PALSAR & Envisat ASAR Study of the 2008 Yutian Normal Fault Earthquake (M7.2) and its Possible Link with Duofeng Glacier Motion, Xinjiang, China (**M. Furuya**, Hokkaido U.)

Vegetation, Forest & Wetlands Session summary

Ake Rosenqvist, Shane Cloude, Manabu Watanabe, Josef Kellndorfer, Richard Lucas

ALOS PI Symposium, Tokyo – Nov. 15-17, 2010

- 3 oral sessions

17 presentations, 2 cancellations

- Poster session

Large number of posters on vegetation, forest and wetlands.

20 posters from the

ALOS Kyoto & Carbon Initiative

Some key points - Veg, Forest & Wetlands

- 17 presentations concerned ALOS PALSAR
- 4 presentations PALSAR+AVNIR-2
- Dual-pol (HH+HV) key mode
- Interest explore polarimetric and/or interferometric applicatons for forest mapping and monitoring (3 pres.)
- ScanSAR data key for observation of both rapid deforestation monitoring and wetlands inundation dynamics.
- Impact of missed ScanSAR acquisitions serious - more frequent ScanSAR acquisitions required for ALOS-2.

Some key points - Veg, Forest & Wetlands

- 6 presentations on regional/global-scale appl.
- Basic Observation Scenario (BOS) implemented by JAXA makes PALSAR unique sensor for global-scale monitoring of changes in forest
- Important that BOS for ALOS-1 continues during mission life-time
- Important to implement BOS for ALOS-2 to ensure continuity of global L-band SAR data
- Increased observations in polarimetric mode needed to advance Pol-SAR applications

Hydrology & Water Resource

- 8 + 2 papers in the Hydrology & Water Resource session, of which
  - 4 on mapping flooded areas (2 of which based on PalSAR data and 2 on AVNIR-2/PRISM data)
  - 3 on soil moisture retrieval (1 Fully polarimetric fine resolution PalSAR data and 1 using PalSAR scansar data)
  - 1 on sub-surface imaging (using fAVNIR-2 & fully polarimetric fine resolution PalSAR data)
  - 1 on predicting erosion and sedimentation (using AVNIR-2 data)
  - 1 on subsidence monitoring (using PalSAR fine resolution data)

- 1 paper in the plenary session on Perspectives on Soil Moisture Retrieval Using ALOS PALSAR by Tom Jackson

Hydrology & Water Resource: mapping flooded areas

- Methods for mapping flooded areas include:
  - thresholding based on PalSAR ScanSAR data
  - retrieval water level from InSAR PalSAR fine resolution data
  - retrieval topography from PRISM data
- Most important limitation felt by users of PalSAR data: too long revisiting time
- Action: future systems should have shorter revisiting time, particularly for InSAR based applications

Hydrology & Water Resource: soil moisture retrieval

- Methods for soil moisture retrieval include:
  - inverting theoretical/empirical models using fully polarimetric PalSAR data at fine resolution
  - inverting temporal series of backscatter temporal changes using PalSAR ScanSAR data
- Most important limitations felt by users:
  - Too long revisiting time of PalSAR system&
  - lack of long and consistent temporal series of PalSAR data over well documented sites (partly due to a lack of coordination between PIs in charge to collect in situ data and PalSAR acquisition planning)
- Challenges:
  - Assess whether or not the available retrieval algorithms can provide maps at a global scale with the requested accuracy & resolution
  - Assess the potential of multiple polarized SAR data in improving retrieval algorithms based on the change detection technique
  - Demonstrate the improvement of land process models assimilating soil moisture maps at the high spatial resolution

Ocean session

8 oral and 3 poster presentations

8 using PALSAR
5 using optical sensors (AVNIR-2/PRISM)

PALSAR
Wind speed, wave, ship for fishery, oceanic and atmospheric phenomena (i.e., internal waves and sub-mesoscale eddies), oil spill, and agricultural field (oyster, seagrass)

AVNIR-2/PRISM
Coastal zone mapping, (agricultural field, red soil sedimentation)

Remarks/requirements:
- Ground radar interfearance sometimes degradates (ScanSAR) PALSAR image quality near the coast, which resulted in errors in detecting wind speed.
- PALSAR mosaics are also very useful for finding oceanic phenomena.
- Coastal monitoring will become more important because many population consentrate on coastal area.

INVESTIGATION ON METHODOLOGY OF OFFSHORE WIND SPEED ESTIMATIONBY USING SYNTHETIC APERTURE RADAR
Katsutoshi Kozai, Kobe University, Japan

OCEAN02
VALIDATION OF ALOS PALSAR SEA SURFACE WIND PRODUCTS
Xiaofeng Li, NOAA/NESDIS, USA

OCEAN03
IMPRINTS OF DYNAMIC OCEANIC AND ATMOSPHERIC PHENOMENA ON ALOSPALSAR MOSAICS
Leonid Mitnik, Russian Academy of Science, Russia

OCEAN04
APLICATION OF ALOS AVNIR-2 IMAGES FOR ASSESSING THE COASTAL ZONERESOURCES IN INDONESIA
Sam Wouthuyzen, Research Center for Oceanography, Indonesia

OCEAN06
RETRIEVAL OF OCEAN WAVE PARAMETERS FROM ALOS/PALSAR
Osamu Isoguchi, JAXA, Japan

OCEAN07
OBSERVATION OF INTERTIDAL GROUNDWATER DISCHARGE WITH SYNTHETICAPERTURE RADAR
Duk-jin Kim, Seoul National University, Korea

OCEAN08
OIL SPILL MOINTORING WITH ALOS PALSAR IMAGES
Xiaofeng Li, NOAA/NESDIS, USA
OCEAN10
MAPPING OF HUMAN ACTIVITIES RELATED TO FISHERIES AND ECOSYSTEMSIN COASTAL AREAS
Teruhisa Komatsu, Univeristy of Tokyo, Japan

ASSESSMENT OF THE DISTRIBUTION AND HEALTH STATUS OF CORAL REEFS IN VIETNAM COASTUSING ALOS-AVNIR2 IMAGERY
Tong Phuoc Hoang Son, Institute of Oceanography, Vietnam
MONITORING OF PACIFIC SAURY AND JAPANESE COMMON SQUID FISHING VESSELS USING PALSARDATA
Fumihiro Takahashi, Hokkaido University, Japan
USING ALOS DATA FOR MONITORING RED-SOIL SEDIMENTATION IN REEF PONDS OFF OKINAWAISLAND
Katsuo Okamoto, National Institute for Agro-Environmental Sciences, Japan