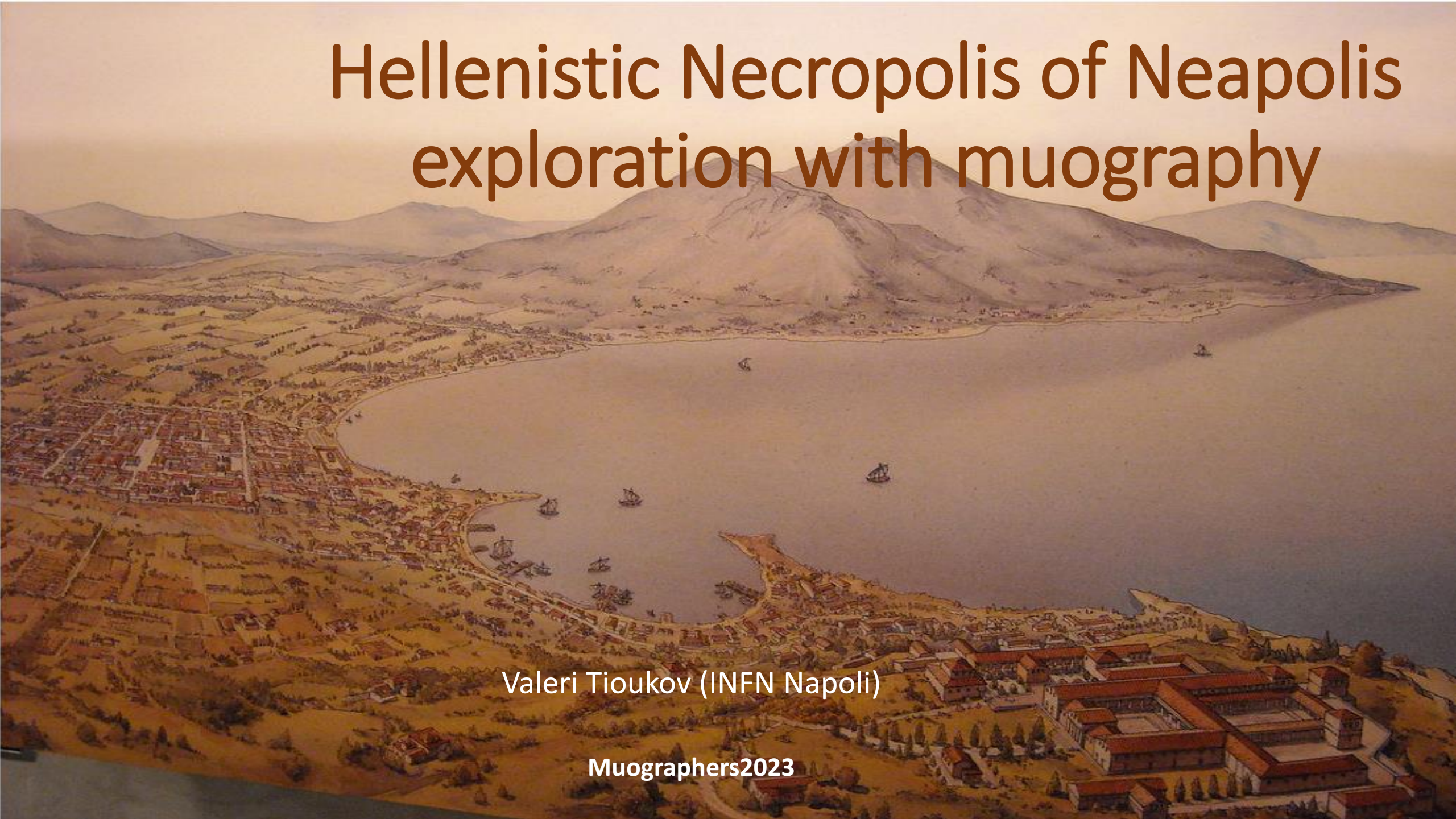


Hellenistic Necropolis of Neapolis exploration with muography

Valeri Tioukov (INFN Napoli)

Muographers2023



NEAPOLIS.

Neapolis about 2500 years ago



1. The Temple of Apollo	17. The Temple of Juno	33. The Temple of Minerva
2. The Temple of Diana	18. The Temple of Mars	34. The Temple of Vulcan
3. The Temple of Cybele	19. The Temple of Neptune	35. The Temple of Mercury
4. The Temple of Ceres	20. The Temple of Juno	36. The Temple of Venus
5. The Temple of Proserpine	21. The Temple of Mars	37. The Temple of Bacchus
6. The Temple of Pluto	22. The Temple of Neptune	38. The Temple of Liber
7. The Temple of Pluto	23. The Temple of Juno	39. The Temple of Bacchus
8. The Temple of Pluto	24. The Temple of Mars	40. The Temple of Liber
9. The Temple of Pluto	25. The Temple of Neptune	41. The Temple of Bacchus
10. The Temple of Pluto	26. The Temple of Juno	42. The Temple of Liber
11. The Temple of Pluto	27. The Temple of Mars	43. The Temple of Bacchus
12. The Temple of Pluto	28. The Temple of Neptune	44. The Temple of Liber
13. The Temple of Pluto	29. The Temple of Juno	45. The Temple of Bacchus
14. The Temple of Pluto	30. The Temple of Mars	46. The Temple of Liber
15. The Temple of Pluto	31. The Temple of Neptune	47. The Temple of Bacchus
16. The Temple of Pluto	32. The Temple of Juno	48. The Temple of Liber

Next 1000 years – Roman period



BAIA
PISCINA
MIRABILIS

Acquedotto romano del Serino

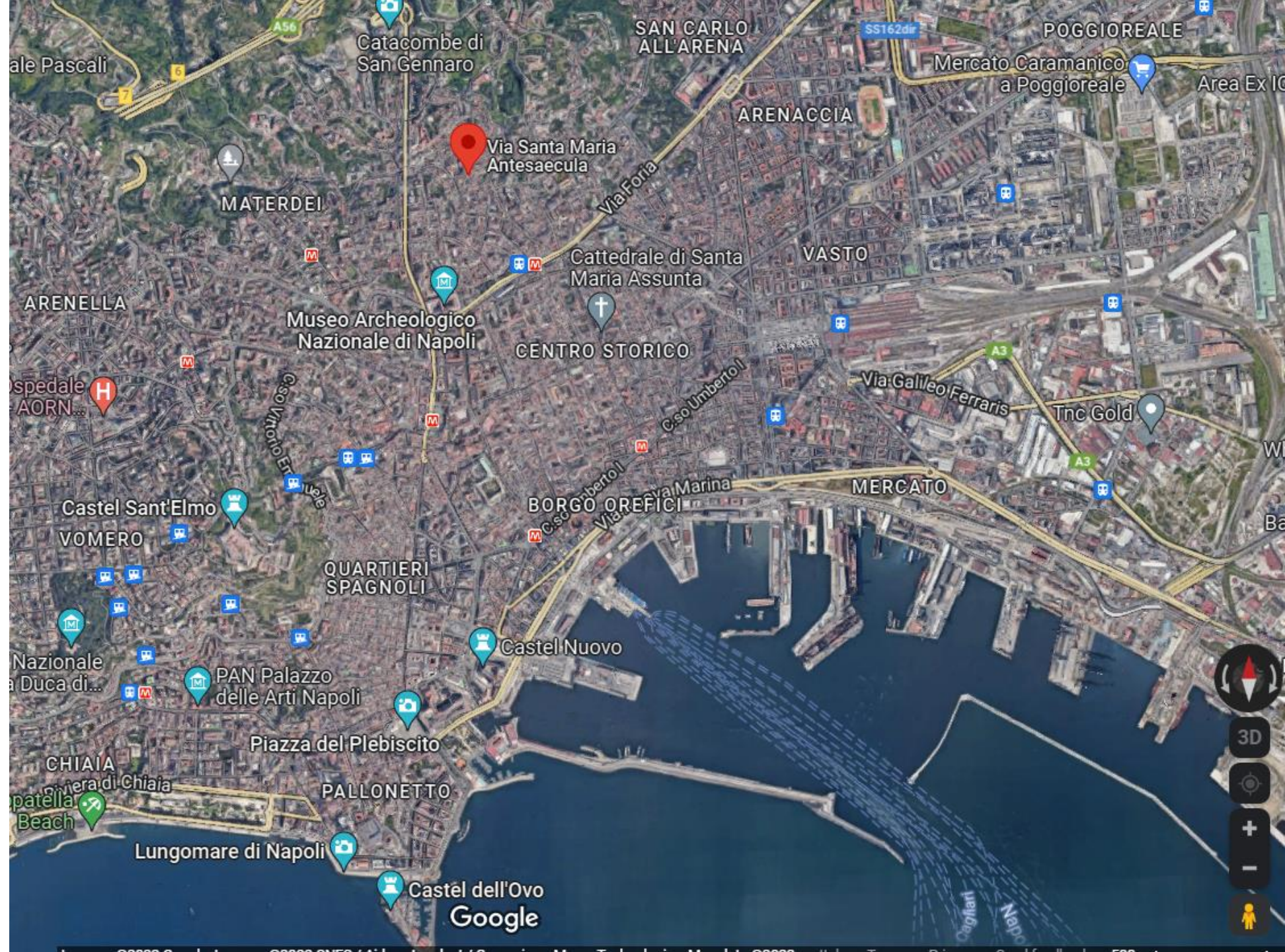
SERINO

Ancient Greek and Roman cultural layer of Neapolis was covered later by eruptions and alluvions and completely forgotten

Starting from XVI century active urbanization started in this region and some Greek and Roman constructions was accidentally revealed

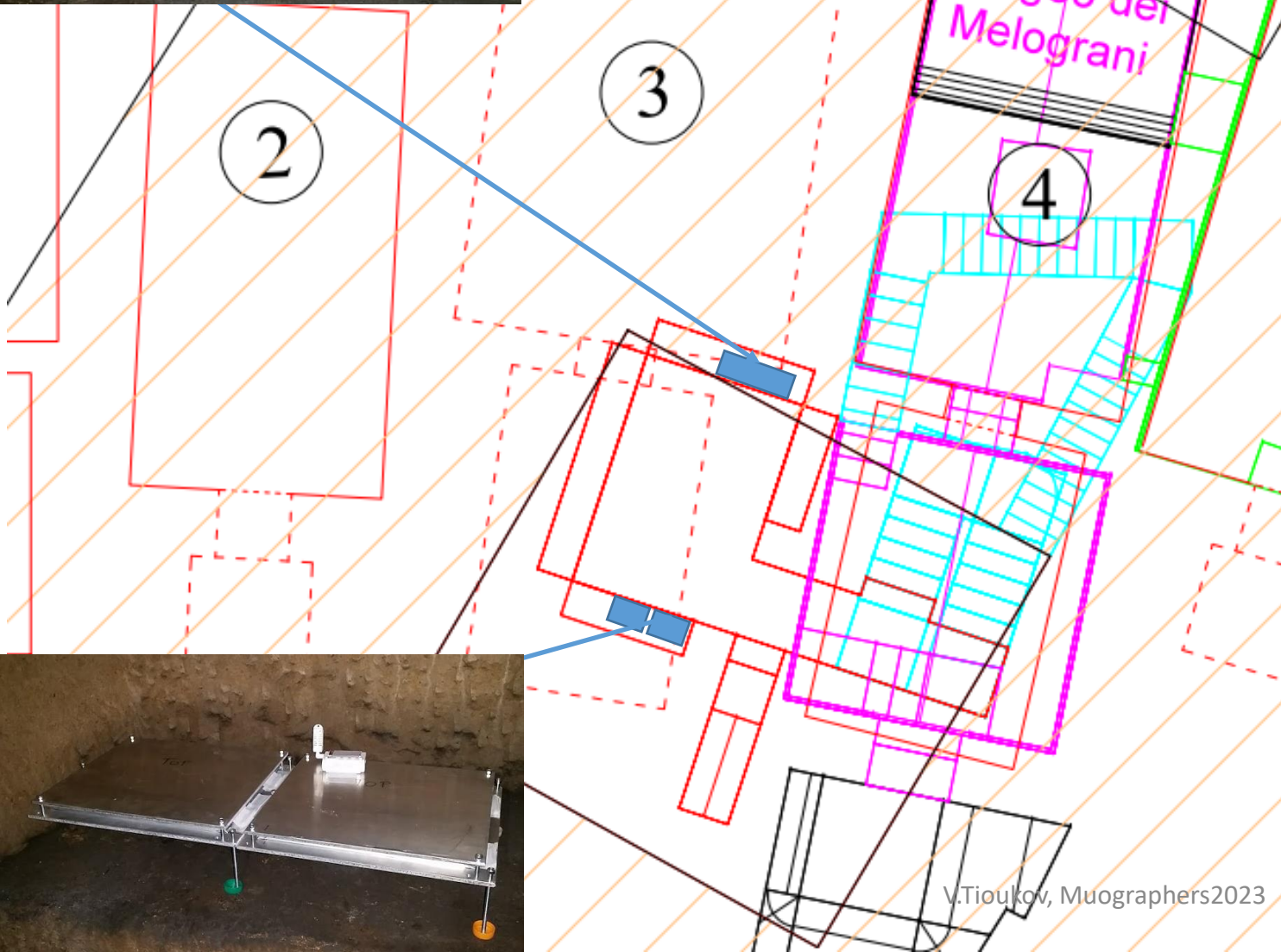
Ancient Greek and Roman layers nowadays stay about 10 m below the street level under the highly populated Napoli districts.

Regular invasive archeology is generally not possible here



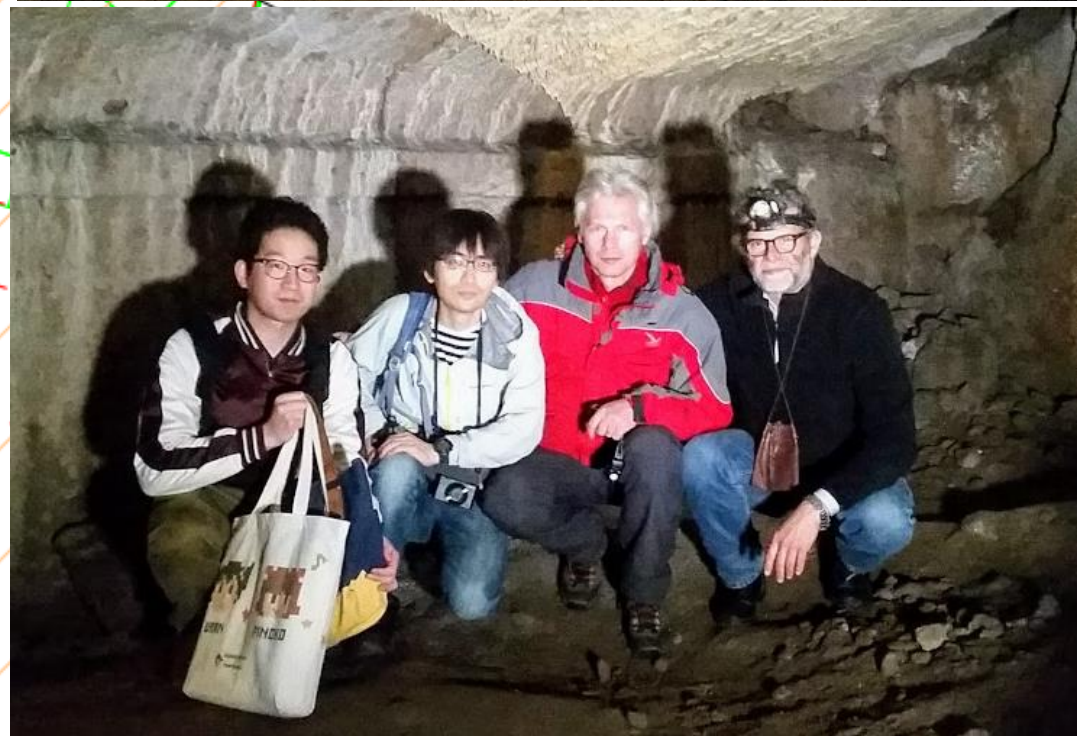


Valeri Tioukov, Kunihiro Morishima, Carlo Leggieri, Federico Capriuoli, Nobuko Kitagawa, Mitsuaki Kuno, Yuta Manabe, Akira Nishio, Andrey Alexandrov, Valerio Gentile, Antonio Iuliano, and Giovanni De Lellis



Napoli - Via Santa Maria Antesaecula, 126.
Ipogeo dei "Melograni" Camera inferiore - Parete est

Associazione Culturale Cclanapoli



V.Tioukov, Muographers2023



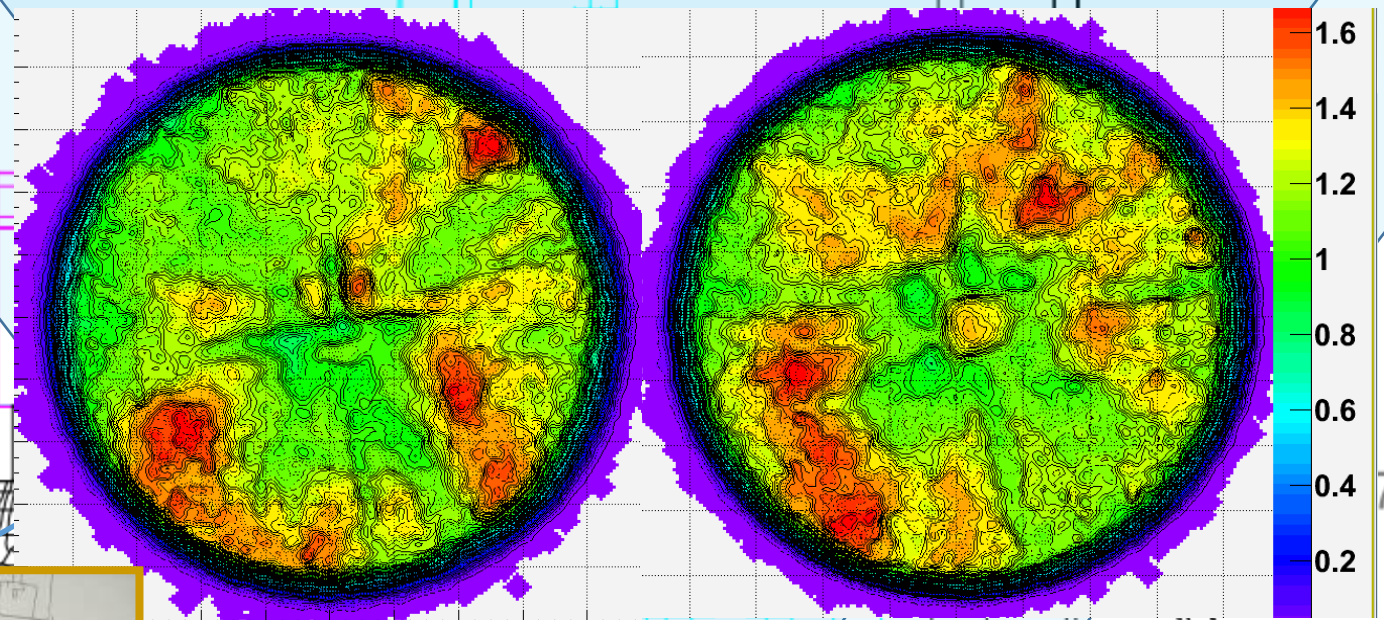


Emulsion plates
of $25 \times 30 \text{ cm}^2$



The street surface now

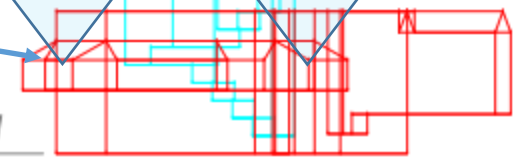
Underground levels



The street surface
IV sec B.C.

7.65

10.01



28 days data accumulation
Two 0.15 m² detectors

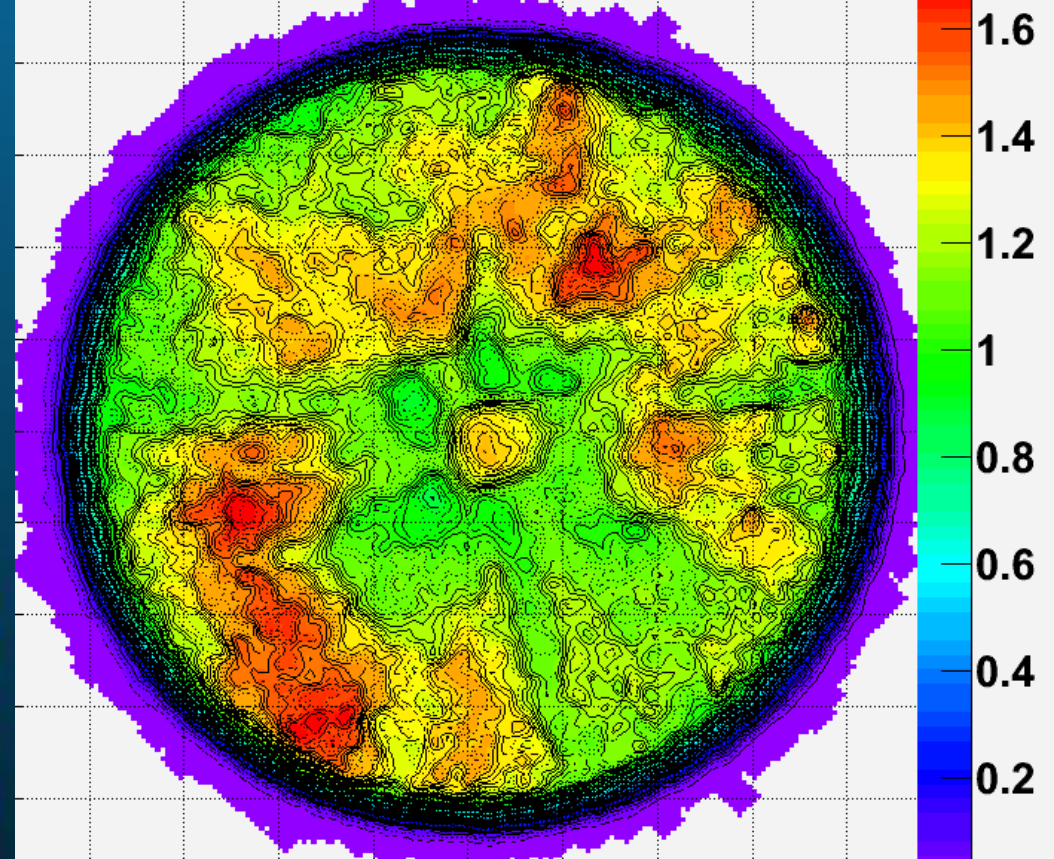
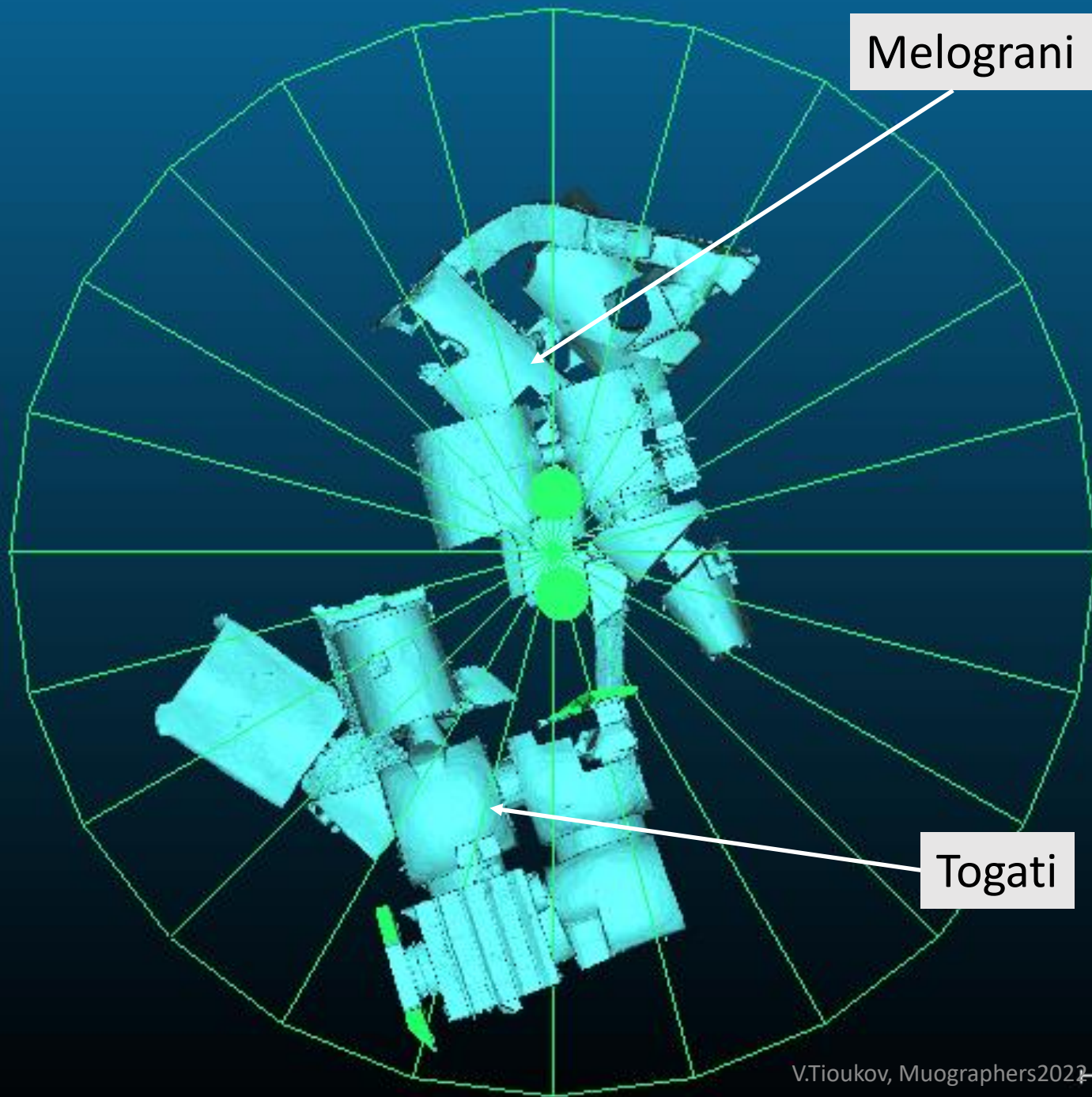
V.Tioukov, Muographers2023



Emulsion analysis laboratory at INFN-Napoli: 7 scanning systems

Neutrino and HNL, Medical Physics, Dark Matter search, Muon Radiography

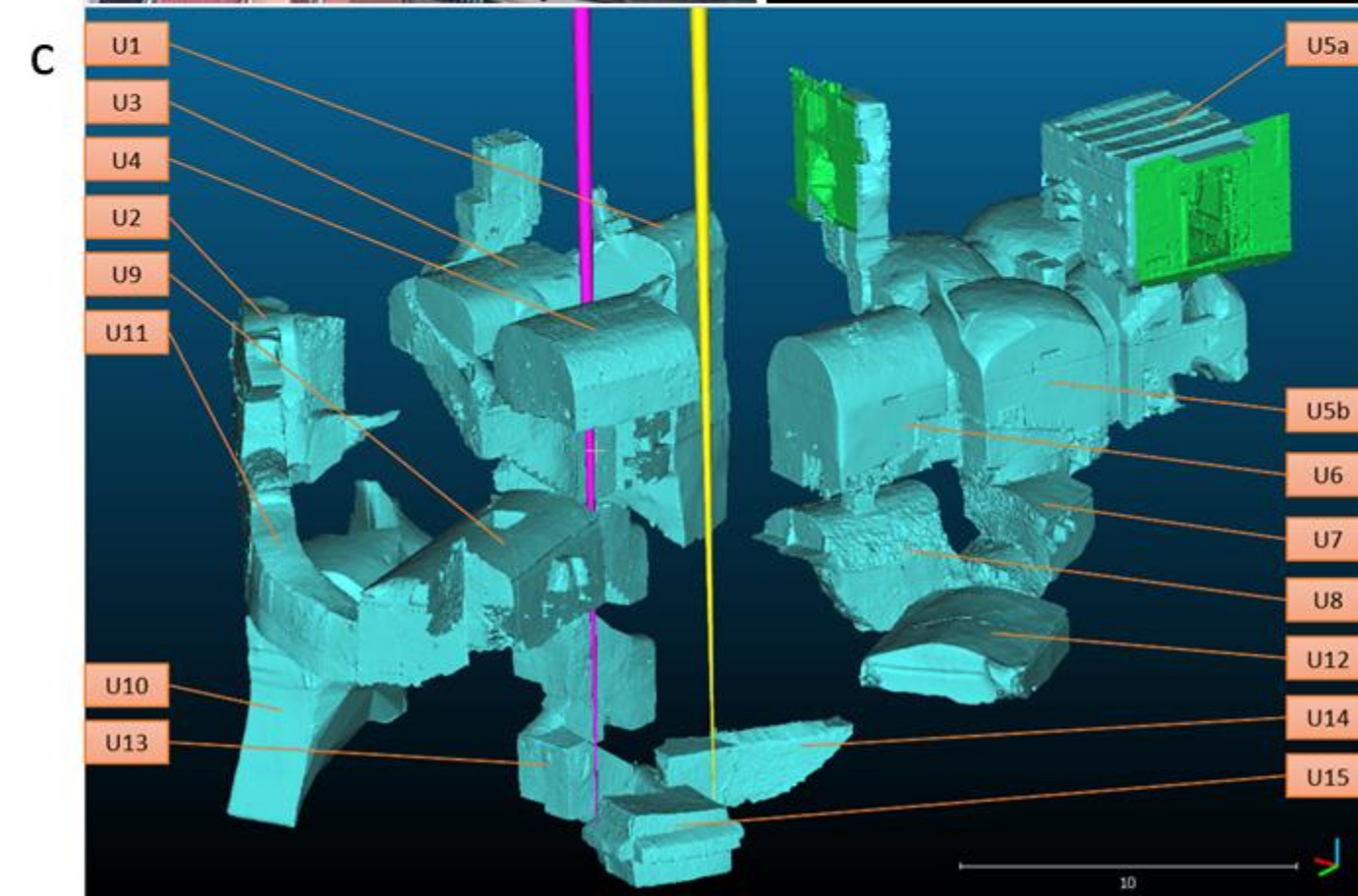






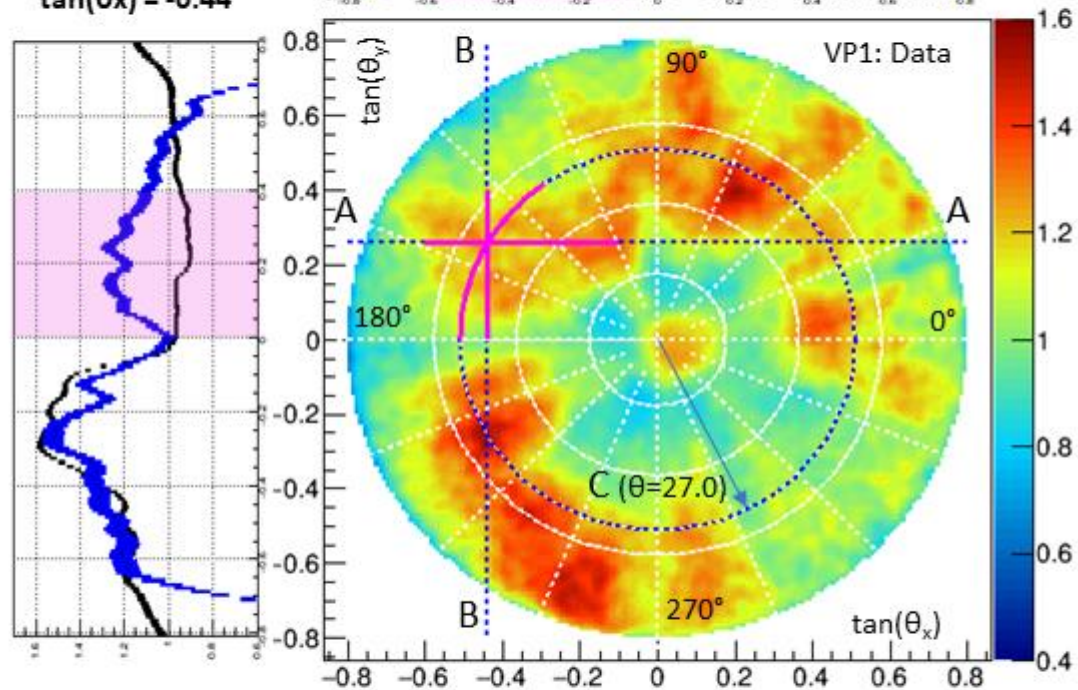
b

ID	Title	Level
F1	Foreground: external courtyard between the buildings	0
U1	Cistern in front of the Melograni chamber	-1,-2
U2	Cellar at the end of a modern ramp	-1
U3	Cellar above the Melograni	-1
U4	Cellar above the detector room	-1
U5	Celanapoli cellar	-1
U6	Celanapoli cellar	-1
U7	Togati hypogeum lobby	-2
U8	Volume below U6	-2
U9	hypogeum n. 4 - Melograni burial chamber	-3
U10	hypogeum n. 5 with the floor collapsed during excavations	-3
U11	Modern ramp	-3
U12	hypogeum n. 1 - Togati burial chamber	-3
U13	Stairs vertical volume	-4
U14	Impasse corridor	-4
U15	Chianca where detectors were located	-4

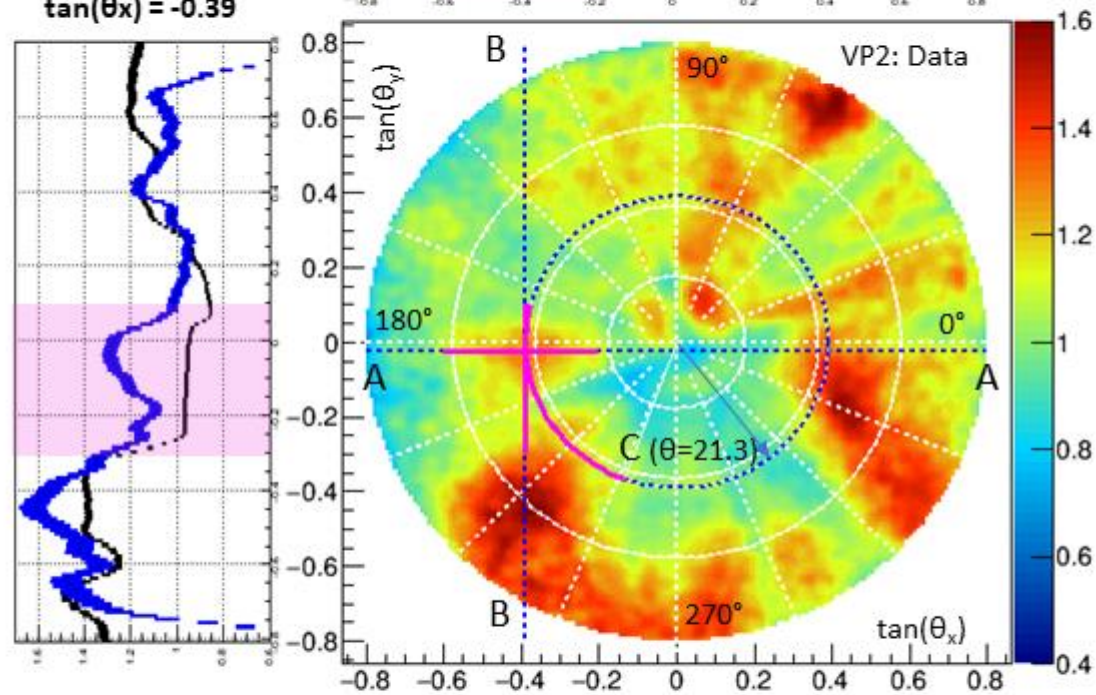
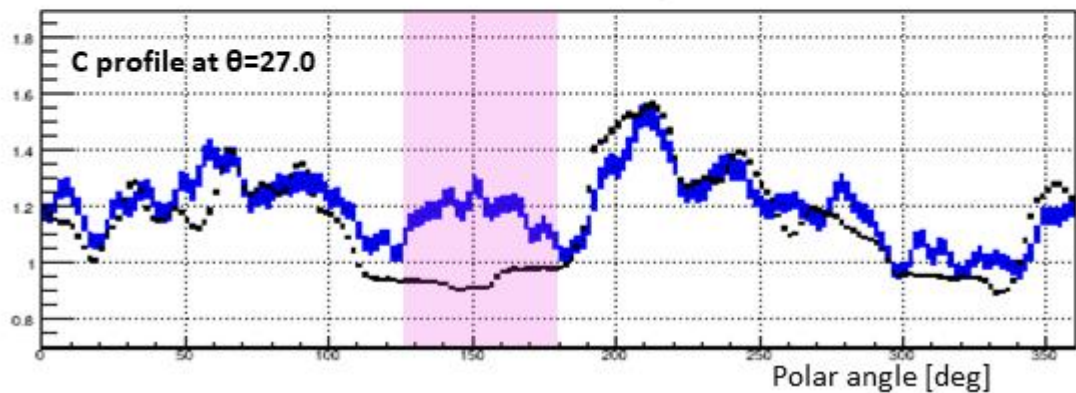
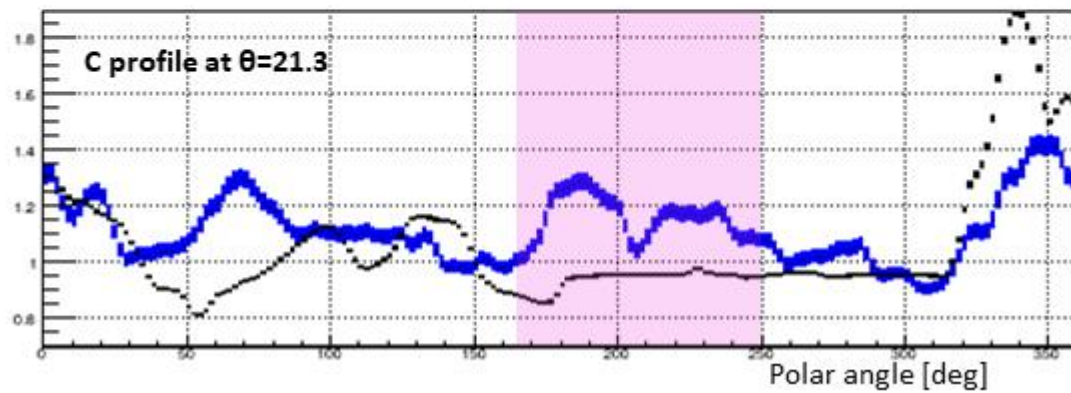


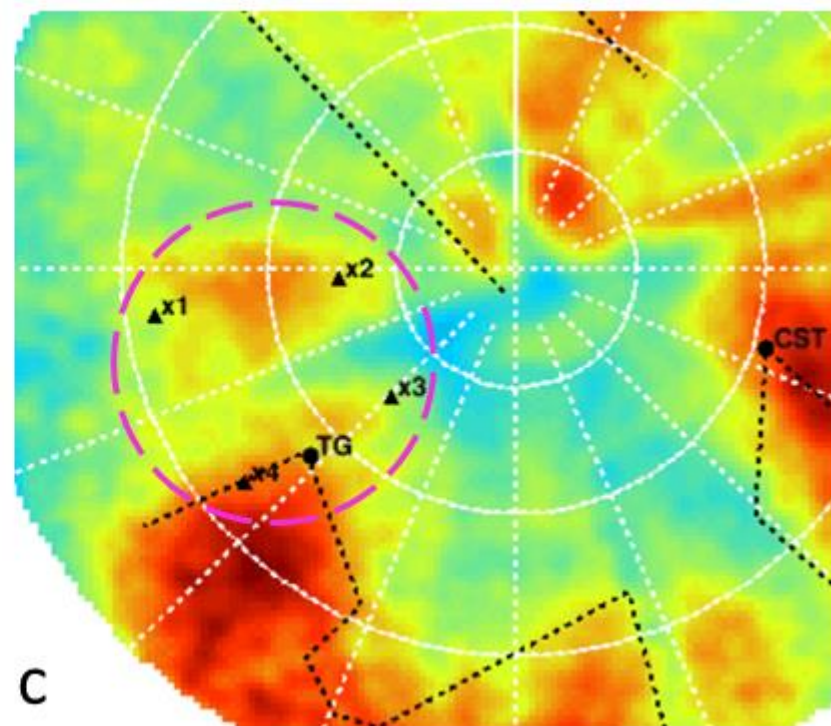
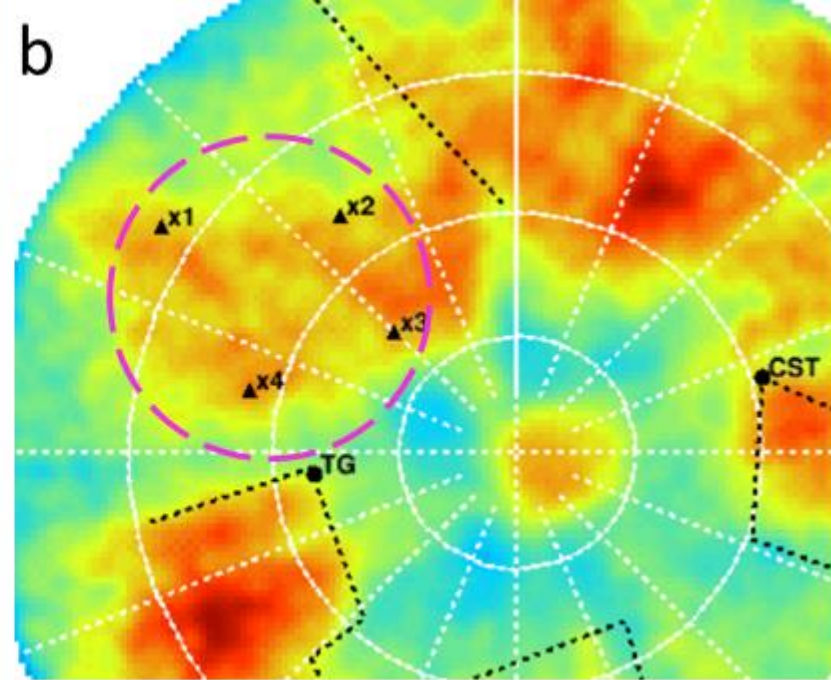
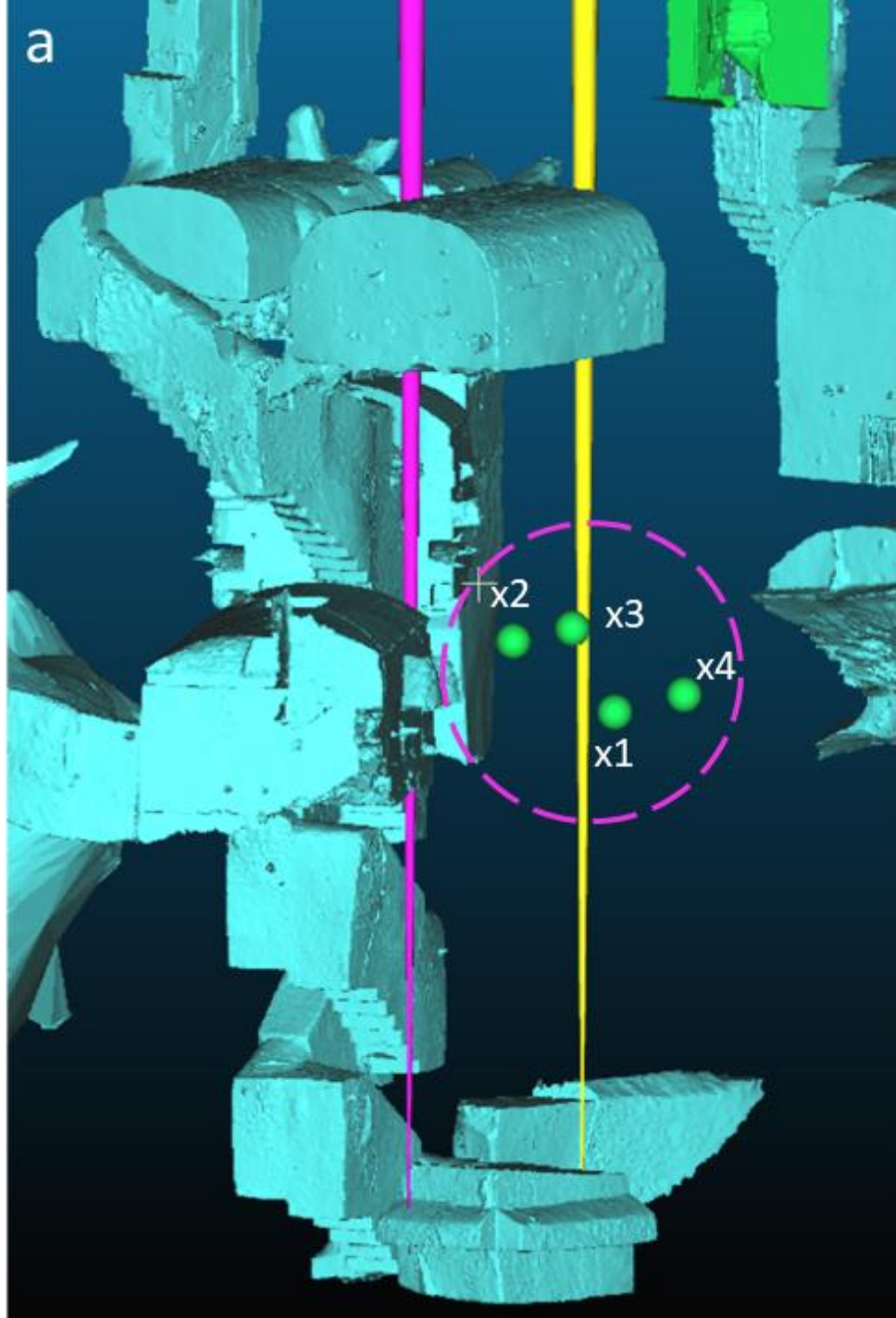
Laser survey performed to create a 3D digital model of all accessible underground spaces

a

A-A profile at
 $\tan(\theta_y) = 0.26$ B-B profile at
 $\tan(\theta_x) = -0.44$ 

b

A-A profile at
 $\tan(\theta_y) = -0.023$ B-B profile at
 $\tan(\theta_x) = -0.39$ C profile at $\theta=27.0$ C profile at $\theta=21.3$ 



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