



Università
di Catania



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Naravoslovnotehniška
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Workshop on Advanced X-ray characterization technologies in Earth Sciences

ZAG – Slovenian National Building and Civil Engineering Institute
27-29 February 2024, Ljubljana (Slovenia)

Organizers;

Lucia Mancini (lucia.mancini@zag.si, ZAG - Slovenian National Building and Civil Engineering Institute), Rosalda Punturo (rosalda.punturo@unict.it, University of Catania and IGAG-CNR), Gabriele Lanzafame (gabriele.lanzafame@unict.it, University of Catania), Marko Prašek (marko.prasek@elettra.eu, Elettra-Sincrotrone Trieste).

Venue: ZAG - Dimičeva ulica, 12 – 1000 Ljubljana.

Workshop modalities: In presence, maximum number of participants = 50.

Deadline for registration: 30th January 2024. The participation to workshop is free of charge. However, all participants, speakers and tutors must register and confirm within the deadline. Please, register at link: <https://forms.gle/3iHV3ns6RH9FMVo69> or scan the QR code:



Objectives and contents of the workshop:

The workshop, dedicated to MSc and PhD students, post-docs and senior researchers, aims to illustrate the advanced three-dimensional (3D) processing and analysis protocols applied to studies in Earth sciences domain. Through the use of X-ray computed microtomography (X- μ CT) techniques, both at synchrotron and advanced laboratory instruments, static, time-lapse and dynamic experiments will be presented. During lectures, practicals and a final round table, the methods to acquire and process X- μ CT data will be illustrated and open to discussion in order to analyse perspectives and enhance potential collaborations among participants.

More specifically the workshop will offer an introduction to digital image analysis techniques, aimed at determining the qualitative and quantitative morpho-textural characteristics of the phases composing the investigated materials. Particular emphasis will be given on pre-processing tools aimed at the treatment of digital images, the selection of phases to be investigated (eg. minerals, pores, fluids) and the extraction of quantitative parameters of interest (such as abundance, size, shape, connectivity, fractal dimension and tortuosity).

To this end, the operation of the most used image data processing and analysis software tools (i.e. *Fiji*, *Pore3D*, *Avizo*, *Dragonfly*, *VGStudio*) will be presented, followed by a practical session where participants will be involved aimed at processing real 3D data sets previously acquired via X- μ CT at ZAG and Elettra.

Finally, some recent results of the applications of microtomographic techniques, often combined with other characterization methods, on samples of various natural and artificial geo-materials as well as materials employed in cultural heritage restoration and their environmental implications will be shown.



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Topics:

The workshop will encompass theoretical (lectures) and practical sessions and will cover the following topics:

- 3D/4D X-ray imaging techniques: principles, applications and tutorials
- Artificial and natural building materials: environmental and health impact
- Natural and cultural heritage applications
- Multidisciplinary applications in geosciences

Programme Committee

Miha Hren (ZAG, Slovenia)
Roberta Occhipinti (University of Catania, Italy)
Primož Oprčkal (ZAG, Slovenia)
Giuliana Tromba (Elettra, Italy)
Roberto Visalli (University of Catania, Italy)
Franco Zanini (Elettra, Italy)

Sponsorship

Department of Biological, Geological and Environmental Sciences, University of Catania; Elettra Sincrotrone Trieste S.C.p.A.; SIMP - Società Italiana di Mineralogia e Petrologia, ZAG - Slovenian National Building and Civil Engineering Institute; Department of Geology, University of Ljubljana.

Speakers & Tutors

Fabio Arzilli (University of Camerino, Italy)
Luca Bondioli (Sapienza University of Roma & University of Padova, Italy)
Lucija Hanžič (ZAG, Slovenia)
Gianluca Iezzi (University of Chieti, Italy)
Lidija Korat (ZAG, Slovenia)
Gabriele Lanzafame (University of Catania, Italy)
Lucia Mancini (ZAG, Slovenia & LINXS, Sweden)
Elena Marrocchino & Carmela Vaccaro (University of Ferrara, Italy)
Alenka Mauko Pranjić (ZAG, Slovenia)
Vito Mocella (CNR of Napoli, Italy)
Matevž Novak (GeoZS, Geological survey of Slovenia)
Marko Prašek (Elettra, Italy)
Rosalda Punturo (University of Catania & IGAG-CNR)
Rožle Repič (ZAG, Slovenia)
Giovanna Rizzo (University of Basilicata, Italy)
Tomáš Zikmund (CEITEC-BUT, Brno, Czech Republic)
Nina Zupančič (University of Ljubljana, Slovenia)



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Programme

27 February 2024 - Artificial and natural building materials: environmental impact

8.30-9.00	Welcome & Registration
9.00-9.15	General introduction to the workshop/organizers
9:15-10:00	L. Mancini, Introduction to laboratory and synchrotron X-ray CT facilities
10:00-10:45	R. Punturo & G. Rizzo, Asbestos and asbestiform minerals: new techniques for highlighting microstructural features
10:45-11:05	Coffee break
11:05-11:50	E. Marrocchino & C. Vaccaro, Morphological and chemical analysis of natural asbestos fibers in artificial stone from historically significant contexts and road pavements
11:50-12:20	L. Hanžič, 3D printing in construction
12.20-13.20	Visit to ZAG Institute and labs
13.20-14.30	Lunch break & poster session
14.30-18.00	Tutorials/hands-on (for small groups)
19.00-23.00	Social Dinner in Ljubljana

28 February 2024 - Heritage Sciences

9:00-9:45	G. Lanzafame, Advanced X-ray characterization techniques: applications to Cultural Heritage
9:45-10:30	L. Bondioli: Looking inside ancient teeth: Reading ancient lives
10:30-11:00	Coffee break
11:00-11:45	L. Korat: X-ray computed microtomography in Slovenian cultural heritage
11:45-12:30	V. Mocella: The quest of recovering lost ancient literature: reading the Herculaneum papyri
12.30-13.40	Lunch break
13.40-17.30	Petrographic itinerary in Ljubljana (M. Novak & N. Zupančič) and guided visit to National Museum of Slovenia

29 February 2024 - Multidisciplinary applications

8:30-9:15	M. Prašek, Advances in imaging environments, reconstruction, segmentation and data processing at Elettra-Sincrotrone Trieste
9:15-10:00	T. Zikmund, Selected case studies in applications of lab-based micro and nano X-ray CT setups - advantages and limitations
10:00-10:30	Coffee break
10:30-11:15	F. Arzilli, A new vision of kinetic processes: 4D experiments combining X-ray microtomography and high temperature high pressure apparatuses
11:15-12:00	G. Iezzi, 2D textures of geo- and construction- materials and new perspectives
12:00-12:45	Summary talk, A. Mauko Pranjić
12.45-14.00	Lunch break
14.00-16.30	Plenary discussion: future collaboration and perspectives (with coffee)