Report on FRINGE2007

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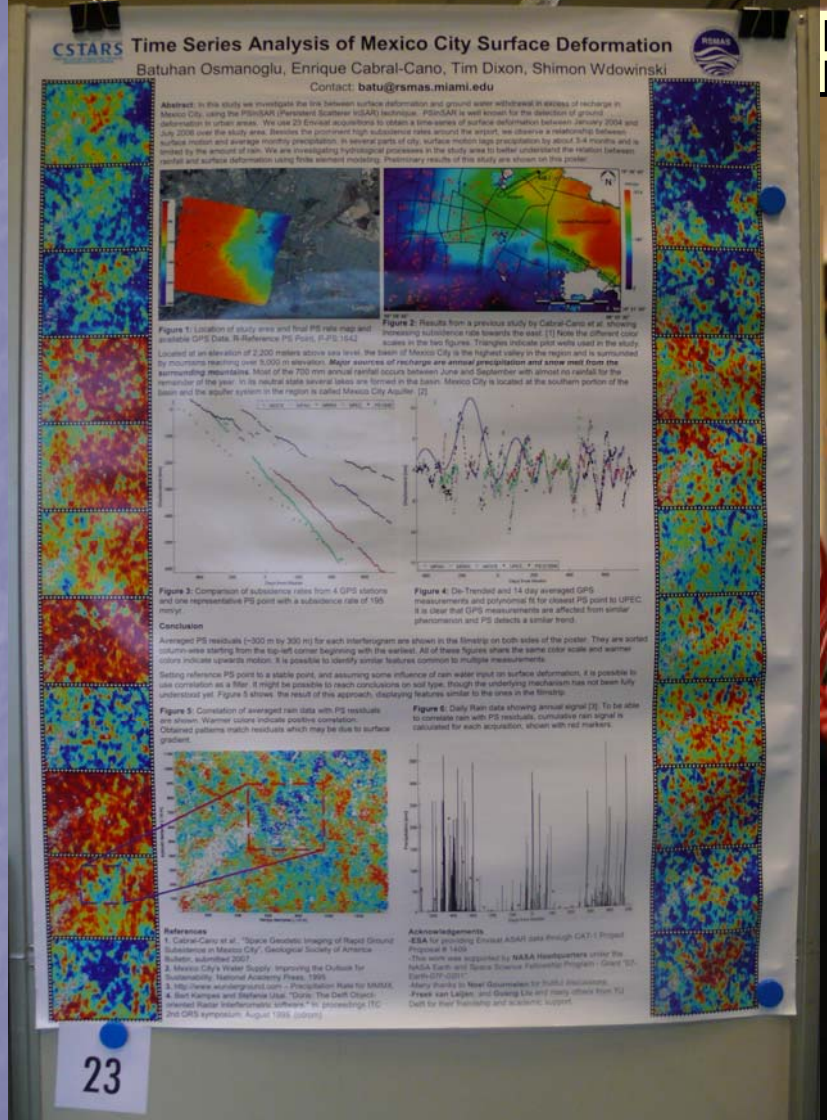
FRINGE2007

- Nov.26 ~ Nov.30, 2007, @ ESRIN, Frascati, Italy
- Attendees > 100
  - 3 from Japan (YF, AD, and MH)
- 11 oral sessions and 2 poster sessions
- Follow-up of FRINGE2005
- Each oral session is accompanied by discussion on seed questions.
- Most presentations can be seen at http://earth.esa.int/fringe07/programme.html


JLX

Scene of Oral Session

Poster Session



Post Symposium Tour of ESRIN

Laur & Lengert: ERS and ENVISAT missions status

- ERS-2: approved 3-years extension
- Envisat: envisaged 3-years extension
- Sentinel-1: scheduled to be launched in late 2011

Methodology: General

- How to fully exploit ERS and Envisat archives?
- In particular, what are the strategies for exploiting ERS2 high DC data?
- Are there new applications that become possible by exploiting the higher resolutions of Terra-SAR-X and Cosmo SkyMed sensors? Will the availability of a constellation of SAR satellites (i.e. the four Cosmo- Skymed satellites) open new possibilities and applications, thanks for example to the shorter revisit time?
- Are new studies necessary to fully exploit the higher resolution of new sensors? Can automatic recognition of objects become potentially feasible in high resolution SAR images? And, consequently, is research in this field needed?
- In preparation for new SAR data, which is the added value of simulations with respect to the existent data? Have multiple reflections in urban areas to be better investigated in order to exploit high resolution SAR images?

Methodology: General (cont.)

- How should frequency and band be selected for optimizing urban SAR tomography? Which is the most suitable system among the existent ones? Can SAR tomography be useful for glaciers monitoring or other "volumetric" applications?
- Which are the potential and limitations of the different bands, frequencies and polarizations for forest and other applications?
- Data from future bistatic and/or bichannel SAR missions (TanDEM-X, ASI Sabrina?) can be valuable for SAR tomography, polarimetry, polinsar, enhanced resolution or swath, interference filtering ,etc. (in addition of course to across and along-track interferometry)?
- Multistatic and multichannel SAR data would allow new important applications? Having in mind a very limited budget for future simple missions, what features are mandatory and what can be avoided?

Methodology: General – Recommendations

- Studies for new and/or improved algorithms are necessary to fully exploit high resolution SAR data from new missions.
- Simulations can be useful to better understand the scattering mechanisms.
- Advanced techniques like SAR tomography and differential tomography, multi-aperture interferometry, Pol-InSAR, etc., will become more important with the availability of SAR data from the new missions (characterized by frequent revisit time, high resolution, wide-band, polarimetric capabilities, etc.)

DInSAR/PSI Session

- Should persistent scatterer (full resolution) and coherence(multilooked)-based methods be considered as independent or complementary means of extracting information from satellite SAR data?
- What are the main bottlenecks in terms of quality assessments for the various techniques?
- Is it possible to make generic statements on the quality of the estimated deformation parameters, independent of the area of interest, or are these always case study dependent?
- How should the trade-off between point density and quality be considered?
- How can we parameterize the information content of PS time series? (to interpret time series different from linear velocity model)
- How should advanced DInSAR algorithms benefit from spatial + temporal phase unwrapping?

DInSAR/PSI Session Recommendations

- Significantly more experiments are needed. The availability of the required data is paramount.
- ESA should make the historical SAR archive available with easy ftp access and no data charges.

EQs and Tectonics Session

- What is the smallest ground deformation signal that can be measured with InSAR? Over what spatial and temporal scale?
- What is the accuracy on constant rate estimates?
- What level of rate change can be estimated? Over what time scale?
- Can the trade-off between competitive processes (e.g., after-slip and visco-elastic relaxation) be resolved with InSAR monitoring of post-seismic movement?

EQs and Tectonics Session (cont.)

- What recent developments have we achieved with the use of ancillary data such as the MERIS or GPS nadir delay maps etc.?
- Can long temporal data series help characterize the tropospheric signal?
- How does the multi-directional observations (ascending/descending, near/far range) help constrain the source parameters (geometry of faults and slip direction)?
- What is the advantage of scan-SAR interferometry? What can we observe with scan-InSAR that was not accessible to conventional InSAR? Should scan-SAR become the background mode of data acquisition for surveillance purposes?

EQs and Tectonics Session Recommendations

- **Primary Recommendation**
- ESA should provide ERS and Envisat radar data to Cat.-1 users via FTP at no cost: Keep it simple, all data online in level-zero RAW format.
- If there are technical obstacles, then fund to solve them.
- If there are bandwidth issues, then introduce quotas (# of scenes/month).
- If commercial restrictions on new data exist, then only provide data older than for example 6 months.
- Make the ESA processing software for SLC generation available.
- **Other Recommendations:**
- The important background mission should be extended to more areas, if possible, and should have a higher priority, i.e. becoming a "foreground" mission!
- The community recommends as frequent and uniform data acquisitions as possible until the end of the Envisat mission (i.e. the IS2 mode and consistent polarization).
- However, with Envisat wide-swath InSAR being now demonstrated, some selected tracks/orbits should be dedicated to wide-swath acquisitions (but only if burst synchronization can be achieved)

PSI Validation - Session

- Can we define the "error bars" to be associated with deformation velocity; deformation time series; and PS geo-location?
- Can we define the conditions to be fulfilled to achieve the above "error bars": number of images, deformation pattern and magnitude, deformation rates, etc.
- How can we handle the spatially wide trends (tilts) in the data, which are due to residual orbit?
- Can we characterize the PSI capability to detect deformation phenomena (e.g. in urban areas) in terms of omission and false alarms?
- Can we expect significant improvements in the measurement of non-linear deformations?

Atmosphere Session

- Do we feel that the problem of atmospheric delay signal in SAR interferometric approaches is well-understood?
- We distinguish effects of (i) vertical stratification, of importance in case of strong topographic height differences, and (ii) turbulent mixing. Should both effects be tackled independently?
- Is it possible to uniquely identify a spatially correlated interferometric phase error due to ionosphere using current sensors? If yes, which empirical evidence is available?
- What is the value of Numerical Weather Models for (i) local case studies, and (ii) systematic correction of APS irrespective of location and time
- What is the value of the interferometrically derived atmospheric phase screen for operational meteorology and atmospheric research?

FUTURE SAR MISSIONS AND INTERFEROMETRY

- Future SAR missions are planned for the time frame 2010++. Are those missions sufficient to satisfy the future needs? If not what is missing. Are there too many? Why?
- Future missions are based on experience gained with data from existing missions in space and/or airborne experiments at different wavelength. What are the preferred wavelengths for interferometry applications in order of priority and why?
- Are there critical minimum repeat intervals required for the future? Minimum operational life time? For which application?
- Future operational missions are likely to produce massive data volumes. What processing level would be preferred for the future? Un-compressed data (level-0), complex single look (level-1) products or interpreted data such as subsidence maps (level-2), or else?
- What additional ancillary data (e.g. about baseline information, coherence) should future missions add to their standard products?

FUTURE SAR MISSIONS AND INTERFEROMETRY: Recommendations

- For the future no detailed requirements were suggested for new systems for two reasons. First it was felt that the new missions offer excellent opportunities and that in general the right options have been chosen. Second the knowledge exists about what can be gained by adding more resources in terms of resolution, revisit, sensitivity and what this would cost. More money buys more performance.
- As an exception to the above, based on the excellent results of ALOS, it is recommended to consider for the future an operational long-term mission in L-band featuring conflict-free operations.
- In spite of the advances of interferometry applications it was agreed that further penetration into the end-user market was a key issue for the space agencies, value-added companies and the scientific community.

Summary

- EU and US are several years ahead of us!
  - Time series analyses with PS, CS, SB etc.
  - Correction of tropospheric/ionospheric disturbances
  - Utilization of ScanSAR WS mode, MAI, etc.
  - We need more collaboration with researchers from several fields of science.
- ESA tries to incorporate community's opinion.
- ALOS/PALSAR gave a strong impact.
- We should collaborate with JAXA much more.