

Prof. Ferdinando Nunziata

Curriculum vitae – ai fini della pubblicazione

1 General information

1.1 Personal Data

Name	Prof. Eng. Ferdinando Nunziata, PhD
Spoken languages.	Italian (mother tongue), English (proficient user)
IEEE grades	SM'14, M'12
IEEE Member No.	41592140



1.2 Business Affiliation

Università di Napoli Parthenope.
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2 Descriptive Biography of Prof. Ferdinando Nunziata

Ferdinando Nunziata was born in Avellino, Italy on 9th sept 1982 as son of Domenico and Rosa Nunziata. He attended classical high school in Palma Campania where he graduated with full marks in 2000.

In 2000 Ferdinando Nunziata began his BSc study of Telecommunication Engineering at the Università di Napoli Parthenope and he graduated (summa cum laude) with a thesis entitled “SAR sea oil slick observation”.

In 2003 he began his MSc study of Telecommunication Engineering at the Università di Napoli Parthenope and he graduated (summa cum laude) with a thesis entitled “Airborne remote sensing of marine pollutants”. The thesis benefited of a study period spent at National Oceanographic Center in Southampton under the supervision of Dr V. Byfield.

During his studies Ferdinando Nunziata took courses in English and was interested in literature, history, and environment.

In 2005 he became a PhD student in Telecommunication Engineering at the Università di Napoli Parthenope (curriculum in electromagnetic fields) and he graduated in 2008 with a thesis entitled “Single- and Multi-polarization Electromagnetic Models for SAR Sea Oil slick Observation”. The PhD thesis was developed also with the benefits of visiting periods spent at Department of Physic Engineering, Helsinki University of Technology, Espoo, Finland (where he studied wave polarization) and at Laboratoire de Télécommunications & Télédétection, Université Catholique de Louvain, Louvain-la-neuve, Belgium (where he studied microwave scattering from randomly rough surfaces).

In 2009 he granted a research fellow position with the Università degli Studi di Napoli “Parthenope” to study microwave scattering from the sea surface for SAR applications.

In 2010 he becomes Assistant professor in electromagnetic fields with the Università degli Studi di Napoli “Parthenope” with both teaching (electromagnetic theory) and research duties. The research activities benefited of visiting periods spent at College of Marine Science Shanghai Ocean University, Shanghai, China (coastline

extraction from SAR imagery) and Danmarks Meteorologiske Institut, Copenhagen, Denmark (Spatial resolution enhancement techniques for coastal area products).

As independent and new activity he pioneered the use of SAR polarimetry and the enhancement of the spatial resolution of microwave radiometer products for coastal area applications. From 2013 to 2017 he is guest professor in Microwave remote sensing of coastal zones with the College of Marine Science, Shanghai Ocean University, Shanghai, China.

In these years the European Space Agency (ESA) provides funding to develop research and training activities on microwave remote sensing to monitor coastal areas under nominal and extreme weather conditions. Hence, he focuses his main new studies on such a topic building up a new Remote Sensing Laboratory and summing up a first group of PhD students. He starts cooperating with X.Li, NOAA developing a physical polarimetric approach for better discriminating the dark areas due to oil spill and metallic targets due to oil/gas rigs/platforms. He develops, together with prof. P.Sobieski, UCL, Belgium, a new scattering model that, augmented with a damping model that includes also environmental parameters, allows the physical modelling of dark areas due to biogenic films. The scattering models was successfully verified at both L-, C- and X-band.

While he soon realizes that the classical image processing is not satisfactory to monitor oil spills and metallic targets in a robust and effective way, he explores the limit of such an approach, and he is more and more persuaded that only the extra information of polarimetric SAR data with a physical modelling support may conduct to a better solution.

He is also very active in the IEEE community. In 2023 he becomes chairman of the IEEE Geoscience and Remote sensing South Italy Chapter which he also served as secretary (2014-2022). In 2021 he becomes chairman of the IEEE Oceanic Engineering Society Ocean remote Sensing Technology Committee. He has been deeply involved in the IEEE Young Professionals (YP) (formerly GOLD) program both with the IEEE Italy Section (2013-1020) and with the GRSS (2010-2017).

Ferdinando Nunziata has been IEEE Senior Member since 2014 and he has been in the organizing committee of several conferences focused on remote sensing, including the 2015 edition of the Geoscience and Remote Sensing Society (GRSS) flagship conference: "IEEE International Geoscience and Remote Sensing Symposium (IGARSS) 2015" (> 2000 attendees) held in Milan, Italy.

In 2018 he becomes Associate professor in electromagnetic fields with the Università degli Studi di Napoli "Parthenope" where he teaches applied electromagnetics in BSc, MSc, and PhD engineering courses. From 2019 to 2021 he is vice-Chairman of the Telecommunication Courses at Università di Napoli Parthenope.

Although he keeps working in SAR remote sensing, he also develops projects and scientific ideas that trigger the use of microwave radiometer products for coastal area applications. The core of these methods is the generation of gridded products (from un-gridded measurements) at enhanced spatial resolution. The methods were verified on both microwave radiometer and Global Navigation Satellite System – Reflectometry (GNSS-R) products. The methods were appreciated from the scientific and industrial community, and he awarded two contracts (from Polytechnical University of Catalunya – UPC – and AIRBUS) to generate a proof-of-concept of an enhanced spatial resolution product for the forthcoming Copernicus CIMR mission.

In 2018 he started a scientific co-operation with the Italian Institute for Geophysics and Vulcanology (INGV) where he develops brand new models and methods to use polarimetric SAR data to estimate earthquake-induced damages.

In 2021, due to his expertise in polarimetric SAR remote sensing, he was selected by the Italian Space Agency to the role of Mission Advisory Group (MAG) for the COSMO-SkyMed 2nd generation (CSG) SAR mission.

During his professional career he authored/coauthored more than 100 peer-reviewed journal papers, > 150 refereed conference papers and 5 book chapters that mainly cover microwave remote sensing theoretical (e.g.; multi-polarization scattering from rough surfaces, radar polarimetry, bistatic scattering, inverse problems) and applicative (e.g.; marine and maritime applications including oil spills/ship detection, sea surface wind estimation and typhoon observation, and coastline extraction, land classification, crop phenology estimation, detection of damages due to earthquakes, spatial resolution enhancement of radiometer products, generation of radar image from Global Navigation Satellite System Reflectometry (GNSS-R) measurements) aspects.

3 Education

- 2008: PhD and *Doctor Europeus* in Telecommunication Engineering (2005-2008) at Università di Napoli Parthenope. Curriculum in Electromagnetic fields.
- 2005: MSc in Telecommunication Engineering (2003-2005) at Università di Napoli Parthenope. Thesis in Remote Sensing.
- 2003: BSc in Telecommunication Engineering (2000-2003) at Università di Napoli Parthenope. Thesis in Remote Sensing.

4 Appointments

4.1 Academic Appointments

- 2018-now: Associate Professor of Electromagnetics at Università di Napoli Parthenope, Italy.
- 2013-2016: Guest Professor of Microwave Remote Sensing at Shanghai Ocean University, College of Marine Science, Shanghai, China.
- 2010-2018: Assistant Professor of Electromagnetics at Università di Napoli Parthenope, Italy.
- 2009-2010: Research fellow at Università di Napoli Parthenope, Italy.

4.2 Other Appointments

- 2021 - now: He has been in the Italian Space Agency (ASI) Mission Advisory Committee (MAG) for CosmoSkyMed 1st and 2nd Generation SAR missions.
- 2013 - now: He has been in the board of the PhD school of Information and Communication Technology and Engineering
- 2014: He was visiting scientist at the Danmarks Meteorologiske Institut, (DMI) Copenhagen, Denmark. The topic is “Spatial resolution enhancement of microwave radiometer products for coastal area applications” – DMI reference Dr. L.T. Pedersen.
- 2012: He was visiting scientist at the College of Marine Science - Shanghai Ocean University (SHOU), Shanghai, China. The topic is about “Coastline extraction using X-band SAR data”– SHOU reference Prof. X. Li.
- 2010: He was visiting scientist at the Department of Earth and Atmospheric Science - City College of New York (CCNY), New York, USA. The topic is about “Microwave remote sensing of sea ice” – CCNY reference Prof. M. Tedesco.
- 2009: He was visiting student at the Department of Physic Engineering, Helsinki University of Technology (TKK), Espoo, Finland. The topic is about “Wave polarization” – TKK reference Prof A.T. Friberg.
- 2008: He was visiting student at the Laboratoire de Télécommunications & Télédétection, Université Catholique de Louvain (UCL), Louvain-la-neuve, Belgium. The topic is about “Microwave scattering from randomly rough surfaces” – UCL reference Prof. P. Sobieski.

5 Teaching experience

5.1 Academic teaching

- | | | |
|------------|---|---|
| 2022 - now | University of Napoli Parthenope – Department of Engineering | Antenne e propagazione per scenari complessi – LM27 |
| 2018 - now | University of Napoli Parthenope – Department of Engineering | Propagazione – L8 |
| 2015 -now | University of Napoli Parthenope – Department of Engineering | Microwave scattering and propagation – PhD school in Information and Communication Technology and Engineering |
| 2018- 2022 | University of Napoli Parthenope – Department of Engineering | Antenne e propagazione per sistemi wireless – LM27 |
| 2016-2017 | University of Napoli Parthenope – Department of Engineering | Microonde – LM27 |
| 2013-2015 | University of Napoli Parthenope – Department of Engineering | Metodi numerici per le antenne – LM27 |
| 2012-2012 | University of Napoli Parthenope – Department of Engineering | Electromagnetic networks – L8 |

2012	College of Marine Science - Shanghai Ocean University (SHOU), Shanghai, China	Radar remote sensing – Marine Science MSc school
2009-2011	Italian Space Agency (ASI) – Matera Space Center: 2nd level ASI Master degree	SAR for marine applications

According to the student survey at Dipartimento di Ingegneria, his 2023 average teaching evaluation score is “perfect”.

5.2 Tutorials

2023	IEEE MetroSea Conference, 4-6 October 2023, Valletta, Malta. Full-day tutorial, entitled “SAR remote sensing of coastal areas”.
2023	IEEE OCEANS Conference, 5-8 June 2023, Limerick, UK. Full-day tutorial, entitled “SAR remote sensing of the ocean surface”.
2022	Mediterranean Ph.D. school, 12–13 December 2022 (virtual event). Full-day tutorial: “SAR polarimetry: Oceans applications”

5.3 Seminars

2023	Italian National Research Council, Florence, Italy, on 21 April 2023. “Spatial resolution enhancement of microwave radiometer measurements“ (IEEE OES Distinguished Lecturer talk).
2019	Beihang University, School of Electronic and Information Engineering, Beijing, China: “Oil fields observation by polarimetric SAR”.
2019	Technical University of Wien, Vienna. “Model-based approaches to observe environmental changes using multi-polarization SAR”.
2018	Centro Interforze Telerilevamento Satellitare, Aeroporto “M. De Bernardis”, Pomezia, Rome. “Added-value microwave products for marine and maritime applications”.
2017	Istituto Nazionale di Geofisica e Vulcanologia (INGV), Grottaminarda, Italy. “Added-value products for Earth Observation purposes”.
2016	Beihang University, School of Electronic and Information Engineering, Beijing, China. “Imaging remote sensing products from GNSS-R DDMs”.
2014	Danish Meteorological Institute (DMI), Copenhagen, Denmark. “PolSAR observation of coastal areas”.
2014	Danish Meteorological Institute (DMI), Copenhagen, Denmark. “Spatial resolution enhancement techniques for coastal area products”.
2013	Université Pierre & Marie Curie, Laboratoire d’Oceanographie et du Climat Experimentation et Approches Numeriques (LOCEAN), Paris, France. “Recent advances on sea oil slick observation using polarimetric SAR data”.
2012	Shanghai Ocean University (SHOU), College of Marine Science, Shanghai, China. “RADAR remote sensing for marine applications”.
2012	Beihang University, School of Electronic and Information Engineering, Beijing, China. “Oil at sea observation by polarimetric SAR data”.
2011	European Maritime Safety Agency (EMSA), Lisbon, Portugal. “SAR sea oil field monitoring: An operational view”.
2010	Centro Interforze Telerilevamento Satellitare Aeroporto “M. De Bernardis”, Pomezia, Rome. “COSMO-SkyMed for targets at sea detection purposes”.
2009	Dipartimento di Elettronica, Politecnico di Torino, Turin, Italy. “Multi-polarization model for sea surface scattering: sea oil slick observation”.
2009	Dipartimento di Elettronica, Politecnico di Torino, Turin, Italy. “Single-polarization em models for rough surface scattering: the sea surface scenario”.
2009	Department of Earth and Atmospheric Science, City College of New York, New York, USA. “RADAR polarimetry for environmental applications: sea oil slick observation”.
2008	Technical University of Helsinki (TKK), Optical Department, Humaljarvi, Finland. “Polarimetry for SAR sea oil slick observation”.
2008	Department of Physics Engineering, Helsinki University of Technology, Espoo, Finland. “Brand results in single- and multi-polarization sea oil slick observation”.
2007	Università di Napoli Parthenope IEEE Student Branch, Naples, Italy. “Sea Surface Scattering: the BPM approach”.
2007	Laboratoire de Télécommunications & Télédétection (TELE), Université catholique de Louvain, Louvain-la-Neuve, Belgio. “SAR sea surface waves imaging”.

5.4 Supervisor

- 2013 – now: He has been academic tutor of about 20 graduated students (3 international visiting students, 9 PhD students and 5 post-doc research fellows).
- 2011 – now: He is constantly supervising MSc/BSc students (more than 60 thesis).

6 Societies activities

6.1 Society memberships

- 2023 – now: He chairs the IEEE Geoscience and Remote Sensing South Italy Chapter.
- 2022 – now: He chairs the Ocean remote Sensing Technology Committee of the IEEE Oceanic Engineering Society (OES).
- 2016 – now: IEEE member of the Oceanic Engineering Society (OES).
- 2014 – now: He serves as Theme coordinator/Session Organizer the IGARSS organizing committee.
- 2014 – 2022: He is secretary of the IEEE Geoscience and Remote Sensing South Italy Chapter
- 2013 – 2020: He chairs the Young Professionals (YP) Affinity Group (AG) of the IEEE Italy Section.
- 2011 – 2017: He chairs the Young Professionals (YP) program of the IEEE GRSS
- 2008 – now: He is Member of the IGARSS scientific committee.
- 2005 – 2014: He chairs the Student Branch @ Università degli Studi di Napoli Parthenope
- 2003 – now: Member of the Italian Society of Electromagnetics (SIEm).
- 2003 – now: Member of the Geoscience and Remote Sensing Society (GRSS).

6.2 Associate editor

- 2019 – now: He is Associate Editor of the IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS).
- 2018-now: He is Associate Editor of MDPI Remote Sensing.
- 2022: Co-Editor (with Dr Christian Bignami, INGV, Italy and X. Yang, Chinese Academy of Sciences, Beijing, China) of the Special Issue of Frontiers in Environmental Science “Remotely sensed measurements to manage inland and coastal water”.
- 2022: Co-Editor (with Prof. Weizeng Shao, Dr Juhong Zou and Dr Gang Zheng) of the Special Issue of MDPI Remote Sensing “Marine Disaster Monitoring Using Satellites”.
- 2019-2021: He is Associate Editor of MDPI Ocean.
- 2019 – 2019: He was guest editor of a Special Issue for JSTARS: “H.-C.Li, S.R.Cloude, J.Yang and F.Nunziata, Compact Polarimetric SAR, 2019.”
- 2017: Co-Editor (with Dr Armando Marino, University of Stirling, UK and Dr Domenico Velotto, German Aerospace Center, Germany) of the Special Issue of MDPI Remote Sensing “Remote Sensing of Target Detection in Marine Environment”
- 2016: Co-Editor (with Dr Xiaofeng Yang, Chinese Academy of Sciences, Beijing, China, Dr Alexis Mouche, IFREMER, France and Xiaofeng Li, NOAA, USA) of the Special Issue of MDPI Remote Sensing “Ocean Remote Sensing with Synthetic Aperture Radar”.
- 2015: Guest editor of the Special Issue of European Journal of Remote Sensing “Young Professionals – Remote Sensing”.

6.3 AdCom/ExCom

- 2023 – now: He joined the IEEE Italy Section ExCom chairing the GRS South Italy Chapter.
- 2013 – 2021: He joined the IEEE Italy Section ExCom overseeing the Young Professionals (YP) activities.
- 2010 – 2017: He joined the IEEE GRSS AdCom overseeing the Young Professionals (YP) activities (formerly Graduate of the last decade - GOLD).

6.4 Honors

- 2023 – now: He has been serving as Distinguished Lecturer for the IEEE Oceanic Engineering Society.
- 2022 – now: He has been serving the Italian Space Agency (ASI) as member of the Cosmo SkyMed 1st and 2nd Generation Mission Advisory Group (MAG).
- 2014- now: He is IEEE Senior Member

6.5 Conferences - speaker

Since 2007, he has been attending – as speaker – more than 40 international conferences, e.g.,

- 2007 – now IEEE International Geoscience and Remote Sensing Symposium (GRSS flagship conference).
- 2007 – now ESA sponsored conferences (SeaSAR, PolINSAR, Living Planet Symposium, Dragon)

He has been providing as – invited speaker – more than 20 “oral presentations” at international conferences (e.g., IEEE GRSS IGARSS, EUSAR, etc.)

6.6 Conferences – management activities.

- 2008 - now: He is constantly chairing/co-chairing IEEE IGARSS (the flagship GRSS conference) thematic sessions (IGARSS'08 Boston, USA; IGARSS'09 Cape Town, South Africa; IGARSS'12 Munich, Germany; IGARSS'15 Milan, Italy, IGARSS'16 Beijing, P.R. China, IGARSS'18 Valencia, Spain, IGARSS'20 Virtual, IGARSS'21 Virtual, IGARSS'22 Virtual).
- 2024 He organized the community-contributed session “New methods and models to generate remotely sensed products for a sustainable ocean” at the GRSS IGARSS'24 Conference, Athens, Greece.
- 2023 He organized the invited session “Remote sensing technologies and advanced methods for safe and security applications” at the 2023 IEEE international workshop on Technologies for Defense and Security, 20-22 November, Rome, Italy.
- 2019 He organized the invited session “Remote sensing models and methods to support sustainable development and disaster management” at the IEEE 4th International Forum on Research and Technologies for Society and Industry (RTSI 2018), 10-13 September, Palermo, Italy.
- 2019 He organized the IEEE Young Professionals Poster and Demo session at “5th International Forum on Research and Technologies for Society and Industry (RTSI 2019)” University of Firenze, Firenze, Italy, 9-12 September 2019.
- 2019: He organized the invited session entitled “Monitoring the coastal zone from space: from land/sea/air interactions to trends and extremes” at the ESA Living Planet Symposium 2019, Milan, Italy.
- 2018 He organized the invited session entitled “New remote sensing techniques and methods for extreme weather and ocean events monitoring” at the IEEE Geoscience and Remote Sensing Symposium (IGARSS) 2018, 22-27 July, Valencia, Spain.
- 2018 He organized the IEEE Young Professionals Poster and Demo session at “4th International Forum on Research and Technologies for Society and Industry (RTSI 2018)” University of Palermo, Palermo, Italy, 10-13 September 2018.
- 2018 He co-organized the IEEE Young Professionals Conference on Remote Sensing, Aachen, Germany, 7-8 June, 2018.
- 2017 He organized the invited session “Advanced remote sensing methods for a smarter and safer world” @ IEEE 3rd International Forum on Research and Technologies for Society and Industry (RTSI 2017), 11-13 September, Modena, Italy.
- 2017 He organized the IEEE Young Professionals Poster and Demo session at “3rd International Forum on Research and Technologies for Society and Industry (RTSI 2017)” University of Modena e Reggio Emilia, Modena, Italy, 11-13 September 2017.
- 2016 He was in the organizing committee of the IEEE “EMC Day” Università degli Studi di Napoli Parthenope, Napoli, Italy, December 2nd, 2016.
- 2016 He was the general chair of the IEEE Young Professionals Conference on Remote Sensing German Aerospace Center (DLR), Oberpfaffenhofen, Germany, 20-21 October 2016.
- 2016 He organized the IEEE Young Professionals Poster and Demo session at “2nd International Forum on Research and Technologies for Society and Industry (RTSI 2016)” University of Bologna, Bologna, Italy, 7-9 September 2016.
- 2015 He co-organized the IEEE Young Professionals Conference on Remote Sensing Polytechnic Polytechnical University of Catalunya, Barcelona, Spain, December 3-4, 2015.
- 2015 He was in the organizing committee of the IEEE International Geoscience and Remote Sensing Symposium (IGARSS) 2015 Convention Center, Milan, Italy, July 26-31, 2015.
- 2014 He organized the IEEE Graduate of the Last Decade (GOLD) Conference Maritim Hotel Berlin, 5-6 June 2014.

- 2012 He was in the organizing committee of the IEEE Graduate of the Last Decade (GOLD) Conference National Research Council (CNR), Rome, Italy, 4-5 June 2012.
- 2012- now He is regularly chairing/co-chairing thematic sessions at the joint ESA-MOST sponsored international conference DRAGON
- 2010 He was in the organizing committee of the IEEE GOLD Conference Italian Naval Academy, Livorno, Italy, 29-30 April 2010. 2008 IEEE GOLD Conference ESA-ESRIN, Frascati, Italy, 22-23 May 2008.
- 2019 - now He is member of the ESA Living Planet Symposium Scientific Committee.
- 2008 – now He is regularly chairing/co-chairing thematic sessions at the ESA-sponsored international conference Polarimetric Interferometric SAR (PolInSAR).

6.7 Awards

- 2023: IEEE Journal of Oceanic Engineering (JOE) 2022 Outstanding Reviewers award.
- 2021: Best Poster Award ESA/MOST Dragon-4 Symposium “Ocean & Coastal zone session”.
- 2015: Best “Principal Investigator” jointly awarded by European Space Agency (ESA) and Ministry of Science and Technology (MOST) of China for his activities in the frame of the Dragon 3 project entitled “Oil spill monitoring”.
- 2014: He is invited as distinguished speaker at the “International Oil Spill Response Technical Seminar IOSRTS 2014”, an international conference sponsored by the International Maritime Organization (IMO), held in Yantai, Cina, 2-3 September 2014.
- 2012: “G. Latmiral” prize awarded by the Italian Society of Electromagnetics (SiEM) for the best paper “Reflection symmetry to detect man-made targets” presented by an under 35y old scientist.
- 2010: Front page of IEEE GRSL. The study “Schiaivulli et. al., Observing Sea/Ice Transition Using Radar Images Generated from TechDemoSat-1 Delay Doppler Maps, IEEE GRSL, vol. 14, n. 5, pp.734-738, 2017, achieved the front page of the GRSL issue.
- 2009: “Sebetia-Ter 2009” (targa d’argento del Presidente della Repubblica Italiana) to recognize his research activity in microwave remote sensing
- 2004: 2003 Best Remote Sensing Thesis Award Provided by the IEEE GRS South Italy Chapter

7 Professional expertise

7.1 Project’s reviewer

- 2022 – now: He is constantly reviewing research projects funded by Cyprus Research and Innovation Foundation (RIF).
- 2016 – now: He is constantly reviewing research projects funded by the Ministry of University and Research (MUR).
- 2014 - now: He is constantly reviewing research projects funded by the National Center of Science and Technology Evaluation, Kazakhstan.

7.2 Reviewer of scientific journals

- 2008 – now: He is constantly serving as reviewer for international per-reviewed scientific journals (IEEE TGRS, IEEE JSTARS, IEEE GRSL, IJRS, MDPI, etc.).

7.3 Academic management duties

- 2012 – now: He is involved in several panels within the Corso di Studi in Ingegneria dell’Informazione at Dipartimento di Ingegneria, Università di Napoli Parthenope (“Commissione AQ”, “Commissione Didattica”, “Giunta del Dipartimento”, “Commissione relazioni con le aziende”).
- 2020-2022: He is secretary of the Information Engineering MSc and BSc programs at Università di Napoli Parthenope.

8 Funding information

8.1 Principal Investigator (PI)

- 2023 – now: MUR - Progetti di ricerca di Rilevante Interesse Nazionale - PRIN 2022 (282K Euro): “multi-layEr approaCh to detect and analyze cOastal aggregation of MAcRo-plastic littEr (ECOMARE)”.

2023 - now:	Rai Way SpA funded project (20K Euro) “Verifiche funzionali dei «Rilevatori a Soglia NIR»”.
2022 - now:	Rai Way SpA funded project (18K Euro) “Measurements of electromagnetic fields close to DVB/BAD RayWay towers”.
2021 - now	European Space Agency (ESA) Dragon-5 Cooperation Programme (50K Euro): “Monitoring hArsh Coastal environments and Ocean Surveillance using radar remote sensing (MAC-OS)”.
2021 - 2023	Italian Space Agency (ASI) funded project (106K Euro) “APPLICAVEMARS - Approccio multi-frequenza e multi-polarizzazione per la stima del campo di vento marino da immagini SAR” to estimate wind speed from L-, C- and X-band SAR imagery.
2020 - 2021	AIRBUS Defence, Spain - Contract of Services (40K Euro): “Phase A/B1 of Passive Microwave Imaging Mission (CIMR)”
2019 - 2020	Polytechnical University of Catalunya (UPC) - Contract of Services (15K Euro): “Pre-development of the Resolution enhancement Algorithm in order to support the CIMR mission.”
2017 - 2020	European Space Agency (ESA) Dragon-4 Cooperation Programme (70K Euro): “Microwave satellite measurements for coastal area and extreme weather monitoring”.
2013 - 2016	European Space Agency (ESA) Dragon-3 Cooperation. Programme (30K) “Oil spill monitoring”.

8.2 I-Investigator

2019-2021	Research project funded by Italian Ministry of research (MIUR) under the label “Programma nazionale di ricerca in Antartide (PNRA) 2018 (15K Euro allocated to Ferdinando’s unit) “Sea ice and Wave-ice Interaction Monitoring for a safe Marginal Ice Navigation (SWIMMING)”.
2019-2020	Research and development project in the frame of PNR 2015-2010 (ARS01 00922) (170K Euro allocated to the Ferdinando’s unit) “FORMATION flying of CubEsat assemblies for remote sensing (FORCE)”
2019-2020	Research and development project in the frame of PNR 2015-2010 (ARS01 00922) (40K Euro allocated to the Ferdinando’s unit) “Deployable Optics for Remote sensing Applications.”
2011-2013	ESA “PolSARapp: Polarimetric SAR Apps Demonstration” project (40K allocated to the Ferdinando’s unit). His unit is responsible of the marine and maritime activities.

9 Research activities

9.1 Research Fields and Areas of Interest

Prof. Nunziata is a leading expert on applied electromagnetics. His research activities include both theoretical and applicative aspects mainly related to microwave remote sensing using radar and radiometer sensors including signals of opportunity. Recently, Prof. Nunziata started a research activity focused on the exploitation of LIDAR remote sensing for coastal area applications, including aggregated plastic monitoring.

The theoretical aspects include multi-polarization models to deal with scattering from randomly rough surfaces; radar polarimetry and polarimetric decompositions; fading and speckle models; bistatic and mono-static scattering models; inverse problems arising from microwave remote sensing; interpolation of stochastic fields. The operational ones deal with the generation of added-value products from a physically-based processing of synthetic aperture radar (SAR), microwave radiometer and global navigation satellite system – reflectometry (GNSS-R) measurements. His research activities are well documented by (according to SCOPUS) more than 220 scientific papers, including more than 100 peer-reviewed journal papers. A brief description of the research activities, which includes references to the peer-reviewed journal papers listed in the next section, is provided below.

9.2 Keywords: polarimetric scattering, water pollution, polarimetric models, SAR.

Description: Polarimetric models and analysis tools have been developed to observe sea oil slicks and have shown that some polarimetric features (derived from either conventional polarimetric SAR measurements of compact-polarimetric ones), namely the correlation between co-pol channels, unpolarized backscattered energy and scene depolarization capabilities, can be successfully used to both observe oil slicks and distinguish them from weak-damping look-alikes. These results represent a fundamental breakthrough to former knowledge, which, in a nutshell, considered radar polarimetry unsatisfactory for sea oil slick observation.

All these new physical approaches share a common physical rationale that relies on the fact that, under low-to-

moderate wind conditions (3 – 12 m/s) and at intermediate incidence angles, both slick-free and weak-damping slick-covered sea surfaces call for Bragg scattering, whereas in the case of oil-covered sea surfaces, a completely different, i.e., non-Bragg scattering mechanism, is in place. These studies boosted the development of operational methods to detect and to classify sea oil slicks in full-, dual- and compact-polarimetric SAR imagery.

Publications: [IJ-86-85-69-68-64-48-43-37-36-32-24-19-17-15-14-13-11-10-8-5]

9.3 Keywords: multi-polarization scattering, IEM, BPM, two-scale scattering models, SAR.

Description: Electromagnetic models to describe the scattering from randomly rough surfaces are specialized to the sea surface case and augmented with damping models to predict slick-free and slick-covered sea surface scattering. The models (belonging to the family of the boundary perturbation models (BPM) and two-scale Improved Integral Equation Model (IEM)) are developed under the - more general - bistatic scattering framework and then specialized to the backscatter case to contrast theoretical predictions with actual measurements remotely sensed by SAR under slick-free and slick-covered sea surface conditions.

All these approaches share a common physical rationale, namely a two-scale scattering model is augmented with a damping model that accounts for the reduction of the sea surface roughness by the surfactant. With respect to the state-of-the-art prof. Nunziata pioneered the inclusion of additional effects related to the pollutant; namely, the reduction of the input energy from the wind to the sea (through a reduced friction velocity) and the modification of the Fresnel reflection coefficients in case of thicker oil layers or emulsified oils. Prof. Nunziata was among the first scientists to test the sensitivity of X-band backscatter to marine litter which showed promising results.

Publications: [IJ-103-94-91-80-53-7]

N. Davaasuren, A. Marino, C.P. Boardman, M. Alparone, F. Nunziata, N. Ackermann, and I. Hajnsek, "Detecting microplastics pollution in world oceans using SAR remote sensing," *Proceedings of the International Geoscience and Remote Sensing Symposium (IGARSS) 2018*, July 22-27, Valencia, Spain.

9.4 Keywords: reflection symmetry, metallic targets, polarimetry, SAR

Description: Prof. Nunziata proposed a new paradigm to observe metallic targets at sea in dual-polarimetric SAR measurements that "looks" at metallic targets at sea as targets that break the reflection symmetry that characterizes natural scenes, e.g., ocean surface. The new coherent approach relies on intrinsic Maxwell's equation properties and ensures effective results independently of the wind blowing direction and over a large range of incidence angles and wind conditions. Prof. Nunziata proposed a robust and simple method to exploit the different symmetry properties which characterize sea surface with and without man-made metallic targets through the correlation between the cross-polarized polarimetric channels that was successfully verified on L-, C- and X-band SAR data.

Prof. Nunziata also developed a model that relates the correlation between the co-polarized channels, in case of sea surface with and without metallic targets, to the time offset between bursts related to the HH and VV polarimetric channels - measured by the Italian CosmoSkyMed imagery collected according to the PingPong mode - in a fashion like a polarimetric along-track interferometry to sort out the dynamic sea background.

Prof. Nunziata also deeply investigated the role of the SAR incidence angle in the observation of metallic platforms using multi-polarization SAR measurements. This analysis demonstrated that the straightforward image-processing approach that consists of detecting metallic targets at sea as bright spots in the SAR image plane presents severe limitations that can be overcome by an intelligent combination of multi-polarization measurements. All the physical approaches are computer time effective, robust to sea state conditions and more reliable than single-polarimetric approach.

Publications: [IJ-105-95-72-55-44-25-22-20]

9.5 Keywords: speckle, 2D random walk, targets at sea, SAR

Description: Prof. Nunziata pioneered the use of speckle as a source of information to observe metallic targets at sea in single look complex (SLC) SAR imagery. When large targets are present the speckle model changes and this allows detecting the target, when the target has a strong scattering response, but it is small, one cannot

expect to have a change into the speckle model and must analyze the speckle pdf tail. Of course, while the single-polarimetric approach has the benefit of a fine spatial resolution they are less robust since there may present environmental phenomena generating similar scattering, especially in the small target case.

This approach has been applied to detect target and dark areas in co- and cross-polarized SAR imagery.

Publications: [IJ-18-12-6-3-2]

9.6 Keywords: crop phenology, multi-polarization, time series of SAR imagery

Description: Time series of multi-polarization SAR data are exploited to retrieve the phenological stages of crops. Two classes of methods are proposed.

The first class is based on a data-driven procedure that consists of classifying phenological stages using polarimetric features and single-polarization intensity channels. The procedure is successfully verified on actual polarimetric SAR data collected by RadarSAT-2 and CosmoSkyMed over different crop fields, including rice and onion fields.

The second class consists of a new methodology to estimate crop phenology using time-series of polarimetric SAR data. The procedure constitutes an effective methodology for all the steps involved in the phenology retrieval. Phenological intervals and training areas are identified evaluating the distances among polarimetric covariance matrices obtained from time series of PolSAR data. Consequently, the computation of PolSAR observable, which is the main step of state-of-the-art methods, is no longer needed and the proposed approach can be applied in the same way to any crop type.

Publications: [IJ-71-57-49-42-52-46-40-39-34]

9.7 Keywords: coastline, dual-polarimetric SAR

Description: Prof. Nunziata proposed a completely new paradigm to use SAR measurement to map the coastline, i.e., to distinguish the boundary between land and sea in SAR imagery, which relies on the inherent imaging characteristics of the COSMO-SkyMed dual-polarization Ping-Pong mode. According to this imaging mode, the two polarimetric channels are acquired with a time lag that is long enough to make sea surface uncorrelated at X-band and, therefore, easy to be sorted out from land. Further, a new approach that exploits the inter-channel correlation was proposed to extract coastline in C- and X-band SAR measurements that triggered the development of several applications suitable for end-users.

Publications: [IJ-101-90-89-58-26]

9.8 Keywords: inland water, time-series, SAR

Description: Prof. Nunziata proposed a model to deal with the use of time-series of multi-polarization SAR measurements to monitor inland water and to extract key parameters, e.g., the water-area coverage and rough info about the bathymetry.

From an electromagnetic viewpoint, these models also shed light on the peculiarities of the scattering from inland waters that distinguish it from the well-known sea surface scattering. These findings explain, for instance, the physics that makes the cross-pol channel uninformative.

Publications: [IJ-106-75]

9.9 Keywords: change detection, damage assessment, earthquakes, SAR

Description: Prof. Nunziata pioneered the development of new bi-temporal approaches which, based on a proper modeling of dual-polarimetric scattering, allow detecting damages related to earthquakes. The proposed

modeling consists of designing a scattering-based polarimetric change detector metric that maximizes the difference between a pair of covariance matrices acquired before and after the earthquake event.

In addition, a novel approach that exploits the reflection symmetry to classify areas affected by earthquake-related damages is also proposed. The approach models that damaged built up areas more “reflection-symmetric” than non-damaged built-up areas.

The accuracy of the proposed approaches in detecting damaged areas and providing information on the level of damages using dual-polarimetric SAR imagery is verified against ground surveys.

Publications: [IJ-104-102-87-62-61]

9.10 Keywords: inverse problems, Hilbert and Banach spaces, microwave radiometer

Description: The use of large-scale microwave sensors for coastal area applications poses two main problems: non-imaging capabilities and coarse spatial resolution. Both problems can be mathematically framed as inverse ill-posed problems that must be handled with care.

Prof Nunziata pioneered the development of new physically based algorithms suitable to generate images at native and enhanced spatial resolution that have been verified using actual microwave radiometer measurements. Both the instruments do not generally provide "image" products, i.e., their measurements are not inherently arranged in a uniform gridded format. This very often prevents their use in Earth Observation (EO) applications where the spatial information is important. This is the case, for instance, of climate-related studies where parameters must be derived at fixed locations through time. Accordingly, reconstruction techniques aimed at generating gridded products in an effective way have been proposed that can be formulated as an inverse problem. Within this context, Prof. Nunziata:

- Developed a completely new paradigm that allows taking care of the inversion in the Banach spaces in a robust and effective way and, therefore, overcoming the classical over-smoothing and the Gibbs oscillations that arise from the minimization of the conventional energy norm in the Hilbert spaces. From a mathematical viewpoint, spatial resolution enhancement leads to an underdetermined problem that, from a mathematical viewpoint, implies that no unique inverse operator exists; therefore, additional constraints must be imposed on the sought solution. Two classes of approaches have been proposed to deal with spatial resolution enhancement of microwave radiometer data based on the minimum p -norm constraint, with $1 < p \leq 2$. The first class consists of choosing $p = 2$; hence, reconstructions in Hilbert space are obtained. The second class consists of choosing $1 < p < 2$, i.e., reconstructions are obtained in Banach spaces. The latter are shown to overcome the drawbacks of classical approaches in Hilbert space, i.e., over-smoothness and Gibbs oscillations.

Prof Nunziata first promoted an innovative processing scheme that adapts the p -norm to the scenario to be reconstructed, i.e., the so-called variable p -exponent reconstruction that provides a better reconstruction of abrupt discontinuities (e.g., the land/sea boundary) without any artifact when reconstructing smoother gradient.

Prof. Nunziata also addressed both theoretically and experimentally a key issue that arises with the enhancement of the spatial resolution of conical-scanning microwave radiometer measurements, i.e., noise amplification by discussing mathematically and experimentally the tradeoff between the enhancement of the spatial resolution and the noise amplification.

Recently prof. Nunziata pioneered a mathematically based approach to augment spatial resolution in multi-frequency radiometers by “augmenting” the lower-frequency (coarser spatial resolution) channel with tailored information extracted from the higher-frequency (finer spatial resolution) channel.

The methods developed by Prof. Nunziata were also used to design a L1-b product for the forthcoming Copernicus CIMR mission in the frame of a joint project carried out by AIRBUS Spain, Polytechnical University of Catalunya and Università di Napoli Parthenope.

Publications: [IJ-96-93-92-84-83-73-45-41-38-28-27-16]

9.11 Keywords: inverse problems, radar image, GNSS-R

Description: Prof Nunziata pioneered the development of a high-level Global Navigation Satellite System – Reflectometry (GNSS-R) product that includes normalized radar cross sections (NCRSSs) arranged in a gridded format. This product can be successfully used for imaging remote sensing applications. To obtain this high-level

product an ill-conditioned inverse problem is to be solved. Prof. Nunziata proposed new de-convolution methods to deal with the reconstruction problem in both Hilbert and Banach spaces.

The suite of methods was successfully verified against simulated and actual measurements and triggered the development of new added-values products for coastal area applications.

Publications: [IJ-54-51-33-31]

9.12 Keywords: wave polarization, 2D planar waves, 3D non-planar waves, reverberation chamber

Description: The research activities concern polarization properties of both 2D and 3D electromagnetic waves. The differences between the degrees of partial polarization of electromagnetic beam-like wave fields on time average and in the frequency domain is analyzed. It is pointed out that the spectral degree of polarization depends on the temporal coherence properties of the field, but the same is not true for the time-domain degree of polarization. Consequently, the degrees of polarization in the two domains assume, in general, different values. For example, a field that is fully unpolarized in the time domain can be fully polarized at every frequency. However, a field that is fully polarized in the time domain is also fully polarized in the frequency domain.

The electromagnetic field within a Reverberating Chamber (RC) has a random three-dimensional structure that must be properly taken into account to analyze it. A model for three-dimensional degree of polarization is applied to analyze the randomness of the 3D electromagnetic field generated within a RC. Experiments, undertaken at the RC of Università degli Studi di Napoli Parthenope, show: a) the field within the well stirred RC is three-dimensional; b) the measurements and the physical meaning of the three indexes provide a quantitative evaluation of the effectiveness of the stirring process and hence of the randomness of the electromagnetic field within the RC.

Publications: [IJ-77-47-30-9]

9.13 Keywords: reverberation chamber, power delay profile, total radiated power

Description: These activities are devoted to the modeling, the identification and the measurements of properties associated to the wireless communication emulated in the reverberation chamber. A model, based on the generalized K (GK) distribution, is developed to identify distinguish not only line-of-sight (LOS) and non-line-of-sight configurations but also to provide a better granularity within these two macro groups (i.e. distinguishing the clear LOS condition from the near LOS one, that typically applies when an object partially shadows the link). Total radiated power (TRP) is typically measured using an array of sensors with the anechoic chamber. Prof. Nunziata pioneered a completely different approach that consists of using the peculiarities of the reverberation chamber, i.e., generating an electromagnetic field that is isotropic and uniform in the average sense, to measure the total power radiated by a mobile phone (MP). A model is proposed to describe the mobile phone (MP) under test inside the working volume of the Reverberation Chamber to the real external wireless communication system. Then, a method is proposed to evaluate the total radiated power by the MP under both LOS and NLOS conditions and the results are inter-compared with open literature.

The Power delay profile (PDP) of a wireless channel emulated within the reverberation chamber is characterized using a completely new measurement setup that consists of using the conventional central barrier, i.e.; absorbing material arranged on the floor of the RC, together with anechoic corners. The latter are built covering the two side of a chamber's edge and nearby floor with absorbing material. This configuration is shown to outperform the conventional one since it provides a remarkably good fit with actual in field measurements.

Publications: [IJ-99-98-82-81]

9.14 Bibliometrics

Total number of papers (according to SCOPUS 29 nov 2023): 225 di cui 102 (article)

Hirsch (H) index (according to SCOPUS 29 nov 2023): 33

Total Citations (according to SCOPUS 29 nov 2023): 3385

Total Impact factor (according to the publication's date and evaluated using "Journal Citation Reports"): 308

Mean Impact factor (according to the publication's date and evaluated using "Journal Citation Reports"): 3.05

Average Citations per Product (according to SCOPUS 29 nov 2023): 15.04

Normalized H index (i.e., *H index divided by the academic seniority) according to SCOPUS 29 nov 2023: 1.83

10 Publications

Prof. Nunziata (according to SCOPUS 5 dec 2023) is author and co-author of 222 “documents” that include 102 peer-reviewed journal papers, 4 book chapters, and more than 116 conference papers (not listed for brevity):

10.1. List of the publications selected for the evaluation (2013-2023) – Number of citations from SCOPUS

- [SP-1] M. Alparone, F. Nunziata, C. Estatico, A. Camps, H. Park and M. Migliaccio, “On the trade-off between enhancement of the spatial resolution and noise amplification in conical-scanning microwave radiometers,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 60, pp. 1-14, 2022.
IF 8.2. Citations: 4
- [SP-2] F. Nunziata, M. Alparone, A. Camps, H. Park, A.M. Zurita, C. Estatico and M. Migliaccio, “An Enhanced Resolution Brightness Temperature Product for Future Conical Scanning Microwave Radiometers,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 60, pp. 1-12, 2022.
IF 8.2 Citations 8
- [SP-3] T. Meng, X. Yang, K.-S. Chen, F. Nunziata, D. Xie and A. Buono, “Radar Backscattering Over Sea Surface Oil Emulsions: Simulation and Observation,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60, pp. 1-14, 2022.
IF 8.2 Citations: 12
- [SP-4] T. Meng, K. -S. Chen, X. Yang, F. Nunziata, D. Xie and A. Buono, "Simulation and Analysis of Bistatic Radar Scattering From Oil-Covered Sea Surface," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60, pp. 1-15, 2022, Art no. 2003915, doi: 10.1109/TGRS.2021.3137654.
IF 8.2 Citations 5
- [SP-5] M. Alparone, F. Nunziata, C. Estatico and M. Migliaccio, “A multi-channel data fusion method to enhance the spatial resolution of microwave radiometer measurements,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 59, no. 3, pp. 2213–2221, 2021.
IF 8.2 Citations 13
- [SP-6] A. Buono, F. Nunziata, C.R. De Macedo, D. Velotto and M. Migliaccio, “A sensitivity analysis of the standard deviation of the co-polarized phase difference for sea oil slick observation,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 57, no. 4, pp. 2022-2030, 2019.
IF 8.2. Citations 20.
- [SP-7] M. Alparone, F. Nunziata, C. Estatico, F. Lenti and M. Migliaccio, “An adaptive Lp-penalization method to enhance the spatial resolution of microwave radiometer measurements,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 57, no. 9, pp. 6782-6791, 2019.
IF 8.2 Citations 21
- [SP-8] F. Nunziata, A. Buono, M. Migliaccio, and G. Benassai, “Dual-polarimetric C- and X-band SAR data for coastline extraction,” *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 9, no. 11, pp. 4921-4928, 2016.
IF 4.7 Citations: 64
- [SP-9] D. Schiavulli, F. Nunziata, G. Pugliano and M. Migliaccio, “Reconstruction of the Normalized Radar Cross Section field from GNSS-R Delay-Doppler Map,” *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 7, no. 5, pp. 1573- 1583, 2014.
IF 4.7. Citations 43
- [SP-10] A. Buono, F. Nunziata, and M. Migliaccio, “Analysis of full- and compact-polarimetric SAR features over sea surface,” *IEEE Geoscience and Remote Sensing Letters*, vol. 13, no. 10, pp. 1527-1531, 2016.
IF 5.3 Citations: 32
- [SP-11] L. Mascolo, J.M. Lopez-Sanchez, F. Vicentea-Guijalba, F. Nunziata, M. Migliaccio, and G. Mazzarella, “A complete procedure for crop phenology estimation with PolSAR data based on the complex Wishart classifier, *IEEE Transaction on Geoscience and Remote Sensing*, vol. 54, no. 11, pp. 6505-6511, 2016.
IF 8.2. Citations: 49
- [SP-12] A. Buono, F. Nunziata, M. Migliaccio, and X. Li, “Polarimetric analysis of Compact-Polarimetry SAR architectures for sea oil slick observation,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 54, no. 10, pp. 5862-5874, 2016.
IF 8.2 Citations: 65
- [SP-13] F. Lenti, F. Nunziata, M. Migliaccio, and G. Rodriguez, “Two-dimensional TSVD to enhance the spatial resolution of radiometer data,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 52, no. 3, pp. 2450-2458. 2014.
IF 8.2. Citations: 62.

- [SP-14] F. Lenti, F. Nunziata, C. Estatico and M. Migliaccio, "On the spatial resolution enhancement of microwave radiometer data in Banach spaces," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 52, no.3, pp. 1834-1842, 2014.
IF 8.2. Citations: 50.
- [SP-15] F. Nunziata, M. Migliaccio, X. Li, and X. Ding, "Coastline extraction using dual-polarimetric COSMO-SkyMed PingPong mode SAR data," *IEEE Geoscience and Remote Sensing Letters*, vol. 11, no. 1, pp. 104-108, 2014.
IF 5.3. Citations: 66.
- [SP-16] D. Velotto, F. Nunziata, M. Migliaccio and S. Lehner, "Dual-polarimetric TerraSAR-X SAR data for target at sea observation," *IEEE Geoscience and Remote Sensing Letters*, vol. 10, pp. 1114-1118, 2013.
IF 5.3. Citations: 59

10.2. Full list of peer-reviewed journal papers

- [IJ-106] G. Inserra, A. Buono, F. Nunziata, M. Virelli & M. Migliaccio, "On the extraction of the reservoirs' waterline using polarimetric X-band SAR measurements: the case study of the San Giuliano reservoir, Italy," *International Journal of Remote Sensing*, 44:19, 2023.
- [IJ-105] M. Adil, F. Nunziata, A. Buono, D. Velotto and M. Migliaccio, "Polarimetric Scattering by a Vessel at Different Incidence Angles," in *IEEE Geoscience and Remote Sensing Letters*, vol. 20, pp. 1-5, 2023.
- [IJ-104] E. Ferrentino, C. Bignami, F. Nunziata, S. Stramondo, M. Migliaccio, "On the ability of dual-polarimetric SAR measurements to observe lava flows under different volcanic environments," *International Journal of Applied Earth Observation and Geoinformation*, Volume 123, 2023.
- [IJ-103] T. Meng, F. Nunziata, A. Buono, X. Yang, M. Migliaccio, "On the joint use of scattering and damping models to predict X-band co-polarized backscattering from a slick-covered sea surface," *Front. Mar. Sci.*, vol. 9, n.23, 2022.
- [IJ-102] E. Ferrentino, F. Nunziata, C. Bignami, L. Graziani, A. Maramai, M. Migliaccio, "On the Combination of Dual-Polarization Sentinel-1 Ascending/Descending Orbiting Passes to Estimate Damage Due to the 2016 Central Italy Earthquake," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 15, pp. 9509-9518, 2022.
- [IJ-101] M. Zahriban Hesari, A. Buono, F. Nunziata, G. Aulicino, M. Migliaccio, "Multi-Polarisation C-Band SAR Imagery to Estimate the Recent Dynamics of the d'Iberville Glacier," *MDPI Remote Sensing*, vol. 14, n. 22, pp.5758, 2022.
- [IJ-100] E. Martellato, A.M. Piccirillo, G. Ferraioli, A. Rotundi, Della Corte V., Palumbo P., Alcaras E., Appolloni L., Aulicino G., Bertini I., Capozzi V., Catucci E., Dionnet Z., Di Palma P., Esposito F., Ferrentino E., Innac A., Inno L., Pennino S., Saviano S., Tirimberio G., Campopiano S., Chianese E., Franzese P.P., Fusco G., Gaglione S., Iadicicco A., Nunziata F., Parente C., Piscopo V., Riccio A., Russo G.F., Zambianchi E., "A New Orbiting Deployable System for Small Satellite Observations for Ecology and Earth Observation," *Remote Sensing*, vol. 14, no.9, 2022.
- [IJ-99] A. Gifuni, M. Adil, G. Grassini, A. Buono, F. Nunziata, D. Micheli, M. Migliaccio, "An Effective Method Using Reverberation Chambers to Measure TRP From Mobile Phones and Power Absorbed by User Body," *IEEE Transactions on Electromagnetic Compatibility*, vol.64, no.4, pp. 951 - 962, 2022.
- [IJ-98] A. Gifuni, G. Gradoni, R. Serra, G. Grassini, M. Adil, A. Buono, F. Nunziata, M. Migliaccio, "On the Improvement of Shielding Effectiveness Measurements of Materials and Gaskets in Reverberation Chambers," *IEEE Transactions on Electromagnetic Compatibility*, vol.64, no.5, pp. 1653 - 1664, 2022.
- [IJ-97] W. Shao, Z. Lai, F. Nunziata, A. Buono, X. Jiang, J. Zuo, "Wind Field Retrieval with Rain Correction from Dual-Polarized Sentinel-1 SAR Imagery Collected during Tropical Cyclones," *Remote Sensing*, vol.14 n.19, 2022.
- [IJ-96] M. Alparone, F. Nunziata, C. Estatico, M. Migliaccio, "Comparison of Accelerated Versions of the Iterative Gradient Method to Ameliorate the Spatial Resolution of Microwave Radiometer Products," *MDPI Remote Sensing*, vol.14, n.20, 2022.
- [IJ-95] M. Adil, A. Buono, F. Nunziata, E. Ferrentino, D. Velotto, M. Migliaccio, "On the Effects of the Incidence Angle on the L-Band Multi-Polarisation Scattering of a Small Ship", *MDPI Remote Sensing*, 14, n.22, 2022.
- [IJ-94] T. Meng, K. -S. Chen, X. Yang, F. Nunziata, D. Xie and A. Buono, "Simulation and Analysis of Bistatic Radar Scattering From Oil-Covered Sea Surface," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60, pp. 1-15, 2022,

- [IJ-93] M. Alparone, F. Nunziata, C. Estatico, A. Camps, H. Park and M. Migliaccio, "On the trade-off between enhancement of the spatial resolution and noise amplification in conical-scanning microwave radiometers," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 60, pp. 1-14, 2022.
- [IJ-92] F. Nunziata, M. Alparone, A. Camps, H. Park, A.M. Zurita, C. Estatico and M. Migliaccio, "An Enhanced Resolution Brightness Temperature Product for Future Conical Scanning Microwave Radiometers," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 60, pp. 1-12, 2022.
- [IJ-91] T. Meng, X. Yang, K.-S. Chen, F. Nunziata, D. Xie and A. Buono, "Radar Backscattering Over Sea Surface Oil Emulsions: Simulation and Observation," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60, pp. 1-14, 2022.
- [IJ-90] E. Ferrentino, A. Buono, F. Nunziata, A. Marino and M. Migliaccio, "On the Use of Multi-polarization Satellite SAR Data for Coastline Extraction in Harsh Coastal Environments: The Case of Solway Firth," in *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 14, pp. 249-257, 2021.
- [IJ-89] F. Nunziata, X. Li, A. Marino, W. Shao, M. Portabella, X. Yang, A. Buono, "Microwave Satellite Measurements for Coastal Area and Extreme Weather Monitoring", *Remote Sens.* 2021, 13, 3126. <https://doi.org/10.3390/rs13163126>.
- [IJ-88] W. Shao, F. Nunziata, Y. Zhang, V. Corcione and M. Migliaccio, "Wind speed retrieval from the Gaofen-3 synthetic aperture radar for VV- and HH-polarization using a re-tuned algorithm," *European Journal of Remote Sensing*, vol. 54, no. 1, pp. 318-337, 2021.
- [IJ-87] E. Ferrentino, F. Nunziata, C. Bignami, L. Graziani, A. Maramai and M. Migliaccio, "Multi-polarization C-band SAR imagery to quantify damage levels due to the Central Italy earth- quake", *International Journal of Remote Sensing*, vol.45, no.15, pp. 5969-5984, 2021.
- [IJ-86] A. Buono, C. R. de Macedo, F. Nunziata, D. Velotto and X. Li, "The Taylor Energy Oil Spill: Time-series of PolSAR Data to Support Continuous and Effective Observation," *Journal of Geodesy and Geoinformation Science*, vol. 4, no. 1, pp. 24-29, 2021.
- [IJ-85] V. Corcione, A. Buono, F. Nunziata and M. Migliaccio, "A Sensitivity Analysis on the Spectral Signatures of Low-Backscattering Sea Areas in Sentinel-1 SAR Images," *Remote Sens.*, vol. 13, pp. 1183-1200, 2021.
- [IJ-84] M. Alparone, F. Nunziata, C. Estatico and M. Migliaccio, "On the use of preconditioners to improve the accuracy and effectiveness of iterative methods to enhance the spatial resolution of radiometer measurements," *IEEE Geoscience and Remote Sensing Letters*, Vol. 3, no. 18, pp. 446-450, 2021.
- [IJ-83] M. Alparone, F. Nunziata, C. Estatico and M. Migliaccio, "A multi-channel data fusion method to enhance the spatial resolution of microwave radiometer measurements," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 59, no. 3, pp. 2213-2221, 2021.
- [IJ-82] A. Sorrentino, F. Nunziata, S. Cappa, S. Gargiulo and M. Migliaccio, "A Semi-Reverberation Chamber Configuration to Emulate Second-Order Descriptors of Real-Life Indoor Wireless Propagation Channels," *IEEE Transaction on Electromagnetic Compatibility*, vol. 63, no. 1, pp.3-10, 2021.
- [IJ-81] A. Gifuni, G. Grassini, A. Buono, D. Festa, I.D. Flintoft, S. Gargiulo, F. Nunziata and M. Migliaccio, "Non-Destructive Reverberation Chamber Measurement of Microwave Oven Total Radiated Power and Shielding Effectiveness," *IEEE Transaction on Electromagnetic Compatibility*, vol. 63, no. 2, pp. 427-434, 2021.
- [IJ-80] R.D. Viana, J.A. Lorenzetti, J.T. Carvalho, F. Nunziata, "Estimating Energy Dissipation Rate from Breaking Waves Using Polarimetric SAR Images," *Sensors*, vol. 20, no. 22, pp. 6540- 6558, 2020.
- [IJ-79] W. Shao, X. Jiang, F. Nunziata, A. Marino, Z. Yang, Y. Zhang, V. Corcione, "Analysis of waves observed by synthetic aperture radar across ocean fronts," *Ocean Dynamics*, vol. 70, no. 11, pp. 1397-1407, 2020.
- [IJ-78] W. Shao, Y. Hu, F. Nunziata, V. Corcione, M. Migliaccio and X. Li, "Cyclone wind retrieval on X-band SAR-derived wave parameter estimation," *Journal of Atmospheric and Oceanic Technology*, vol. 37, no. 10, pp. 1907-1924, 2020.
- [IJ-77] M. Migliaccio, A. Sorrentino, F. Nunziata, J.J. Gil, and S. Cappa, "Components of purity to describe the polarimetric state of a 3D field within the reverberating chamber," *IEEE Transaction on Electromagnetic Compatibility*, vol. 62, no. 6, pp. 2661-2668, 2020.
- [IJ-76] E. Ferrentino, F. Nunziata, H. Zang and M. Migliaccio, "On the ability of PolSAR measurements to discriminate among mangrove species," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 13, no. 1, pp. 2729-2737, 2020.
- [IJ-75] E. Ferrentino, F. Nunziata, A. Buono, A. Urciuoli and M. Migliaccio, "Multi-polarization and multi-temporal Sentinel-1 SAR imagery to analyze the variations in the water-body of reservoirs," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 13, no. 1, pp. 840-846, 2020.

- [IJ-74] W. Shao, Y. Ding, X. Yuan, X. Zhang, F. Nunziata and L. Zhao, "Wave retrieval under typhoon conditions using a machine learning method applied to Gaofen-3 SAR imagery," *Canadian Journal of Remote Sensing*, vol. 45, no. 6, pp.723-732, 2019.
- [IJ-73] M. Alparone, F. Nunziata, C. Estatico, F. Lenti and M. Migliaccio, "An adaptive Lp-penalization method to enhance the spatial resolution of microwave radiometer measurements," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 57, no. 9, pp. 6782-6791, 2019.
- [IJ-72] E. Ferrentino, F. Nunziata, A. Marino, M. Migliaccio and X. Li, "Detection of wind turbines in intertidal areas using SAR polarimetry," *IEEE Geoscience and Remote Sensing Letters*, vol. 16, no. 10, pp. 1516-1520, 2019.
- [IJ-71] L. Mascolo, G. Forino, F. Nunziata, G. Pugliano M. Migliaccio, "A new methodology for Rice area Mapping with COSMO-SkyMed HHVV PingPong mode SAR Data," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 12, no.4, pp.1076-1084, 2019.
- [IJ-70] D. Di Luccio, G. Benassai, G. Di Paola, L. Mucerino, A. Buono, C.M. Roskopf, F. Nunziata, M. Migliaccio, A. Urciuoli, R. Montella, "Shoreline Rotation Analysis of Embayed Beaches by Means of In Situ and Remote Surveys," *Sustainability*, vol. 11, no. 3, pp. 725-745, 2019.
- [IJ-69] F. Nunziata, C.R. de Macedo, A. Buono, D. Velotto, and M. Migliaccio "On the analysis of a time series of Xa-band TerraSAR-X SAR imagery over oil seepages," *International Journal of Remote Sensing*, vol. 49, no. 9, pp. 3623-3646, pp. 2019.
- [IJ-68] A. Buono, F. Nunziata, C.R. De Macedo, D. Velotto and M. Migliaccio, "A sensitivity analysis of the standard deviation of the co-polarized phase difference for sea oil slick observation," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 57, no. 4, pp. 2022-2030, 2019.
- [IJ-67] M. Alparone, M. Minutillo, M. Migliaccio, E. Jannelli, N. Massarotti, F. Conventi, C. Di Donato, F. Nunziata, A. Buono, E. Rossi, A. Gifuni, and G. Grassini, "Hydrogen-based hybrid power unit for light vehicles: Assessment of energy performance and radiated electromagnetic emissions," *Il Nuovo Cimento C*, vol. 225, no. 6, pp.1-8, 2018.
- [IJ-66] V. Corcione, G. Grieco, M. Portabella, F. Nunziata and M. Migliaccio, "A novel azimuth cut-off implementation to retrieve sea surface wind speed from SAR imagery," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 57, no. 6, pp. 3331-3340, 2018.
- [IJ-65] A. Buono, C.R. De Macedo, F. Nunziata, D. Velotto and M. Migliaccio, "Analysis on the effects of SAR imaging parameters and environmental conditions on the standard deviation of the co-polarized phase difference measured over sea surface," *Remote Sensing - MDPI*, vol. 11. no. 1, pp. 18-33, 2018.
- [IJ-64] F. Nunziata, A. Buono and M. Migliaccio, "COSMO-SkyMed Synthetic Aperture Radar Data to Observe the Deepwater Horizon Oil Spill," *Sustainability - MDPI*, vol. 10, n. 3599, 2018, DOI:10.3390/su10103599.
- [IJ-63] W. Shao, Y. Hu, J. Yang, F. Nunziata, J. Sun, H.Li, and J. Zuo, "An Empirical Algorithm to Retrieve Significant Wave Height from Sentinel-1 Synthetic Aperture Radar Imagery Collected under Cyclonic Conditions," *Remote Sensing*, vol. 10, n. 9, pp. 1367-1384, 2018.
- [IJ-62] E. Ferrentino, A. Marino, F. Nunziata, and M. Migliaccio, "A dual-polarimetric approach to earthquake damage assessment," *International Journal of Remote Sensing*, vol. 39, no. 20, pp. 6846-6863, 2018.
- [IJ-61] E. Ferrentino, F. Nunziata, M. Migliaccio, and A. Vicari "A sensitivity analysis of dual-polarization features to damages due to the 2016 Central-Italy earthquake," *International Journal of Remote Sensing*, in print.
- [IJ-60] G. Benassai, D. Di Luccio, V. Corcione, F. Nunziata, and M. Migliaccio, "Marine Spatial Planning using high resolution SAR measurements," *IEEE Journal of Oceanic Engineering*, vol. 43, no. 3, pp. 586-594, 2018.
- [IJ-59] V. Corcione, F. Nunziata, and M. Migliaccio, "Megi typhoon monitoring by X-band synthetic aperture radar measurements," *IEEE Journal of Oceanic Engineering*, vol. 43, no. 1, pp. 184- 194, 2018.
- [IJ-58] E. Ferrentino, F. Nunziata, and M. Migliaccio, "Full-polarimetric SAR measurements for coastline extraction and coastal area classification," *International Journal of Remote Sensing*, vol. 38, n. 23, pp. 7405-7421, 2017.
- [IJ-57] M. Sarti, M. Migliaccio, F. Nunziata, L. Mascolo, and E. Brugnoli "On the sensitivity of polarimetric SAR measurements to vegetation cover: The Coiba National Park, Panama," *International Journal of Remote Sensing*, vol. 38, no. 23, pp. 6755-6768, 2017.

- [IJ-56] A. Buono, F. Nunziata, M. Migliaccio, X. Yang, and X. Li “Classification of the Yellow River delta area using fully-polarimetric SAR measurements”, *International Journal of Remote Sensing*, vol. 38, no.23, pp. 6714-6734, 2017.
- [IJ-55] A. Marino, D. Velotto, and F. Nunziata, “Offshore platforms observation using dual-polarimetric TS-X/TD-X satellite imagery: a case study in the Gulf of Mexico,” *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 10, no. 10, pp. 4376-4386, 2017.
- [IJ-54] D. Schiavulli, F. Frappart, G. Ramilien, J. Darrozes, F. Nunziata and M. Migliaccio, “Observing sea/ice transition using radar images generated from TechDemoSat-1 delay Doppler maps, *IEEE Geoscience and Remote Sensing Letters*, vol. 14, n. 5, pp.734-738, 2017.
- [IJ-53] A. Montuori, F. Nunziata, M. Migliaccio, and P. Sobieski, “X-band two-scale sea surface scattering model to predict the contrast due to an oil slick,” *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 13, no. 11, pp. 4970-4978, 2016.
- [IJ-52] F. Nunziata, A. Buono, M. Migliaccio, and G. Benassai, “Dual-polarimetric C- and X-band SAR data for coastline extraction,” *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 9, no. 11, pp. 4921-4928, 2016.
- [IJ-51] D. Schiavulli, F. Nunziata, M. Migliaccio, F. Frappart, G. Ramilien, and J. Darrozes, “Reconstruction of the radar image from actual DDMs collected by TechDemoSat-1 GNSS-R mission,” *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 9, no. 10, pp. 4700-4708, 2016.
- [IJ-50] A. Buono, F. Nunziata, and M. Migliaccio, “Analysis of full- and compact-polarimetric SAR features over sea surface,” *IEEE Geoscience and Remote Sensing Letters*, vol. 13, no. 10, pp. 1527-1531, 2016.
- [IJ-49] L. Mascolo, J.M. Lopeza-Sanchez, F. Vicente-Guijalba, F. Nunziata, M. Migliaccio, and G. Mazzearella, “A complete procedure for crop phenology estimation with PolSAR data based on the complex Wishart classifier, *IEEE Transaction on Geoscience and Remote Sensing*, vol. 54, no. 11, pp. 6505-6511, 2016.
- [IJ-48] A. Buono, F. Nunziata, M. Migliaccio, and X. Li, “Polarimetric analysis of Compact-Polarimetry SAR architectures for sea oil slick observation,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 54, no. 10, pp. 5862-5874, 2016.
- [IJ-47] M. Migliaccio, J.J. Gil, A. Sorrentino, F. Nunziata, and G. Ferrara, “The Polarization Purity of the Electromagnetic Field in a Reverberating Chamber,” *IEEE Transaction on Electromagnetic Compatibility*, vol. 58, no. 3, pp. 694-700, 2016.
- [IJ-46] V. Corcione, F. Nunziata, L. Mascolo, and M. Migliaccio, “COSMO-SkyMed SAR PingPong polarimetric mode for rice growth monitoring,” *International Journal of Remote Sensing*, vol. 37, no. 3, pp. 633-647, 2016.
- [IJ-45] F. Lenti, F. Nunziata, C. Estatico, and M. Migliaccio, “Conjugate gradient method in Hilbert and Banach spaces to enhance the spatial resolution of radiometer data,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 54, no. 1, pp. 397-406, 2016.
- [IJ-44] R.L. Paes, F. Nunziata, and M. Migliaccio, “On the capability of hybrid-polarity features to observe metallic targets at sea,” *IEEE Journal of Oceanographic Engineering*, vol. 40, no. 2, pp. 426-440, 2015.
- [IJ-43] M. Migliaccio, F. Nunziata, and A. Buono, “SAR polarimetry for sea oil slick observation,” *International Journal of Remote Sensing*, vol. 36, no. 12, pp. 3243-3273, 2015.
- [IJ-42] L. Mascolo, J.M. Lopez-Sanchez, F. Vincente-Guijalba, J.D. Ballester-Berman, G. Mazzearella, F. Nunziata, and M. Migliaccio, “Retrieval of phenological stages of onion fields during the first year of growth by means of C-band polarimetric SAR measurements,” *International Journal of Remote Sensing*, vol. 36, no. 12, pp. 3077-3096, 2015.
- [IJ-41] F. Lenti, F. Nunziata, C. Estatico, and M. Migliaccio, “Analysis of reconstructions obtained solving lp-penalized minimization problems,” *IEEE Transaction on Geoscience and Remote Sensing*, vol. 53, no. 9, pp. 4876-4886, 2015.
- [IJ-40] G. Benassai, M. Migliaccio and F. Nunziata, “The use of COSMO-SKYMED SAR data for coastal management,” *Journal of Marine Science and Technology*, vol. 53, no. 9, pp. 4876- 4886, 2015.
- [IJ-39] X. Ding, F. Nunziata, X. Li and M. Migliaccio, “Performance analysis and validation of waterline extraction approaches using single- and dual-polarimetric SAR data,” *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 8, no. 3, pp. 1019-1027, 2015.

- [IJ-38] F. Lenti, F. Nunziata, C. Estatico and M. Migliaccio, "Spatial resolution enhancement of Earth observation products using an acceleration technique for iterative methods," *IEEE Geoscience and Remote Sensing Letters*, vol. 12, no. 2, pp. 269-273, 2015.
- [IJ-37] F. Nunziata, M. Migliaccio and X. Li, "Sea oil slick observation using hybrid-polarity SAR architecture," *IEEE Journal of Oceanic Engineering*, vol. 40, no. 2, pp. 426-440, 2015.
- [IJ-36] Y. Cheng, B. Liu, X. Li, F. Nunziata, Q. Xue, X. Ding, M. Migliaccio and W.G. Pichel, "Monitoring of oil spill trajectories with COSMO-SkyMed X-band SAR images and model simulation," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 7, no. 7, pp. 2895-2901, 2014.
- [IJ-35] M. Migliaccio, L. Mascolo, F. Nunziata, M. Sarti and G. Mazzarella, "COSMO-SkyMedHH/VV PingPong mode SAR data to discriminate among sea, urban and vegetated areas," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 7, no. 7, pp.1939-1404, 2014.
- [IJ-34] A. Buono, F. Nunziata, L. Mascolo and M. Migliaccio, "A multi-polarization analysis of coastline extraction using X-band COSMO-SkyMed SAR data," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 7, no. 7, pp.2811-2820, 2014.
- [IJ-33] D. Schiavulli, F. Lenti, F. Nunziata, G. Pugliano and M. Migliaccio, "Landweber method in Hilbert and Banach spaces to reconstruct the NRCS field from GNSS-R measurements," *International Journal of Remote Sensing*, vol. 35, no. 10, pp. 3782-3796, 2014.
- [IJ-32] M. Migliaccio and F. Nunziata, "On the exploitation of polarimetric SAR data to map damping properties of the Deepwater Horizon oil spill," *International Journal of Remote Sensing*, vol. 35, no. 10, pp.3499-3519, 2014.
- [IJ-31] D. Schiavulli, F. Nunziata, G. Pugliano and M. Migliaccio, "Reconstruction of the Normalized Radar Cross Section field from GNSS-R Delay-Doppler Map," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol. 7, no. 5, pp. 1573- 1583, 2014.
- [IJ-30] A. Buono, M. Iodice, I. Rendina, F. Nunziata and M. Migliaccio, "Polarimetric approach for well-defined impurities detection in isotropic materials," *J. Europ. Opt. Soc. Rap. Public.*, vol. 9, pp. 14010-14014, 2014.
- [IJ-29] F. Nunziata and A. Montuori, "Reflection symmetry to observe targets at sea by a dual- polarimetric SAR," *Atti della "Fondazione Giorgio Ronchi"*, LXVIII, n. 4, pp.105-109, 2013.
- [IJ-28] F. Lenti, F. Nunziata, M. Migliaccio, and G. Rodriguez, "Two-dimensional TSVD to enhance the spatial resolution of radiometer data," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 52, no. 3, pp. 2450-2458. 2014.
- [IJ-27] F. Lenti, F. Nunziata, C. Estatico and M. Migliaccio, "On the spatial resolution enhancement of microwave radiometer data in Banach spaces," *IEEE Transaction on Geoscience and Remote Sensing*, vol. 52, no.3, pp. 1834-1842, 2014.
- [IJ-26] F. Nunziata, M. Migliaccio, X. Li, and X. Ding, "Coastline extraction using dual-polarimetric COSMO-SkyMed PingPong mode SAR data," *IEEE Geoscience and Remote Sensing Letters*, vol. 11, no. 1, pp. 104-108, 2014.
- [IJ-25] D. Velloto, F. Nunziata, M. Migliaccio and S. Lehner, "Dual-polarimetric TerraSAR-X SAR data for target at sea observation," *IEEE Geoscience and Remote Sensing Letters*, vol. 10, pp. 1114-1118, 2013.
- [IJ-24] F. Nunziata, A. Gambardella, and M. Migliaccio, "On the degree of polarization for SAR sea oil slick observation," *ISPRS Journal of Photogrammetry and Remote Sensing*, vol. 78, pp. 41-49, 2013.
- [IJ-23] G. Benassai, A. Montuori, M. Migliaccio, and F. Nunziata, "X-band COSMO-SkyMed SAR data for sea wave simulations and coastal vulnerability assessment," *OS/BG Inter-Journal SI*, vol. 9, pp.325-341, 2013.
- [IJ-22] F.Nunziata and M.Migliaccio,"On the COSMO-SkyMed PingPong mode to observe metallic targets at sea," *IEEE Journal of Oceanic Engineering*, vol. 38, no. 1, pp. 71-79, 2013.
- [IJ-21] A. Sorrentino, F. Nunziata, M. Migliaccio and G. Ferrara, "Reverberating Chamber Profile Identification," *IET Microwaves, Antennas & Propagation*, vol. 6, no. 13, pp. 1468-1472, 2012.
- [IJ-20] F. Nunziata, M. Migliaccio and C.E. Brown, "Reflection symmetry for polarimetric observation of man-made metallic targets at sea," *IEEE Journal of Oceanic Engineering*, vol.37, no.3, pp.384-394, 2012.

- [IJ-19] M. Migliaccio, F. Nunziata, C.E. Brown, B. Holt, X. Li, W.G. Pichel, and M. Shimada, "Polarimetric synthetic aperture radar utilized to track oil spills," *Transaction on EOS, American Geophysical Union (AGU)*, vol.93, no.16, pp.161-163, 2012.
- [IJ-18] M. Migliaccio, F. Nunziata, A. Montuori, R.L. Paes, "Single Look Complex COSMO-SkyMed SAR data to observe metallic targets at sea," *IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS)*, vol.5, no.3, pp.893-901, 2012.
- [IJ-17] F. Nunziata, A. Gambardella, M. Migliaccio, "A unitary Mueller-based view of polarimetric SAR oil slick observation," *International Journal of Remote Sensing*, vol.33, no.20, pp.6403-6425, 2012.
- [IJ-16] F. Lenti, M. Migliaccio, F. Nunziata, G. Rodriguez, "Two-dimensional TSVD resolution enhancement for EO applications," *Atti della Fondazione "Giorgio Ronchi" - Elettromagnetismo*, vol. LXVII, pp.81-92, 2012.
- [IJ-15] M. Migliaccio, F. Nunziata, A. Montuori, and C.E. Brown, "Marine added-value products by RADARSAT-2 fine quad-polarization mode," *Canadian Journal of Remote Sensing*, vol.37 no.5, pp. 441-450, 2011.
- [IJ-14] D. Velotto, M. Migliaccio, F. Nunziata, and S. Lehner, "Dual-polarized TerraSAR-X data for oil-spill observation," *IEEE Transaction on Geoscience and Remote Sensing*, vol.49, no.12, pp.4751-4762, 2011.
- [IJ-13] M. Migliaccio, F. Nunziata, A. Montuori, X. Li, and W. Pichel, "A multi-frequency polarimetric SAR processing chain to observe oil fields in the Gulf of Mexico," *IEEE Transactions on Geoscience and Remote Sensing*, vol.49, no.12, pp.4729-4737, 2011.
- [IJ-12] G. Ferrara, M. Migliaccio, F. Nunziata, and A. Sorrentino, "GK-based observation of metallic targets at sea in full-resolution SAR data: a multipolarization study," *IEEE Journal of Oceanic Engineering*, vol.36, no.2, pp. 195-204, 2011.
- [IJ-11] F. Nunziata, M. Migliaccio and A. Gambardella, "Pedestal height for oil spill observation," *IET Radar Sonar & Navigation*, vol. 5, no. 2, pp. 103-110, 2011.
- [IJ-10] M. Migliaccio, A. Gambardella, F. Nunziata, M. Shimada and O. Isoguchi, "The PALSAR Polarimetric Mode for Sea Oil Slick Observation," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 47, no. 12, pp. 4032-4041, 2009.
- [IJ-9] T. Setälä, F. Nunziata and A.T. Friberg, "Differences between partial polarizations in the space-time and space-frequency domains," *Optics Letters - Optic Society of America*, vol. 34, no. 19, pp. 2924-2926, 2009.
- [IJ-8] M. Migliaccio, F. Nunziata and A. Gambardella, "On The Copolarised Phase Difference for Oil Spill Observation," *International Journal of Remote Sensing*, vol. 30, n. 6, pp. 1587-1602, 2009.
- [IJ-7] F. Nunziata, P. Sobieski and M. Migliaccio, "The Two-Scale BPM Scattering Model for Sea Biogenic Slicks Contrast," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 47, n. 8, pp. 1949-1956, 2009.
- [IJ-6] A. Gambardella, F. Nunziata and M. Migliaccio, "A Physical Full-Resolution SAR Ship Detection Filter," *IEEE Geoscience and Remote Sensing Letters*, vol. 5, n. 4, pp. 760-763, 2008.
- [IJ-5] F. Nunziata, A. Gambardella and M. Migliaccio, "On the Mueller scattering matrix for SAR sea oil slick observation," *IEEE Geoscience and Remote Sensing Letters*, vol. 5, n. 4, pp. 691-695, 2008.
- [IJ-4] F. Nunziata, A. Gambardella and M. Migliaccio, "An Educational SAR Sea Surface Waves Simulator," *International Journal of Remote Sensing*, vol. 29, n. 11, pp. 3051-3066, 2007.
- [IJ-3] M. Migliaccio, G. Ferrara, A. Gambardella, F. Nunziata and A. Sorrentino, "A Physically Consistent Speckle Model for Marine SLC SAR Images," *IEEE Journal of Oceanic Engineering*, vol. 32, n.4, pp. 839-847, 2007.
- [IJ-2] M. Migliaccio, G. Ferrara, A. Gambardella and F. Nunziata, "A New Stochastic Model for Oil Spill Observation by Means of Single-Look SAR Data," *Scientific Journal of Environmental Research, Engineering and Management*, vol. 39, n. 1, pp. 24-29, 2007.
- [IJ-1] M. Migliaccio, F. Nunziata, F. Bruno and F. Casu, "KNAB Sampling Window for InSAR Data Interpolation," *IEEE Geoscience and Remote Sensing Letters*, vol. 4, n. 3, pp. 397-400, 2007.

10.3 Book chapters

- [BC-5] M. Migliaccio, F. Nunziata, A. Marino, C. Brekke, S. Skrunes, "Ocean Applications" In Remote Sensing and Digital Image Processing Vol. 25, pp. 255–277, 2021.
- [BC-4] M. Migliaccio, F. Nunziata and A. Buono, "Chapter 4: SAR polarimetry," in Maritime surveillance with SAR data, IET, ISBN 9781785616013, doi: 10.1049/SBRA521E2020, 2020.
- [BC-3] F. Nunziata and A. Buono, "Oil fields observation using polarimetric SAR" In Advances in SAR remote sensing of oceans, edited by X. Li, H. Guo, K-S Chen and X. Yang, CRC Press, ISBN:13:978-0-8153-7677-4, 2019.
- [BC-2] X. Li, F. Nunziata and O. Garcia, "Oil Spill Detection from Single- and Multipolarization SAR Imagery," In Reference Module in Earth Systems and Environmental Sciences, Elsevier, 2017, ISBN 9780124095489, <https://doi.org/10.1016/B978-0-12-409548-9.10407-5>, 2017.
- [BC-1] T. Setälä, F. Nunziata and A.T. Friberg, "Chapter 16: Partial Polarization of Optical Beams: Temporal and Spectral Descriptions" in Information Optics and Photonics, Springer Science+Business Media, LLC, 2010.

10.4 International Conference Publications

The full list (> 100) is available at: https://scholar.google.com/citations?view_op=list_works&hl=en&hl=enuser=mw9DHSMAAAAJ&sortby=pubdate

Data

Napoli, 1/12/2023

Firma

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