



## Short Course on Exploration Technologies, Satellite Imaging and Remote Sensing for Environmental Sustainability

1 March 2022, Time: 10:00 - 16:30, CET

On-line edition: Zoom®



The EIT RawMaterials is a platform for innovation funded by the European Institute of Innovation and Technology (EIT). The EIT has created the so-called KIC - Knowledge Innovation Communities, communities that aim to promote innovation and education in Europe in crucial sectors, supporting entrepreneurship and enhancing the passage of new ideas from the incubation phase to the market. The EIT RawMaterials, which since 2016 has established one of its nodes in Rome, is particularly committed to addressing the global challenge of supplying raw materials in Europe through programs and projects that aim to develop technology throughout the entire value chain of raw materials: from the exploration of resources, to the mining industry, from metallurgical processes to the replacement of critical or toxic raw materials, from the recycling of end-of-life product materials to the design of products for the circular economy.

As part of regional development programs, the EIT RawMaterials has created a Hub in the Puglia Region, coordinated by ENEA and participated by CNR, in order to increase the involvement of the local ecosystems in the activities of KIC and its partnership. The Regional Center Southern Italy (RCSI) will also aim at reaching new organizations and promote the participation of the most innovative industries, companies, SMEs, start-ups and spin-offs, as well as the involvement of the prestigious Universities and Research Centres in the RIS area including education and training programmes towards MSc and PhD students, researchers, professionals innovators, entrepreneurs.

The 1-day virtual Short Course on *Exploration Technologies, Satellite Imaging and Remote Sensing for Environmental Sustainability* represent a chance to know deeper the fundamentals and case-studies of real applications on Copernicus and Earth Observation data to tackle the industrial and societal challenges of raw materials in Europe. Outstanding lectures will be offered by international experts in the sector of exploration technologies, mineral exploration and mapping of deposits, monitoring of mining activities, environmental impact monitoring, change detection, remote sensing and satellite data for natural sources management in order to educate the Southern Italian stakeholders (start-ups, spin-offs, SMEs, companies, research groups, university students) and boost the RCSI community.



## Agenda

- 10:00 - 10:15     **Opening and Welcome**  
                  *ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development*  
                  *EIT Raw Materials Innovation Hub South - CLC-South, Rome, Italy*
- 10:15 - 10:30     **EIT RawMaterials Hub - Regional Center Southern Italy: Overview**  
                  *Michele Penza*  
                  Head of Laboratory of Functional Materials and Technologies for Sustainable Applications, ENEA Brindisi Research Center - Brindisi, Italy  
                  Coordinator of EITRM Hub - Regional Center Southern Italy
- 10:30 - 11:00     **Earth Observation in Italy: a wide portfolio of data for the users**  
                  *Luca Fasano*  
                  Head of Earth Observation Missions Management Office  
                  Earth Observation Department - Italian Space Agency (ASI), Rome, Italy
- 11:00 - 11:30     **Satellite based monitoring: Real Case Studies from raw data to analytics**  
                  *Giuseppe Maldera*  
                  Pre-sales Technical Specialist, Planetek Italia Srl, Bari, Italy
- 11:30 - 12:00     **Recovery of Critical Raw Materials from mining residues: main issues and findings from the INCO-Piles 2020 project**  
                  *Francesco Tinti*  
                  Assistant Professor, University of Bologna, Bologna, Italy
- 12:00 - 12:30     **Integration of Remote Sensing and Geostatistical approaches for mapping the Mining Residues**  
                  Sara Kasmaee  
                  RawMatCop Researcher, University of Bologna, Bologna, Italy
- 12:30 - 13:00     **The operational air pollution forecasting system MINNI as member of the regional CAMS ensemble to monitor the air pollution in Europe**  
                  *Mario Adani*  
                  Researcher, ENEA - Bologna Research Center, Bologna, Italy
- 13:00 - 14:30     **Lunch break**
- 14:30 - 15:30     **Change detection from Remote Sensed Images: Feature selection and Classification**  
                  Annarita D'Addabbo  
                  Researcher, CNR - ISSIA, Bari, Italy
- 15:30 - 16:00     **Imaging Classification by Saliency Detection: Principles and Applications**  
                  Cristiano Tamborrino  
                  PhD student, University of Bari, Bari, Italy
- 16:00 - 16.15     **Closure**



### Further Information

The participation is free of charge. After registration the participants will receive a link Zoom to follow online the scheduled event *Short Course*.

URL: <https://www.enea.it/it/seguici/events/eit-rawmaterials-hub/save-the-date-short-course-2022-on-exploration-technologies-satellite-imaging-and-remote-sensing-for-environmental-sustainability>

### Registration

The free of charge registration should be applied to link:

<https://connect.portici.enea.it/e18d1ut5h7j5/event/registration.html>

### Language

English is the official language. The presentation slides will be in English, but they could be commented in native language (Italian) of the RCSI area, if any.

### Contact

Dr. Michele Penza - RCSI Coordinator & Local Organizer

Email: [info@eitrawmaterials-rcsi.eu](mailto:info@eitrawmaterials-rcsi.eu) or other email: [michele.penza@enea.it](mailto:michele.penza@enea.it)

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## Abstracts and Short CV of the Speakers

### *Earth Observation in Italy: a wide portfolio of data for the users*

Luca Fasano - Italian Space Agency (ASI), Rome, Italy

#### Abstract

Thanks to its satellites, today ASI provide with users a wide portfolio of data, useful to monitor the health of our planet as never before. The Cosmo-SkyMed radar constellation is a unique example at global level, same as the Prisma hyperspectral in Europe.

*COSMO-SkyMed* is the first Earth observation mission designed for dual purposes, both civil and military. Its first and second-generation satellites are “eyes” which are capable of observing Earth from space, meter by meter, day and night, in any weather conditions, to help predict landslides and floods, coordinate relief efforts in case of earthquakes or fires, check crisis areas from uphill. Developed by the Italian Space Agency in cooperation with the Ministry of Defense, *COSMO-SkyMed* is based on a constellation of satellites, equipped with synthetic aperture radars (SARs) which operate in the X-band (and are, therefore, capable of seeing through the clouds and in the absence of sunlight).

*PRISMA*, which started its journey in space on March 22nd, 2019, aboard a VEGA carrier, completes the current offer by the Italian Space Agency in the context of Earth observation, which so far had been essentially based on the Synthetic Opening Radars of the *COSMO-SkyMed* constellation, with an innovative hyperspectral optical sensor, able to provide a unique informative contribution for different applications.

ASI is also able to provide with users other missions’ data, thanks to some collaborations established during last years (for example with Argentinean Space Agency in the frame of SIASGE collaboration).



#### Luca Fasano

Luca Fasano is the Head of the ASI Earth Observation Missions Management Office and SIASGE Mission Director. He is involved in several international fora, as Delegate Alternate at the ESA Earth Observation Program Board, as Delegate at ESA DOSTAG and as Advisor at EUMETSAT Council.

He has been also involved in several Earth Observation programs, both as Program Manager and as Responsible of different subsystems, mainly in Ground Segment.

He received the Computer Engineering degree at the Polytechnic University of Bari and the PhD in “*Computer Science, Control and Geoinformation*” at the

University of Rome Tor Vergata.



## *Satellite based monitoring: Real Case Studies from raw data to analytics*

Giuseppe Maldera - Planetek Italia srl, Bari, Italy

### Abstract

What makes a city "smart"? It isn't technology, as such. It's the degree to which technology gives residents better lives, thriving businesses, and governments that provide great service. The success of smart cities rests on our foresight to build for accessibility, and solutions that can adapt as conditions and priorities change.

We can relate what we said above also to space. Space technology is an enabler and can make an impact on humans lives, cities and on nature conservation only if we are able to extract from rawdata useful information. Nowadays we have a lot of data from satellite, we can talk about SATELLITE BIG DATA: multispectral, hyperspectral, SAR, etc, so what is important now is to improve now is our capability to process this data in real time or near real time in order to obtain useful analytics and insights for our lives and our ecosystems.

This argument will be discussed during our session, by presenting a roundup of all the most recent satellite sensors and looking at their applications in real cases.



### Giuseppe Maldera

Position in Planetek Italia: Technical Specialist - Government & Security SBU.

Education: Bachelor and Master's Degree in Environmental Engineering at the Politecnico di Bari.

Background: Environmental engineer with a strong specialization in GIS, Photogrammetry and RemoteSensing. He has been working in Planetek Italia, since 2015, where he manages the pre-sales and post-sales technical activities regarding Hexagon Geospatial software. He is also involved in enterprise solutions

design and implementation activities for projects that include Hexagon Geospatial's Software, satellite imagery, and custom systems developed by Planetek Italia. As pre-sales engineer he performs technical presentations for Planetek Italia's products and services, he plans and manages the demonstration activities of the products, and he develops product prototypes and proof of concept (POC).

Giuseppe is an author of Geospatial News Blog. As Planetek expert, he shares technical advises, tips & tricks, but also user stories in the use of satellite imagery and geospatial data, from data processing to information production and sharing through remote sensing software. Read more on <http://geospatialnews.planetek.it/>.



*Recovery of Critical Raw Materials from mining residues: main issues and findings from the INCO-Piles 2020 project*

Francesco Tinti - Assistant Professor, University of Bologna, Italy

**Abstract**

INCO-Piles 2020 - International Consortium to recover Critical Raw Materials from stockpiles and tailings, targeting RIS.

The speech presents an overview of the INCO-Piles 2020 project, funded by EIT RawMaterials, on the topic on recovery of Critical Raw Materials from mining residues. After presenting the general structure of the project (scientific sectors, objectives, partnership, activities and duration), the main achieved results are highlighted and discussed. Finally, preliminary ideas and insights for potential work prosecution, based on the Project outputs, are posed.

<https://site.unibo.it/inco-piles-2020/en>



**Francesco Tinti**

Francesco Tinti is an Environmental Engineer and Senior Assistant Professor at University of Bologna. After graduation in Environmental Engineering, in the years 2009 - 2015, he worked as professional, mainly as designer of shallow geothermal energy systems. In 2012, he got the PhD in Geoengineering, Georesources and Geotechnical Engineering.

His main professional and research activity has been dealt with georesources assessment and geothermal characterization. He worked in several projects of international cooperation: Interreg IVC Geo.Power (2010-2011), IPA-Adriatic LEGEND (2012-2014), EuropeAid E4EM (2012-2014), H2020 GEOTECH (2015-2019).

He was the Coordinator, with scientific responsibility, of the EIT RawMaterials INCO-PILES 2020 Project (2020-2021). Currently, he is teacher of three courses at University of Bologna, related to georesources, and he is author and co-author of more than 60 scientific publications, of which 35 indexed in Scopus.

<https://www.unibo.it/sitoweb/francesco.tinti/en>



## *Integration of Remote Sensing and Geostatistical approaches for mapping the Mining Residues*

Sara Kasmaee - RawMatCop Researcher, University of Bologna, Italy

### Abstract

Two case studies from two projects are used to explore the methodological potential of remote sensing and geostatistical integrations. Bauxite residuals from abandoned mining sites are both an environmental challenge and a possible source of secondary raw materials.

Processing of multispectral and hyperspectral images with the best available techniques can help to produce multiscale spatial maps of elements inside and around the mining sites.

The objective is to propose a procedure for mapping the metals concentration using multiple data sets at different scales and resolutions. A comparison between multispectral Sentinel-2 images and hyperspectral PRISMA processing is performed over the case study of bauxite residues in South of Italy.

Final concentration maps were estimated by performing geostatistical techniques and the remote sensing data.



### Sara Kasmaee

Sara Kasmaee has got her PhD (2017) from University of Bologna - DICAM (Department of Civil, Chemical, Environmental and Material Engineering). She has the mining background and she is interested on geostatistical modeling of stockpiles, ore deposits and environmental case studies.

After her PhD, she worked on the European project, (GEOTeCH H2020), using geostatistical tools for mapping of European potential for innovative geothermal technology of economic cooling and heating.

From 2018-2021, she worked on RawMatCop. Project working on sampling optimization in stockpiles/tailings, and grade mapping of raw materials using geostatistical analysis and Earth Observation data.



*The operational air pollution forecasting system MINNI as member of the regional CAMS ensemble to monitor the air pollution in Europe*

Mario Adani - ENEA - Bologna Research Center, Bologna, Italy

**Abstract**

The Copernicus Atmosphere Monitoring Service (CAMS), funded by European Commission, provides continuous data and information on atmospheric composition on global and regional scale.

The regional component is based on several air pollution forecasting systems that provide hourly forecast, analysis and re-analysis products.

MINNI is one of the new forecasting systems that will be part of the model ensemble. The good quality of the data is assured by continuous verification with measurements. The systems are subject to continuous and coordinated upgrades to maintain the service up-to-date. Different levels of information are provided to end-user, from raw-data to tailored product. Information are freely available for businesses, industry or public services and scientists.



**Mario Adani**

He got the degree in Environmental Science in 2002, the PhD in Geophysics in 2007. In 2008 he had a position as a scientific consultant at CMCC and in the same year, a position as a researcher at INGV, working as modeller in operational oceanographic group. From 2013 he is researcher at ENEA and is working with pollutants dispersion models in atmosphere. His major interests are in forecasting skills of air quality modeling systems and in feedback processes between the climate change and air pollution.



## *Change detection from Remote Sensed Images: Feature selection and Classification*

Annarita D'Addabbo - CNR - ISSIA, Bari, Italy

### Abstract

Land cover change detection from remote sensed data is a crucial step in the periodic environmental monitoring, and also in the management of emergencies. In order to perform land cover change detection, multi-temporal images acquired on the same geographical area are needed. Images acquired by different sensor (SAR/optical) can be useful in different change detection problems. Together with data, opportune methodologies able to extract useful information from them are needed.

Several applicative examples of change detection from remote sensed images will be presented, together with the methodologies developed to select useful feature from them and to perform automatic unsupervised or supervised classification.



### Annarita D'Addabbo

Annarita D'Addabbo received the Laurea degree (cum laude) and the PhD degree in Physics from the University of Bari, Bari, Italy. Since 1999, she has been with the Italian Research Council, she is currently a Researcher with the IREA, Bari.

Her research activity is focused on the theoretical and experimental analysis of different classification methodologies, statistical models and machine learning techniques, applied to land cover change detection problems and to the monitoring of natural hazards from remote sensing data.

She has been involved in several national and international projects, concerning the development of automatic tools devoted to environmental hazard detection and mapping, or devoted to land use/cover mapping.



## *Imaging Classification by Saliency Detection: Principles and Applications*

Cristiano Tamborrino - PhD student, University of Bari, Bari, Italy

### Abstract

Reproducing the human vision mechanism to arrive at the interpretation of salient object in the acquired image and the execution of autonomous decisions by a machine is one of the big challenges in computer vision. The concept of saliency detection refers to identifying parts, regions, objects or features that first draw visual attention. This region can be identified with various methods that can be divided into top-down approaches, which take advantage of human knowledge to recognize specific objects and bottom-up approaches that are based on low-level processes, such as colors and texture. Among these methods several techniques have been developed in the field of machine learning, deep learning and statistic. A very interesting application of saliency detection is the analysis of remotely sensed images which is currently attracting a lot of attention.



### Cristiano Tamborrino

I was born in Brindisi, Italy, in 1981. I received the Master's degree (cum laude) in mathematics, at University of Bari and the second level Master in Data Science at University of Perugia.

Currently I am a third year PhD student in mathematics and informatics at University of Bari. I worked as data scientist at Municipality of Bari and I collaborate with Planetek Italia and INRAE Tetis lab Montpellier, where I contributed with research in the field of remote sensing. My principal interest of research is in the field of advanced statistical method for data analysis, data science and machine learning with application in saliency detection, change detection, supervised and unsupervised classification.

On this topic I published papers on international journals and conferences. I attended several courses in the field of machine learning and remote sensing.