



Università
di Catania

Dipartimento di Scienze Biologiche, Geologiche e Ambientali
Dottorato in Scienze della Terra e dell'Ambiente



Elettra Sincrotrone Trieste



ZAVOD ZA
GRADBENIŠTVO
SLOVENIJE

SLOVENIAN
NATIONAL BUILDING
AND CIVIL ENGINEERING
INSTITUTE

Synchrotron- and laboratory-based X-ray computed microtomography: Applications in the Earth sciences

University of Catania and Elettra Sincrotrone Trieste, 27-28/09/2022

Organizers: Rosalda Punturo (University of Catania and IGAG-CNR rosalda.punturo@unict.it), Gabriele Lanzafame (University of Catania, gabriele.lanzafame@unict.it) and Lucia Mancini (ZAG-Slovenian National Building and Civil Engineering Institute, lucia.mancini@zag.si)

Dates: 27 - 28 September 2022

Locations: Dip. Scienze Biologiche, Geologiche e Ambientali (Section of Scienze della Terra), University of Catania, Italy; SYRMEP beamline of Elettra Sincrotrone Trieste (Basovizza, Trieste, Italy).

Maximum participants: 40

In presence at UNICT: MSc and PhD students, post-docs max 15

In presence at SYRMEP ELETTRA: max 5

Only in online modality: max 20

Deadline for registration: 9 September 2022.

Workshop modalities: in presence (at University of Catania and Elettra Sincrotrone Trieste) or online (using MS Team® platform).

Objectives and contents of the workshop:

The workshop, dedicated to MSc and PhD students, post-docs and young researchers, aims to illustrate the main three-dimensional (3D) processing and analysis protocols applied to geological materials through the use of X-ray computed microtomography (X- μ CT) techniques, in the frame of the activities of the Doctorate in Earth and Environmental Sciences at University of Catania, Italy. During the lectures and practicals, the methods to acquire and process X- μ CT data by using conventional sources and synchrotron light will be illustrated.

The course offers an introduction to digital image analysis techniques, aimed at determining the qualitative and quantitative characteristics of the phases composing the investigated geomaterials. 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 determination of their morphological characteristics (such as abundance, size, shape and connectivity) of interest. To this end, the operation of the most used image data processing and analysis software tools (i.e. *Fiji*, *Pore3D*, *Avizo*, *VGStudio*) will be illustrated, followed by a practical session where participants will be involved in exercises aimed at processing data from real 3D data sets previously acquired via X- μ CT at the SYRMEP beamline of ELETTRA.



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Finally, some recent results of the applications of microtomographic techniques on samples of various geological nature (sedimentary, volcanic and metamorphic) and their implications will be illustrated.

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

- Introduction structure and operation of synchrotron facilities;
- X-ray tomography techniques: principles and types;
- CT reconstruction and 3D image processing and analysis: principles and software tools;
- Examples of application to geomaterials.

Programme Committee:

Giuliana Tromba (Elettra Sincrotrone – SYRMEP Beamline)

Silvia Portale (University of Catania)

Roberto Visalli (University of Catania)

Alberto D'Agostino (University of Catania)

Speakers:

Eugenio Fazio (University of Catania)

Gabriele Lanzafame (University of Catania)

Lucia Mancini (ZAG - Slovenian National Building and Civil Engineering Institute, Ljubljana, Slovenia)

Nicoletta Marinoni (University of Milano Statale, Italy)

Pia Pleše (University of Ottawa, Canada)

Miller Zambrano (University of Camerino, Italy)

Sponsorship:

University of Catania, Elettra Sincrotrone Trieste, SIMP- Società Italiana di Mineralogia e Petrologia, ZAG - Slovenian National Building and Civil Engineering Institute



Contribution for young participants (under 35): **SIMP** provides partial financial support to juniors members (under 35) in order to contribute to travel and accommodation expenses. Applicants (up to date with 2022 SIMP membership fee) should send a request, enclosing a brief CV and title of current research that can benefit of micro-CT to the following email address: rosalda.punturo@unict.it. Deadline for application for financial support: **15 July 2022**.



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Programme

27 September 2022

09.00-09.30	Rosalda Punturo: <i>Presentation of the workshop</i>
09.30-11.30	Lucia Mancini: <i>Advanced 3D and 4D imaging techniques: principles and instrumentation</i>
	Gabriele Lanzafame: <i>3D image analysis: fundamentals and application</i>
11.30-12.00	Coffe Break
12.00-13.30	Practicals: Experiments at SYRMEP beamline
13.30-15.00	Lunch break
15.00-18.00	Practicals: 3D image processing and analysis

28 September 2022

09.00-11.00	Nicoletta Marinoni: <i>A field trip into natural materials and their synthetic analogous</i>
	Eugenio Fazio: <i>2D/3D Petro-structural analysis of sedimentary and metamorphic rocks.</i>
11.00-11.30	Coffe Break
11.30-13.30	Pia Pleše: <i>Unravelling volcanic degassing using 4D and 3D microtomography</i>
	Miller Zambrano: <i>Pore network quantitative analysis and computational fluid dynamics on porous carbonate rocks using Synchrotron-based X-Ray microtomography images</i>
13.30-15.00	Lunch break
15.00-16.00	Rosalda Punturo: <i>How to prepare a proposal? Tips and recipe</i>
16.00-16.30	Final comments and considerations



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REGISTRATION FORM

Please fill in and send the file to rosalda.punturo@unict.it

Deadline: 9th September 2022.

Participant information

Name and surname	
Email address	
Role (Master student/ PhD student/ postdoc / researcher)	
University and Dpt	
City	
Participation modality (In presence / online)	