

# Geohazard Supersites Initiative

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# Activity Status

- Short summary:
  - White Paper circulated for comment
  - Response to White Paper presented at SIT-26 with proposed deliverables, milestones and questions for CEOS Agencies
    - CEOS agency coordination meeting – September 12
    - Input provided by CSA, ESA, NASA, DLR and JAXA on proposed structure, supersite definition, information requirements, agency procedures, feedback and reporting (back up slide)

# Activity Status



- Main Issues

- Proposed structure is acceptable under a different designation (not consortium)
- White Paper definition acceptable with clearer scientific criteria. Information for decision maker should be clarified.
- Data requirements are clear but need user license agreements for many agencies and probably data purchase for ALOS.
- Free, open data policy may be considered for future planned missions
- Near-term solution to access RSAT-2, TerraSAR-X, Cosmo-SKYMED, ALOS data requires multi-agency research program with specific proposal for each supersite (SOAR approach, like JECAM)
- Feedback and reporting will be required as well as mention of contribution at events such as GEO ministerial.
- Approval of proposals and coordination of data acquisitions by CEOS working group is being proposed.



# Near Future Plan

- Additional Expected Achievements by the end of 2011:
  - Interact with GEO community – September 21
  - Develop consensus (CEOS revision & agreement with community of practice) – October
  - Report to CEOS Plenary and GEO VIII - November
  - Formation of CEOS working group - November
- Contribution to 2011 Events (*e.g.*, GEO-VIII, COP-17):
  - Showcase demonstration in Turkey for GEO VIII (measure strain accumulation along the North Anatolian Fault to document earthquake risk to Istanbul)
- Information on any decisions that need to be made at CEOS Plenary:
  - Requires commitment from principals to support approach, new working group and showcase demonstration

# **Back-up slides**

## Background 1/6

# DI-09-01: Systematic Monitoring for Geohazards Risk Assessment



## c) Supersites and Natural Laboratories

This sub-task is led by USA (University of Miami) and ESA (wolfgang.lengert@esa.int), and supported by the Geohazards Community of Practice

Develop an international, sustainable and integrated approach to geohazards risk assessment, optimally utilizing the remote-sensing capabilities of GEO Members and Participating Organizations. Promote retrieval, integration and systematic access to remote sensing & in-situ data in selected regional areas exposed to geological threats (“Supersites”) – to improve geohazard monitoring and stimulate fundamental research. The initial objective is to dramatically enhance access to multisatellite SAR data, GPS data, and seismic data for the seven Phase1 Supersites and event Supersites (connected to geological disasters). Intermediate objectives are to: (i) Develop a Supersite data portal (one-stop internet access point for in-situ and remote sensing geophysical data); (ii) Facilitate SAR data access for other selected regional areas exposed to geological threats (Natural Laboratories); (iii) Better demonstrate the power of the Supersite concept to improve geohazards risk assessment; and (iv) Develop a governance structure for the Supersites with representation from the science community and operational users.

# Background 6/6

**REPORT AT SIT-26**

**Plenary CEOS Agencies to review the GEO Geohazards 24-17 Supersites White Paper and to respond to the data action requests therein (including the urgent requests for the GEO Ministerial). Incoming CEOS Chair and SIT Chair will ensure suitable coordination and interface.**

## SIT 26 Status

**CEOS Agencies have reviewed White Paper and have outstanding questions for GEO Task concerning:**

- **Criteria and process for selection of geohazards sites**
- **Specific data requirements for each site and instrument for both archival data and future tasking with associated prioritization and rationale for a given instrument**
- **A plan with deliverables and milestones was presented**

**SIT 26-7**

**Guy Seguin to report to CEOS Plenary on progress towards the GEO Supersites initiative, including outcomes of the June coordination meeting and recommendations for the way forward.**

**CEOS Plenary**

# CEOS agency coordination meeting

Outcome of this meeting would be

- A position relative to the proposed structure
- A clear understanding of what defines a supersite/natural laboratory and how these are selected,
- Specification of a well defined set of information needs that can be used by each agency to identify needed archival imagery and/or tasking and evaluate associated potential resource requirements
- Understanding of CEOS agency procedures to consider and authorize access to archival data and/or tasking of new acquisitions of GEO requested data, along with the associated timeframes and/or resource limitations that impact prioritization of data requests
- Feedback and reporting mechanisms. What do CEOS agencies need back from GEO to demonstrate the use, utility and effectiveness of data provided.
- Discussion of unique or complimentary roles of L-, C-, and X-band SAR data sets, associated priorities tied to information use scenarios, and potential opportunities for distributing the load (shared tasking or other)



# Inputs received

## A position relative to the proposed structure:

ESA: The structure described in the "White Paper" is supported by ESA (W.L)

NASA: The structure proposed in the white paper is acceptable to NASA (CD)

DLR: The proposed structure is acceptable. (J. H)

With reference to the various "decision" responsibilities of the Scientific Advisory Committee (SAC) and Steering Group (SG) we stress that DLR will support the Supersites Initiative on a best-effort basis. DLR will not give any warranties for any specific data to be made available. Also, DLR may "opt-out" of supporting any supersite, e.g. for capacity limitations or if data use over a specific site is deemed operational rather than scientific.

Data requirements should be defined by the Scientific Community, i.e. the Point-of-Contact for each Supersite (candidate).

CSA: Use JECAM approach not a Consortium. CEOS form a working group of space agencies with the following mandates: (i) Liaise with the Supersites scientific users to understand their requirements thoroughly, (ii) Plan coordinated acquisitions that will: a. Respond to the science requirements, b. Exploit the advantages of each space sensor, c. Share the load of data acquisitions. (iii) Follow up to ensure successful acquisition according to the plan, with adjustments as required.

JAXA recommends that the White Paper reflects exact data access criteria of each data provider. provision of ALOS/PALSAR data should be ordered to PASCO or RESTEC

# Inputs received

## **A clear understanding of what defines a supersite/natural laboratory and how these are selected.**

NASA: Selection criteria should be clear and well defined. Pertinent attributes are known risk and population exposure. In addition there need to be sufficient in situ observations and resident local/regional scientific interest and expertise to permit analysis and long term sustainability of natural laboratories.

ESA is in process to make all data of the archive covering the Supersites on-line available. Also for the Natural Laboratories we are trying to provide all available data. Also these data are accessible via the ESA catalogue or via the Supersite portal.

DLR: The supersites should be “*a representative selection of areas exposed to geological threats*” (Supersites White Paper) with a view “*to broaden our knowledge about geological extreme events and to reduce our vulnerability to geologic hazards*”.

The Supersites initiative should develop a set of criteria to define the supersites. If scientists want to also use the supersites mechanism to expand the set of sites to almost anywhere, a restrictive set of truly representative core supersites should be defined in order not to compromise the idea of focussing resources on *representative* sites.

This set of criteria should include: existence of in-situ data, national support by the country (or countries) of the supersite. broad scientific interest, e.g. demonstrated by a minimum number of research teams for this supersite, similarity to already existing supersites

CSA: Should be oriented toward fundamental and applied research. A proposal must be provided for each supersite with well defined science objectives.

JAXA: How can the Supersite provides useful information to decision maker such as Cabinet office, Ministry or local government.

# Inputs received

**Specification of a well defined set of information needs that can be used by each agency to identify needed archival imagery and/or tasking and evaluate associated potential resource requirements:**

NASA: NASA data sets are available on line without restriction. New tasking requests should specify when, what sensor operation mode and justification. Ideally, the POC for a given supersite or natural laboratory is responsible for coordinating and communicating observation needs.

ESA: ERS-2 has been passivated and therefore can not any longer contribute with newly acquired data. All archived data can be ordered via UNAVCO (the WINSAR and GEOEARTHSCOPE data centre) => Envisat: due to the new orbit configuration, which increases the mission life time, INSAR can only be supported at 38 degree north, We think that all possible targets are observed. If a target is missing, please contact EOHelp. Also here, archived data can be ordered via UNAVCO who is managing to ESA's Virtual Archive for the Supersites/

DLR: Data needs should be consolidated in the science group engaged with each supersite. Following this the respective data should be ordered by one PoC/representative, considering the limitations of the systems available and the constraints identified in the data ordering mechanism of each agency (e.g. quotas).

CSA is building RADARSAT-2 archive on Supersites. However data cannot be delivered without a end user licence agreement.

JAXA: the requirement of ALOS data is a huge number and it would be very difficult to provide these free of charge. We would 90% probably ask to purchase from PASCO or RESTEC. A very small possibility for free distribution would be how Supersite community could highlight the ALOS significance to the GEO Ministerial level.

# Inputs received

**Understanding of CEOS agency procedures to consider and authorize access to archival data and/or tasking of new acquisitions of GEO requested data, along with the associated timeframes and/or resource limitations that impact prioritization of data requests:**

NASA: NASA data set are available without restriction

ESA has put now more than 10 TB on-line using Cloud Computing assets. The on-line archive is steadily growing. These data are easily accessible; just sending a mail to EOHelp asking to become a Co-PI of the GEO Supersites project. Following the signature of the T&C the user name and password will be issued. Ordering of archived data should be done via UNAVCO => Envisat tasking should not be necessary since all targets should already be considered.

DLR: The procedure for providing TerraSAR-X data to the Supersites Initiative is described in the Supplement to the Supersites White Paper at

[http://supersites.earthobservations.org/SupersitesWhitepaper\\_FA3\\_2\\_Supplement.pdf](http://supersites.earthobservations.org/SupersitesWhitepaper_FA3_2_Supplement.pdf) .

DLR provides TerraSAR-X data to the Supersites initiative for scientific use only. Operational use for disaster response or urban planning activities are not covered under this license. The scientific user license can be obtained at <http://sss.terrasar-x.dlr.de/pdfs/TSX-TDX-user-license-v2.1.pdf> .

Therefore, the scientists given access to TerraSAR-X data have to agree to prevent non-authorized use of the data.

CSA propose to put in place a thematic SOAR program for Supersites.

JAXA: Since January 2011 after ALOS nominal operation finished JAXA initiated a new data utilization framework with promotion of industry sector and PASCO co inc. and RESTEC have been identified as ALOS data distributors. They are in charge of distributing only to commercial user but also for Science and Research usages as well.

# Inputs received

**Feedback and reporting mechanisms. What do CEOS agencies need back from GEO to demonstrate the use, utility and effectiveness of data provided.**

NASA: No reporting requirements unless specified by a particular announcement of opportunity

ESA: reporting on the results retrieved from the data is required. However the procedure outline in the White Paper is sufficient (outstanding scientific results, feedback on the service, feedback on the collaboration and encouragement of cross-domain collaboration)

DLR requests that the Principal Investigator (the person who has been identified by each Supersite team to request data from TerraSAR-X) reports through the DLR science portal on the use of the data. This reporting should include references to scientific publications and presentation of results. DLR also invites these PI to present at TerraSAR-X Science Team meetings, as appropriate.

CSA: Publication open to public.

JAXA: required highlight of ALOS significance to the GEO Ministerial level.

# Inputs received

**Discussion of unique or complimentary roles of L-, C-, and X-band SAR data sets, associated priorities tied to information use scenarios, and potential opportunities for distributing the load (shared tasking or other)**

NASA: Interesting concept of potential value for designing sampling plans for Geohazard sites. Could provide basis for geographic targeting and prioritization of various sensors.

ESA: need to look into the detail

DLR: No comment

CSA: The RADARSAT-2 background mission may accommodate all Supersites. However not all proposal are likely to be accepted. So complementarities with ESA could be useful. Combination of different frequency bands could be of interest but need to be assessed.

NASA: Difficult for JAXA to provide free data and new acquisition is impossible due to termination of ALOS operation.

# The SOAR Model 1/2

- Mostly joint initiatives i.e. MDA, ESA, DLR, JECAM...
- Addressed to specific Principal Investigators (PI).
- Oriented towards fundamental and applied research; focus on development of applications. Could be with thematic, specific mode or area.
- Usually Announcement of Opportunity (AO) open for a specific time-frame (2 months).
- End date to request RADARSAT data is specified.
- Two years of reporting after project completion.
- Project support is for Research activities ranging from R&D to Pre-operational.
- Operational and commercial project will not be supported.
- Proposal content and structure requirements are defined.
- AO announced through CSA EO EXPRESS newsletter.



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# The SOAR Model 2/2

- Project acquisition duration for 3 years maximum; with a mid-review after 2 years and a 1 year extension based on results and justifications.
- Projects are limited to 2 areas of interest.
- Maximum of 20-35 scenes provided.
- Proposals are evaluated by MDA.
- RADARSAT-2 Loan Agreement must be signed.
- Projects are subject to all regulations relating to the Government of Canada Data Policy, the Remote Sensing Space Systems Act and the Remote Sensing Space Systems Regulations.
- RADARSAT-2 Single End User License Agreement (“EULA”) will govern all permitted and prohibited uses described within the EULA, which will be delivered with every RADARSAT-2 Product.
- Loan RADARSAT-2 Products, free of charge.
- PI intend to use the results to promote RADARSAT-2 applications i.e. publication open to public.



# Agency to Agency SOAR- Initiative

## Exemple: CSA-European Union

Addressed to Principal Investigators located in Europe and Canada

- Joint initiative with ESA.
- AO closed.
- Conduct Sciences and Operational Application Research .
  - Scientific exploitation of RADARSAT-2 new modes (polarimetry, dual polarisation, ultra-fine);
  - Demonstration of the benefit of the full polarimetric mode for operational application research;
  - Research and application development in support to RADARSAT-2 and ESA mission objectives.
- RADARSAT-2 in conjunction with ERS, ENVISAT and other Third Party Mission data
- Full proposal is needed for project selection.
- End date to acquire RADARSAT data: September 2011 or as indicated in the Term and Termination of the RADARSAT-2 Loan Agreement.
- Two years of reporting after project completion.
- Initiative completion: September 2013.

# Thematic SOAR Initiative

## Example: JECAM Initiative

Addressed to Principal Investigators supported by Joint Experiment for Crop Area Monitoring (JECAM)

- GEO Agriculture Monitoring Community of Practice .
- Joint initiative with MDA.
- In development. Open Fall 2011.
- Explore, at the R&D level, viable solutions to current problems and issues and to develop agricultural algorithms, methods and applications that make use of the capabilities of the RADARSAT-2 satellite.
- RADARSAT-2 Products can be provided to approved JECAM test sites.
- No specific data quantity defined.
- Limited proposal needed to support data policy, Canadian legislation and also to evaluate the level of maturity of the application since no operational nor commercial project will be supported.
- PIs reporting through JECAM CSA leader.

# Terms and Conditions

## **Privacy Notice Statement (accepted by PI when submitting the proposal)**

Some information designated as being in the public interest will be posted on a Web site, so as to announce projects sponsored by the SOAR Program. The following information will be deemed public:

- Project name
- Nature of the application
- Region covered
- Name of senior researcher and secondary researchers, if any
- Functions of senior researcher and secondary researchers
- Statement on proposed objectives
- Number of scenes requested and their beam modes

## **IMPORTANT**

- Communication and outreach: Published on the CSA Website
- Update the abstract and include an image

# Interaction with GEO community

Outcome of this meeting would ideally be GEO/CEOS team concurrence on

- Agreement on the approach
- draft plan on event supersite protocols
- draft plan on archival data needs and new tasking by site and instrument, taking into account unique/complimentary nature of L-, C-, X-band data and also agency limitations (resources, data policy, etc.)
- GEO data archive and access plans
- feedback and reporting mechanisms
- Draft materials or statement for GEO/CEOS Plenary

# GEO's Turkey Natural Laboratory

Purpose: Measure strain accumulation along the North Anatolian Fault to help estimate earthquake risk of Istanbul

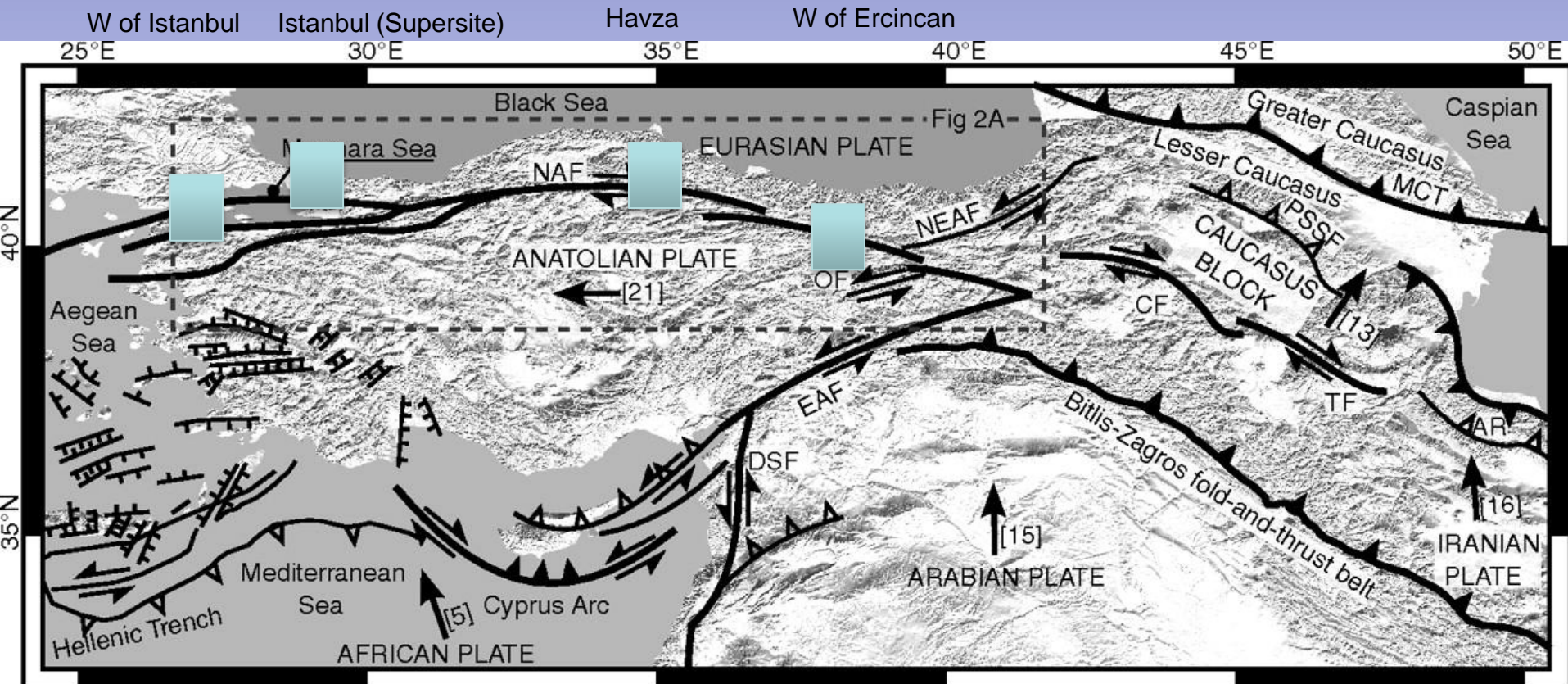
Ground-based data (**in progress**):

1. Existing GPS and seismic data (TUBITAK MRC Earth and Marine Research Institute, Bogazici University, Kandilli Observatory and Earthquake Research Institute)
2. Supersites GPS network (EPOS with turkish partners, funding provided by European Union, 8 million Euro)

Space-based data:

3. Envisat and ERS data for entire Turkey (ESA, 50,000 frames) (**in progress**)
4. TerraSAR-X data for 4 sites (DLR, ~250 images/yr) (**in progress**)
5. Alos data of North Anatolian Fault (Jaxa, ~1000 frames, **requested**)
6. Targeted CosmoSkymed and Radarsat-2 acquisitions? (**need to be planned**)

# Proposed TerraSAR-X coverage for the Turkey Natural Laboratory

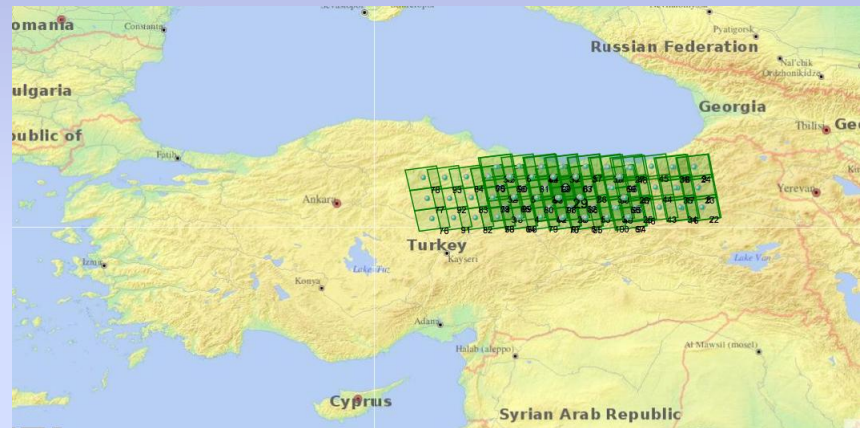
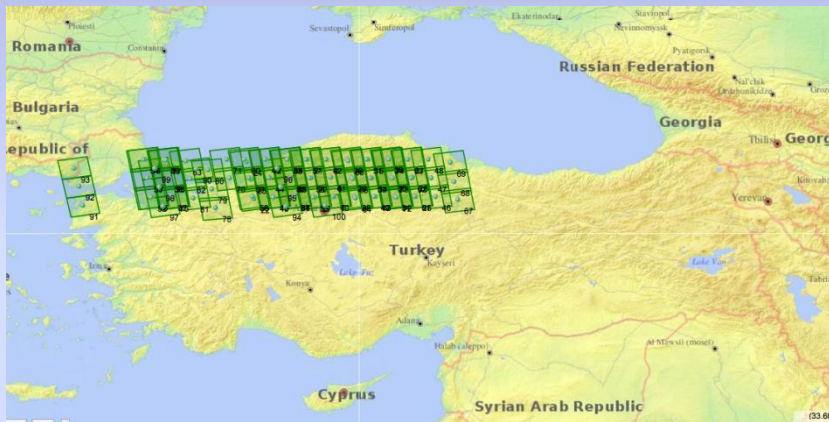


Proposed TerraSAR-X coverage of 4 sites across the North Anatolian Fault (including Istanbul; ascending and descending imagery) to estimate strain accumulation and fault slip rate.

# Proposed ALOS coverage for the Turkey Natural Laboratory

tracks: 590-599: frames 780-800

tracks: 600-615: frames 790-810



# Recent scientific study of North Anatolian fault using Envi

GEOPHYSICAL RESEARCH LETTERS, VOL. 38, L05303, doi:10.1029/2010GL046443, 2011

## Interseismic strain accumulation across the North Anatolian Fault from Envisat InSAR measurements

R. J. Walters,<sup>1</sup> R. J. Holley,<sup>2</sup> B. Parsons,<sup>1</sup> and T. J. Wright<sup>3</sup>

Received 12 December 2010; revised 26 January 2011; accepted 2 February 2011; published 5 March 2011.

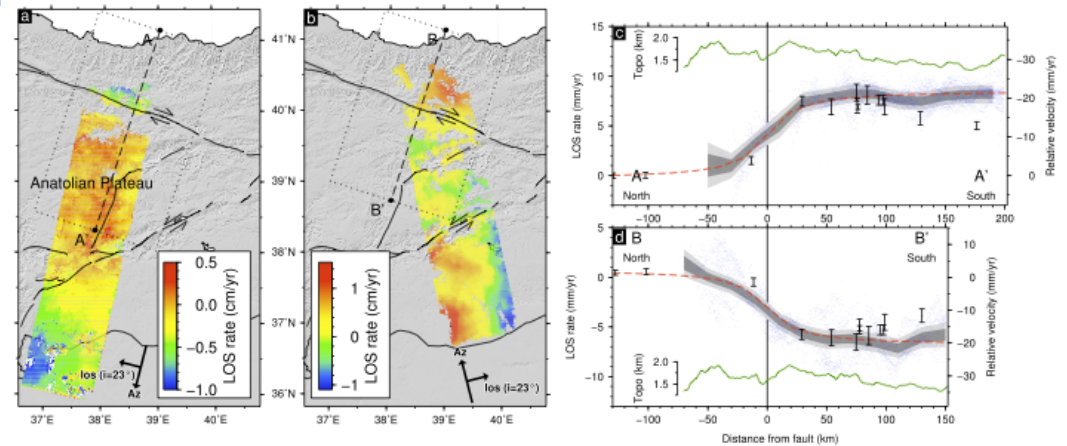
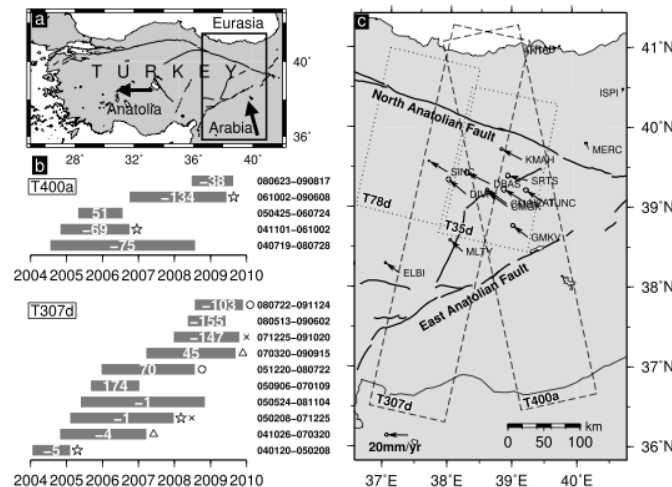
L05303

WALTERS ET AL.: NAF INTERSEISMIC STRAIN FROM INSAR

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WALTERS ET AL.: NAF INTERSEISMIC STRAIN FROM INSAR



**Figure 2.** (a, b) Ratemaps for T307d and T400a. An increase in LOS rate corresponds to an increase in the rate of movement away from the satellite. The dotted boxes show the regions of data that are projected onto the dashed profile lines, and the perpendicular pairs of arrows show the satellite orbit direction (Az), the satellite line-of-sight direction (los), and the incidence angle ( $i$ ). (c, d) LOS rate profiles for T307d and T400a respectively. The thick grey bands show the 1- and 2- $\sigma$  error bounds on LOS rate. Blue points are individual measurements from the ratemaps. Black bars are the GPS velocities and error bounds shown in Figure 1, projected onto the profile line and converted into satellite LOS rates. Velocities predicted by our best-fit slip model for both profiles are plotted as red dashed lines. Average topographic profiles calculated in the same region as for the ratemap profiles are shown in green.



## Detailed TSX coverage for NAF:

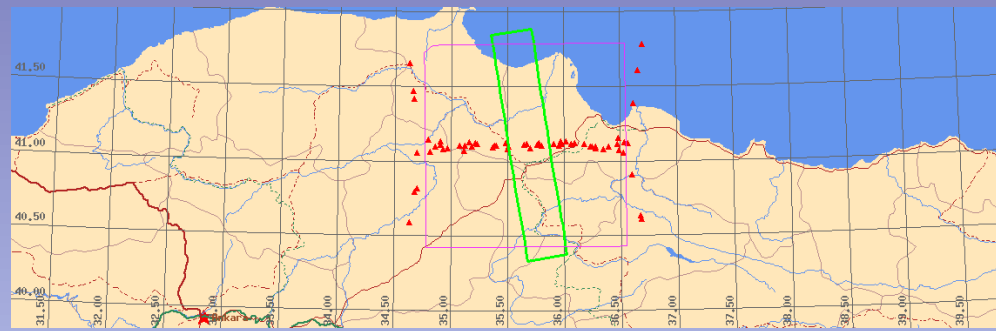
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Orbit = 100  
strip\_005R  
Inc Angle = 24.9-27.9



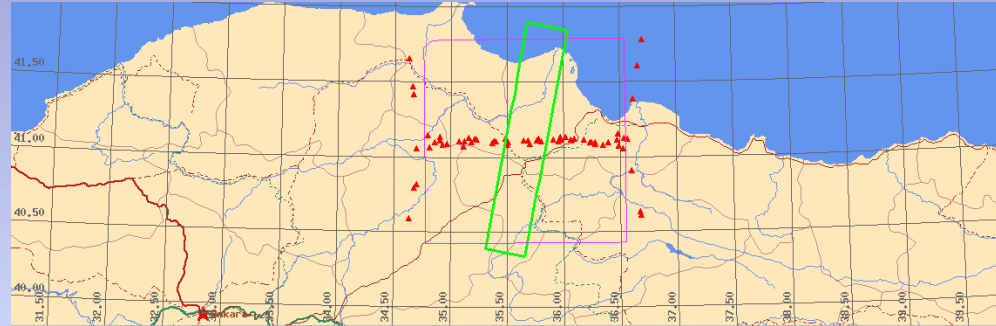
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strip\_011R  
Inc Angle = 38-40.4



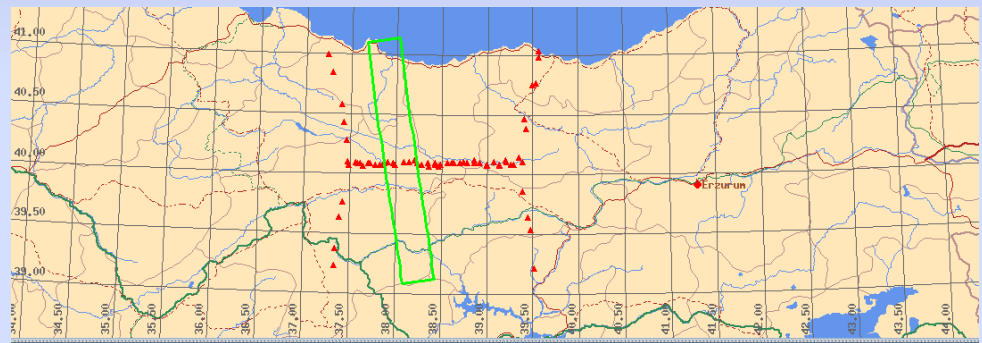
Havza\_Ascending  
Orbit = 39  
strip\_013R  
Inc Angle = 41.7-43.9



Havza\_Descending  
Orbit = 1  
strip\_004R



West\_Erzincan\_Ascending  
Orbit = 130  
strip\_013R  
Inc Angle = 41.7-43.9



West\_Erzincan\_Descending  
Orbit = 16  
strip\_011R  
Inc Angle = 38-40.4

