

DANIELE PERISSIN

INTRODUCTION

With an innate practical sense, Daniele Perissin received a strong education in approaching problems as engineer. By condensing in one point his main skills, he learned observing deeply the characteristics of a practical problem to find its solution. The fields in which he worked span from electronics to telecommunications and data processing, and he got a very high specialization on Remote Sensing and Synthetic Aperture Radar. During the academic experience he faced all aspects of research, starting from the theoretical formulation, data analysis, development of algorithms and software production, in cooperation with industrial companies. He wrote very complex codes to analyse and process remote sensed data to monitor and to recognize radar targets. Before his PhD he got also skills in designing, assembling and repairing electronic equipments, maturing experiences in different Labs. He both worked in group and managed his own research alone. He also supervised the work of MSc students and coordinated temporary researchers and PhD students, creating and conducting small work groups.

WORK EXPERIENCE

2009 – to date Chinese University of Hong Kong (CUHK)

Research Assistant Professor

- ...

2002 – to date Politecnico di Milano (Milan)

Assistant researcher

- Principal Investigator (PI) in the European and Chinese space agencies **ESA/NRSCC Dragon 2** cooperation project. Analyses are conducted for urban monitoring and Digital Elevation Maps retrieval with InSAR data in the test sites of Beijing, Wuhan, Badong, Zhangbei. Moreover, the Three Gorges Dam is studied by means of SAR data acquired by different orbits and geometries. The work is carried out together with Wuhan University, Prof. Li Deren being the Chinese PI. The work in Milan is funded by ESA. On going.
- Mitigation of Electromagnetic Transmission errors induced by Atmospheric Water Vapor Effects (**ESA METAWAVE** project). The project is joined by many Italian teams (Polytechnic of Milan, Sapienza University in Rome, Polytechnic of Turin, CETEMPS L'Aquila, Perugia University). The aim is to achieve an independent estimate of the delay caused by the highly variable water vapor concentration on the InSAR data. To this aim, GPS networks, numerical weather models, radiometers, and other ground instruments are exploited to deeply analyze the water vapor behavior both in space and time. The project is funded by ESA. On going.
- **Multi mission** (multi orbits, frequencies, view angles, polarizations) SAR data analysis exploiting natural corner reflectors. Different works have been carried out to study and to realize the combination of SAR data acquired under different conditions, by different sensors, from different orbits. The developed techniques allow to increase the number of coherent scatterers in a given area, to increase the temporal sampling rate and to increase the number of coherently processed data.

The work has been funded by internal funds and by TeleRilevamento Europa, **TRE**, a POLIMI Spin-off Company. Completed.

- Development of new **multi-baseline** techniques for the generation of accurate Digital Elevation Models by means of interferometric SAR data. The need for extending the Permanent Scatterers (PS) technique to non-urban areas pushed toward the development of new algorithms to extract information also from partially coherent targets. Vegetated and mountainous areas have been fruitfully processed and reliable estimates of the terrain height have been obtained. The work has been funded by internal funds and by **TRE**. Completed.
- Multi orbit PS analysis over Shanghai in collaboration with Wuhan University, China (**ESA- DRAGON** Project Id 2567). Within the first edition of the ESA-NRSCC Dragon Project, different sites have been processed as Shanghai and Tianjin, and city growth level has been retrieved together with subsidence rate and with the recognition of the urban scattering typologies. For the first time, data acquired by satellite parallel tracks have been coherently analyzed to estimate ground motion and local topography. The project has been funded by ESA. Completed.
- Multi orbit PS analysis over New Orleans in collaboration with Canadian Space Agency -CSA- and ESA (**CSA DELTA** Project, ESA Cat-1 Project Id 4394). The obtained results in the field of coherent processing of data acquired under different geometries and view angles pushed toward the study of the New Orleans case, where Hurricane Katrina caused the damage of the river banks and the consequent city flooding. Radarsat and ESA data, provided by the respective space agencies, have been processed and average deformation rate pre-hurricane has been estimated. The project has been funded by internal funds. Completed.
- **Landslides analysis** in various municipalities around Bergamo (Italy), in collaboration with **TRE**. The developed techniques to process partially coherent targets have been applied to landslide and mine stability cases. The work has been conducted together with local geologist. The project has been funded by TRE and ordered by a local geological survey company, under protection of the regional government. Completed.
- **Calibration** of repeated SAR images by means of urban Permanent Scatterers, in collaboration with **ARESYS**, a POLIMI Spin-off Company. Urban Permanent Scatterers can provide a natural ensemble of very good and stable reflectors for the relative calibration of SAR images and for the absolute calibration of satellite antennas. The need for active transponders is in such a way overtaken and very effective calibration algorithms can be developed. The work has been funded by ARESYS. Completed.
- Coherent combination of ERS and Envisat data by means of Permanent Scatterers (**ESA COPEESAT** Project Id 1412). The slightly different carrier frequencies of ERS and Envisat ESA satellites needed the development of new algorithms for the coherent combination of data acquired by them. The study of the problem gave the occasion to discover many characteristics of urban SAR Permanent Scatterers and to produce algorithms for the analysis and recognition of their electromagnetic signature. The Project has been funded by ESA. Completed.

1996 - 2002

Electronic technician, network manager

- Installation, cabling, maintenance, programming of telephone exchanges.
- Installation, cabling, maintenance of PC networks in Windows and Unix environments.
- Assembling, repairing, programming of PC.
- Design and assembling of electronic and electrical equipments.
- Audio amplification for concerts.

TEACHING

- Assistant Professor in the courses of Signals Theory and Telecommunications.
- Co-Supervisor of many Master's Theses.
- Seminars and lessons:

| | |
|---|------------------|
| Lessons at ESA course, Wuhan, China | 17 October 2008 |
| Invited Seminar at ISEIS University, Hong Kong, China, | 10 October 2008 |
| Invited Seminar at IECAS University, Beijing, China, | 8 October 2008 |
| Invited Seminar at Wuhan University, China, | 29 April 2008 |
| Invited Seminar at Province of Bergamo, Italy, | 19 November 2007 |
| Lessons at PhD Course on Remote Sensing, POLIMI | 24 October 2007 |
| Lessons at ESA Course on Remote Sensing, Lisbon, Portugal | 7 September 2007 |
| Lessons at Remote Sensing Course, POLIMI | 26 June 2007 |
| Lessons at ESA Course for Ministry of Defence, Rome | 22 November 2006 |
| Invited Seminar at Carlo Gavazzi Space, Milan, | 16 June 2006 |
| Lessons at Radar theory course, POLIMI, | 15-16 May 2006 |
| Invited Seminar at Region Lombardy, Milan, | 14 February 2006 |
| Invited Seminar at DLR, Oberpfaffenhofen, Germany, | 7 February 2006 |

TRAINING

2002 - 2006 Politecnico di Milano (Milan)

Ph.D. in Information Technology

- Major research project: "SAR super-resolution and characterization of urban targets". Thesis advisor: Prof. Fabio Rocca, Politecnico di Milano, Italy. Referee: Prof. R.F. Hanssen, Delft University of Technology, the Netherlands.
Exploiting about one hundred repeated spaceborne SAR acquisitions at a relatively low resolution (~25m x 5m on the ground) the 3D position of Permanent Scatterers (PS) was estimated with sub-meter accuracy. Moreover, by analyzing scattering pattern and polarimetric response of the targets, their main radar characteristics were estimated and a system for automatic detection of 5 urban target typologies (resonating structures, mirrors, poles, dihedrals and trihedrals) was developed. The interpretation of millimetric deformations detected by the radar was then improved and the identification of multi-sensor targets allowed the combination of data acquired with different orbits, frequencies and polarizations, increasing the number of deformation measurements and the number of detected targets.
- Minor research project: "Reference systems in satellite geodesy". Thesis advisor: Prof. Riccardo Barzaghi, Politecnico di Milano, Italy.
- Attended Courses in: "Neural networks, fuzzy logic and genetic algorithms"; "Graph theory"; "Finite elements technique"; "Inverse problem theory" and "Signals recognition theory".

1996 - 2002 Politecnico di Milano (Milan)

Degree in telecommunication engineering

- Master's Thesis title: "Three-dimensional focusing of SAR data from geosynchronous satellite".

The analyzed SAR system consists of a fixed ground-based receiver and a TV broadcasting satellite as illuminator. The synthetic aperture is obtained by means of the small daily motion of the geosynchronous satellite. A 3D focusing algorithm was developed and the capability to precisely locate a target in 3D space was studied.

1999 - 2000 Technische Universitaet (Wien)

Erasmus project

- Laboratory experiences on: LC filters, digital signal processing, signal decoding, radio devices, stochastic processes, optoelectronic, oscillators, transistors, waveguides.

1991 - 1996 Italian scientific high school (Milan)

High school Degree

- Project activity: design and assembling of an FM radio transmitter with quartz oscillator.

MAIN PUBLICATIONS

PATENTS

- A. Ferretti, **D. Perissin**, C. Prati, F. Rocca, “Data acquisition method and system, use of dihedrals for data acquisition”, Italian Patent No. MI2005A001912, March 2006.

SCI INDEX JOURNALS

- **D. Perissin**, “Validation of the sub-metric accuracy of vertical positioning of PS’s in C band”, IEEE Geoscience and Remote Sensing letters, Vol. 5, No. 3, July 2008, Pages: 502 – 506. (Impact factor 1.2)
- **D. Perissin**, A. Ferretti, “Urban target recognition by means of repeated spaceborne SAR images”, IEEE Transactions on Geoscience and Remote Sensing, Volume 45, Issue 12, December 2007, Pages: 4043 - 4058. (Impact factor 2.4)
- **D. Perissin**, C. Prati, M. Engdahl, Y.-L. Desnos, “Validating the SAR wave-number shift principle with ERS-Envisat PS coherent combination”, IEEE Transactions on Geoscience and Remote Sensing, Volume 44, Issue 9, Sept. 2006 Pages: 2343 - 2351. (Impact factor 2.4)
- **D. Perissin**, F. Rocca, “High accuracy urban DEM using Permanent Scatterers”, IEEE Transactions on Geoscience and Remote Sensing, Volume 44, Issue 11, Nov. 2006 Pages: 3338 - 3347. (Impact factor 2.4)

NATIONAL JOURNALS

- **D. Perissin**, C. Prati, “Identifying urban SAR Permanent Scatterers for motion interpretation and multi-track data fusion”, AIT Rivista italiana di telerilevamento, Vol. 40, 2008, Pages: 115-121.
- **D. Perissin**, C. Prati, “Characterization of urban SAR Permanent Scatterers”, AIT Rivista italiana di telerilevamento, Vol. 38, 2007, Pages 85-95.

PROCEEDINGS OF INTERNATIONAL CONFERENCES

- **D. Perissin**, T. Wang, C. Prati, F. Rocca, “PSInSAR analysis over the Three Gorges Dam and urban areas in China”, Proceedings of 2009 Joint Remote Sensing Event, Shanghai (China), 20-22 May 2009
- **D. Perissin**, T. Wang, F. Novali, “Monitoring terrain motion in China by means of spaceborne SAR image”, Proceedings of 2009 Joint Remote Sensing Event, Shanghai (China), 20-22 May 2009

- **D. Perissin**, C. Prati, “Comparison between SAR atmospheric phase screens at 30’ by means of ERS and ENVISAT’ data”, Proceedings of IGARSS 2008, Boston, MA, 6-11 July 2008.
- **D. Perissin**, F. Rocca, T. Wang, “DEM retrieval and landslide monitoring in Badong, Three Gorges, China by means of InSAR partially coherent targets”, Proceedings of Dragon Symposium 2007, Aix en Provence, (France) 18-22 June 2007.
- **D. Perissin**, “Comparison between SAR atmospheric phase screens at 30’ by means of ERS and ENVISAT’ data”, Proceedings of Fringe 2007, Frascati (Italy), 26-30 November, 2007.
- **D. Perissin**, R. Piantanida, D. Piccagli, F. Rocca, “Landslide in Dossena (BG): comparison between interferometric techniques”, Proceedings of BIOGEOSAR 25-28 September 2007.
- **D. Perissin**, A. Ferretti, R. Piantanida, D. Piccagli, C. Prati, F. Rocca, A. Rucci, F. de Zan, “Repeat-pass SAR interferometry with partially coherent targets”, Proceedings of Fringe 2007, Frascati (Italy), 26-30 November, 2007.
- **D. Perissin**, “Validation of the PS height estimate by means of photogrammetric data” Proceedings of ENVISAT 2007, Montreux (Switzerland), 23-27 April 2007.
- **D. Perissin**, C. Prati, F. Rocca, “ASAR parallel-track PS analysis in urban sites”, Proceedings of IGARSS 2007, Barcelona (Spain), 23-27 July 2007.
- **D. Perissin**, C. Prati, “Target recognition by means of spaceborne C-band SAR data”, Proceedings of URBAN 2007, Paris (France), 11-13 April 2007.
- **D. Perissin**, C. Prati, “SAR multi-track analysis in urban sites”, EARSEL 2007, Bolzano (Italy), Italy, 4-7 June 2007.
- **D. Perissin**, A. Ferretti, C. Prati, F. Rocca, “On the physical characterization of SAR Permanent Scatterers in urban areas”, Proceedings of 6th European Conference on Synthetic Aperture Radar - EUSAR 2006, Dresden (Germany), 16-18 May 2006.
- **D. Perissin**, F. Rocca, “Urban DEM”, Proceedings of FRINGE 2005, Frascati (Italy), 28 November - 2 December 2005.
- **D. Perissin**, C. Prati, F. Rocca, D. Li, M. Liao, “Multi-track PS analysis in Shanghai”, Proceedings of ENVISAT 2007, Montreux (Switzerland), 23-27 April 2007.
- **D. Perissin**, C. Prati, “On the physical nature of urban SAR Permanent Scatterers”, Proceedings of Workshop AIT SIFET, Mantova (Italy), 1-2 December 2005.
- T. Balz, **D. Perissin**, U. Soergel, L. Zhang, M. Liao, “Post-seismic infrastructure damage assessment using high-resolution SAR satellite data”, Proceedings of EOGC 2009, Chengdu (China) 25-29 May 2009.
- N. Pierdicca, F. Rocca, P. Basili, S. Bonafoni, D. Cimini, P. Ciotti, R. Ferretti, W. Foster, F.S. Marzano, V. Mattioli, M. Montopoli, R. Notarpietro, S. Padmanabhan, **D. Perissin**, E. Pichelli, S. Reising, S. Sahoo, G. Venuti, “Atmospheric water-vapour effects on spaceborne Interferometric SAR imaging: data synergy and comparison with ground-based measurements and meteorological model simulations at urban scale” Proceedings of EUCAP 09, Berlin (Germany), 23-27 March 2009.

- T. Wang, M. Liao, **D. Perissin**, F. Rocca, “Deformation monitoring by long term D-InSAR analysis in Three Gorges area, China”, Proceedings of IGARSS 2008, Boston, MA, 6-11 July 2008.
- T. Wang, **D. Perissin**, M. Liao, L. Lu, F. Rocca "Coherence De-composition Analysis", Proceedings of Fringe 2007, Frascati (Italy), 26-30 November, 2007
- A. Ferretti, A. Parizzi, **D. Perissin**, C. Prati, F. Rocca, “Accurate DEM reconstruction from Permanent Scatterers and multi-baseline interferometry”, Proceedings of the IEEE International Geoscience and Remote Sensing Symposium - IGARSS 2006, Denver (Colorado), 31 July - 4 August 2006.
- C. Colesanti, **D. Perissin**, “A first experiment of 3D imaging with a ground based parasitic SAR”, Proceedings of the IEEE International Geoscience and Remote Sensing Symposium - IGARSS 2006, Denver (Colorado), 31 July - 4 August 2006.
- A. Ferretti, **D. Perissin**, C. Prati, “Spaceborne SAR anatomy of a city”, Proceedings of FRINGE 2005, Frascati (Italy), 28 November - 2 December 2005.
- A. Ferretti, **D. Perissin**, C. Prati, F. Rocca, “On the physical nature of SAR Permanent Scatterers”, Proceedings of URSI Commission Symposium - URSI 2005, Ispra (Italy), 20-21 April 2005.
- A. Ferretti, **D. Perissin**, C. Prati, F. Rocca “ERS-ENVISAT Permanent Scatterers” Proceedings of the IEEE International Geoscience and Remote Sensing Symposium - IGARSS 2004, Anchorage (Alaska), 20-24 September 2004.
- C. Colesanti, A. Ferretti, **D. Perissin**, C. Prati, F. Rocca, “ERS-ENVISAT Permanent Scatterers Interferometry”, Proceedings of the IEEE International Geoscience and Remote Sensing Symposium - IGARSS 2003, Toulouse (France) 21-25 July 2003.
- M. Arrigoni, C. Colesanti, A. Ferretti, **D. Perissin**, C. Prati, F. Rocca “Identification of the location phase screen of ERS-ENVISAT Permanent Scatterers” Proceedings of FRINGE 2003, Frascati (Italy), 1-5 December 2003, ESA SP-550, January 2004.
- C. Colesanti, A. Ferretti, **D. Perissin**, C. Prati, F. Rocca “Evaluating the effect of the observation time on the distribution of SAR Permanent Scatterers” Proceedings of FRINGE 2003, Frascati (Italy), 1-5 December 2003, ESA SP-550, January 2004.
- A. Parizzi, **D. Perissin**, C. Prati, F. Rocca “Artificial scatterers in SAR interferometry”, Proceedings of Dragon Symposium 2005, Santorini (Greece), 27 June – 1 July 2005.
- A. Parizzi, **D. Perissin**, C. Prati, F. Rocca “Monitoring Tianjin subsidence with the Permanent Scatterers technique”, Proceedings of Dragon Symposium 2005, Santorini (Greece), 27 June – 1 July 2005.

PROCEEDINGS OF NATIONAL CONFERENCES

- **D. Perissin**, C. Prati, F. Rocca, W. Teng, “Stima di movimenti superficiali del terreno e di mappe digitali di elevazione in Cina tramite dati SAR da satellite”, Conferenza nazionale ASITA, L’Aquila, 21-24 Ottobre 2008.
- **D. Perissin**, C. Prati, D. Piccagli, R. Piantanida, “Tecniche avanzate per la stima di mappe digitali di elevazione da passaggi SAR satellitari multipli” Conferenza nazionale ASITA, Torino, 6-9 Novembre 2007.

- A. Ferretti, **D. Perissin**, C. Prati, F. Rocca, “Nuove tecniche per la generazione di mappe digitali di elevazione da molteplici osservazioni SAR satellitari”, Proceedings of Italian national conference ASITA, Bolzano (Italy), 14-17 November 2006.
- A. Ferretti, **D. Perissin**, C. Prati, F. Rocca, “Caratterizzazione dei punti di misura radar in ambito urbano per lo studio delle deformazioni”, Proceedings of Italian national conference ASITA, Catania (Italy), 15-18 November 2005.

REVIEWER EXPERIENCE

- IEEE Transactions on Geoscience and Remote Sensing
- IEEE Geoscience and Remote Sensing Letters
- International Journal of Remote Sensing
- Journal of Applied Remote Sensing
- Rivista Italiana di Telerilevamento

LANGUAGES

- Italian (native), English (very good, spoken and written), German (very good, spoken and written).

PROGRAMMING LANGUAGES

- Matlab, C, Sql, Php, Fortran.

HOBBIES

- Analog and digital electronics.
- Audio amplifiers (design, assembling and repairing).
- Radio devices (design, assembling and repairing).
- Valves oscilloscopes repairing.
- Mountain sports, bike riding, swimming.