



A conservation study of sandstone: the Church of Orsanmichele in Florence (Italy)

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ECCCELLENZA 2023-27



Da un secolo, oltre.

THE ORSANMICHELE CHURCH



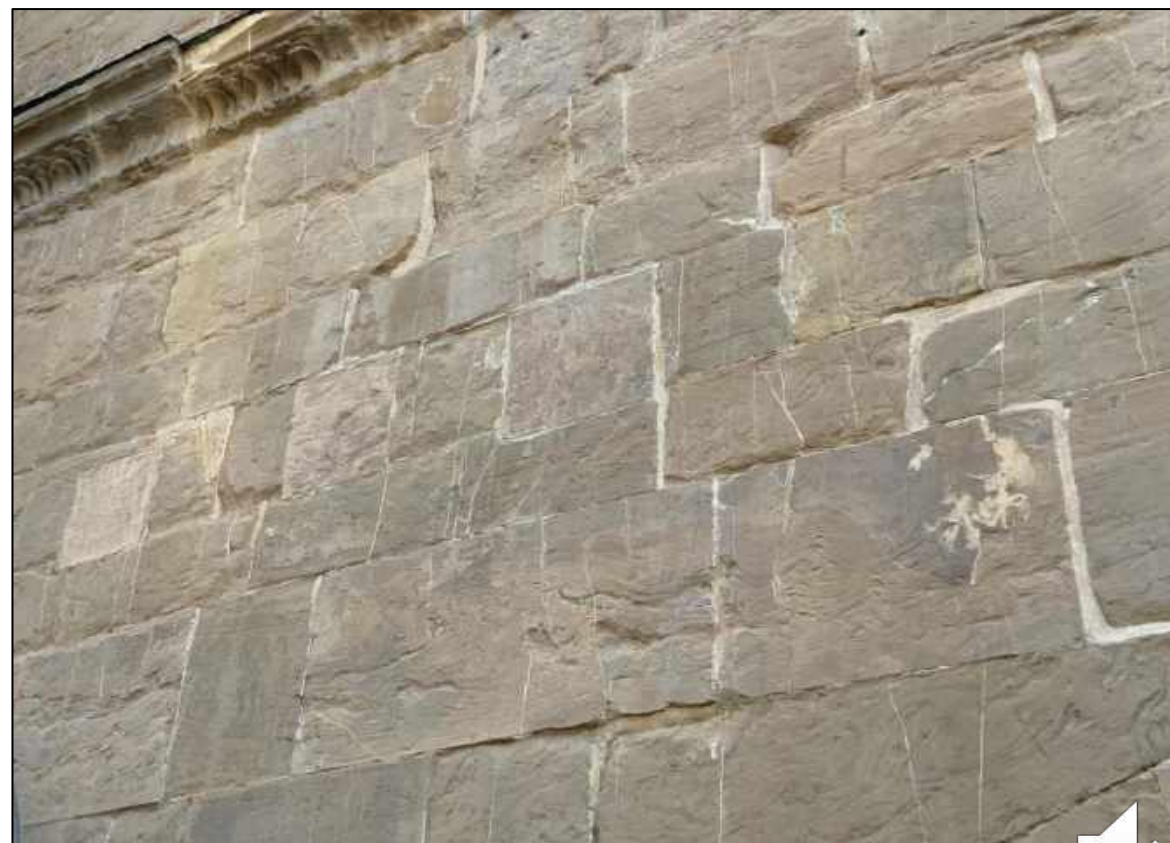
PIETRAFORTE



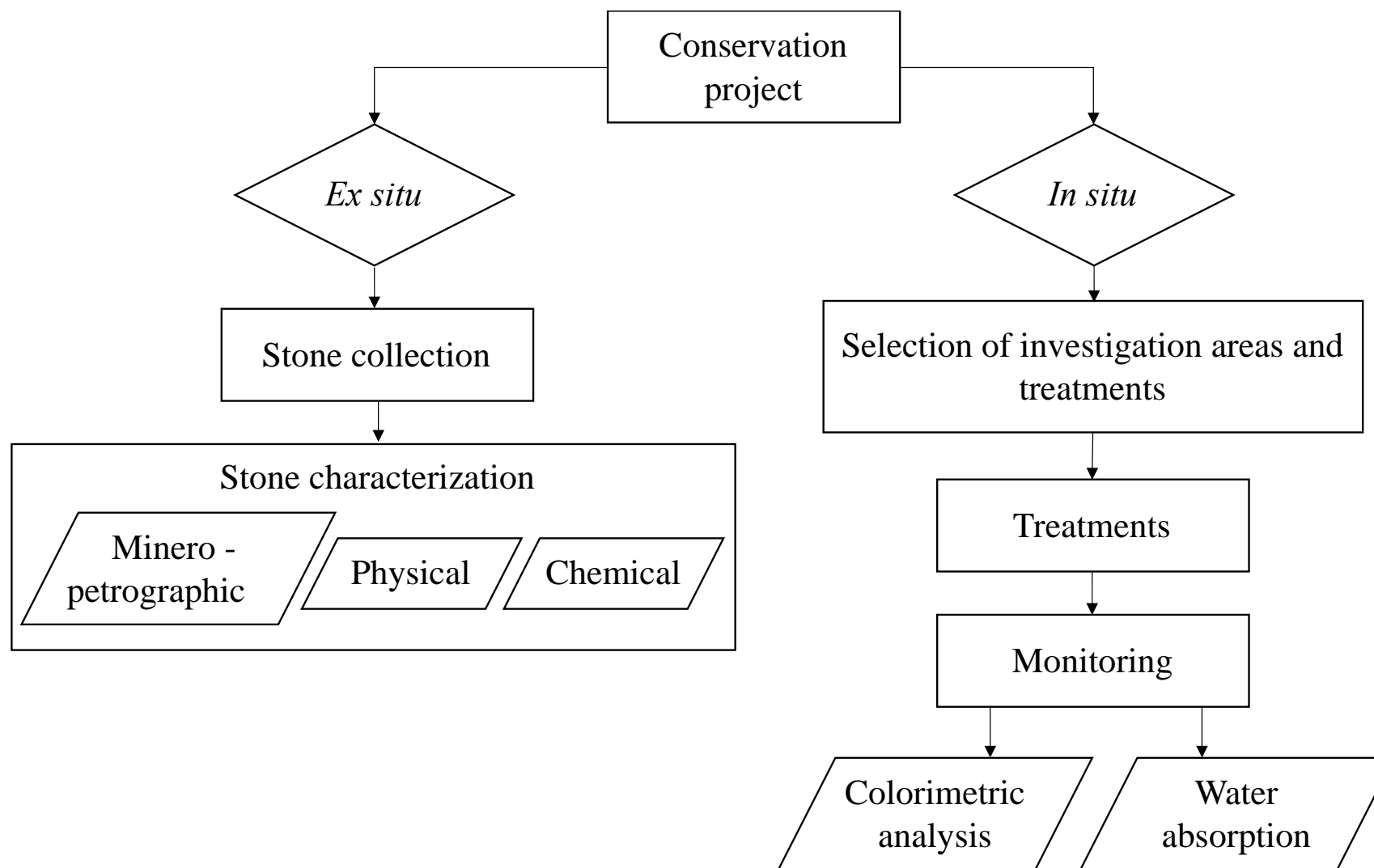
Convoluted laminations



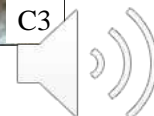
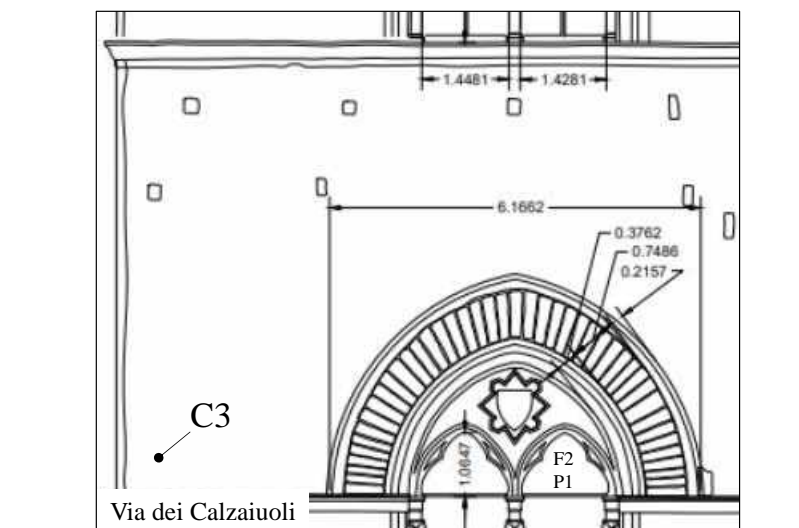
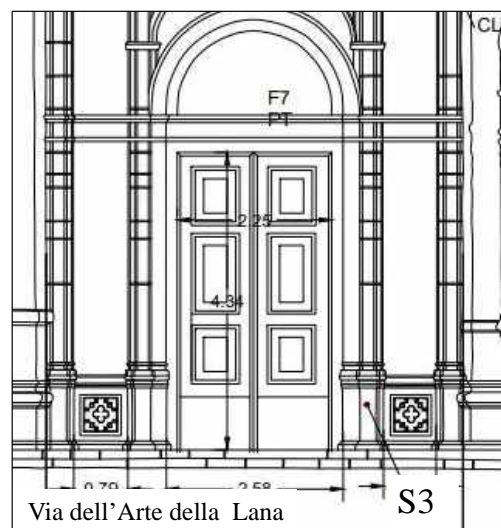
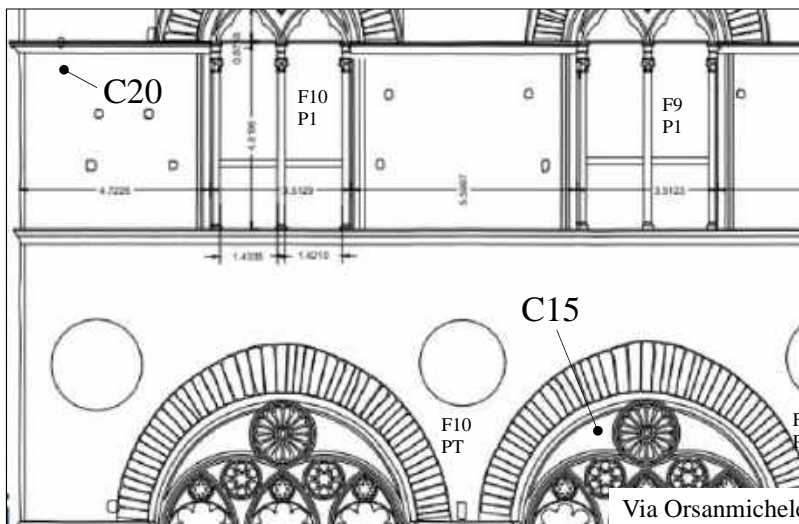
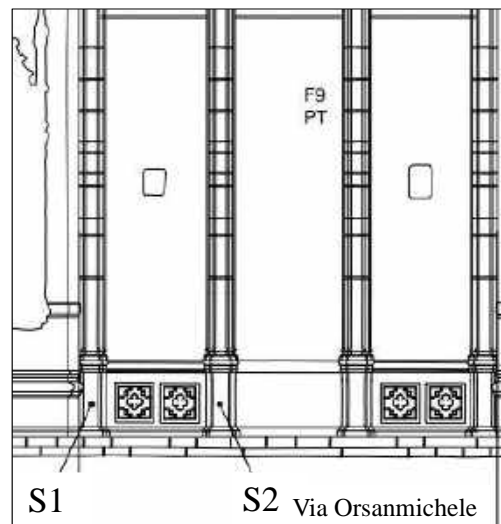
Calcite veins



THE CONSERVATION PROJECT



THE CONSERVATION PROJECT



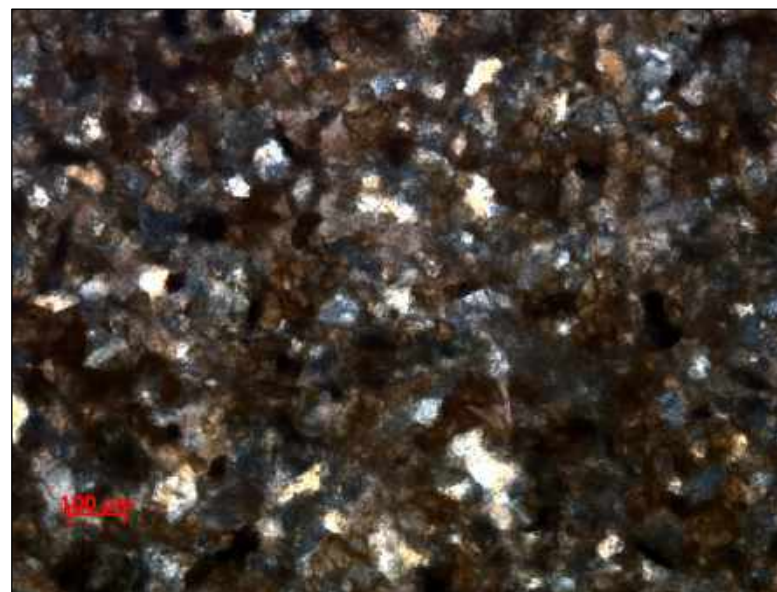
EX SITU INVESTIGATION



Physical results

Total open porosity of $7.61 \pm 0.21\%$,
 Water imbibition coefficient of $3.05 \pm 0.11\%$
 Apparent density of $2.59 \pm 0.01 \text{ g/cm}^2$.

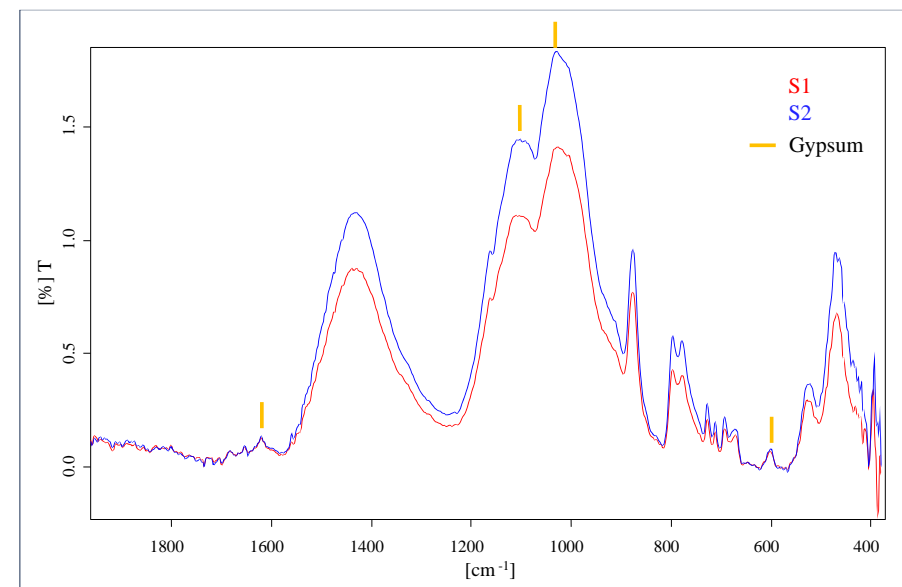
Petrographic observations



XRD analyses

quartz, calcite, dolomite, muscovite, and albite together with small quantities of illite, kaolinite, and gypsum

FTIR analyses



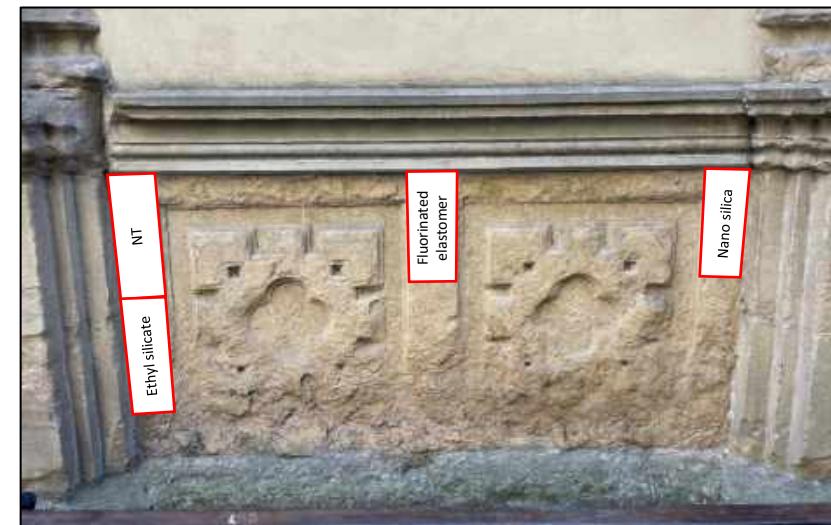
AREAS OF INVESTIGATION AND TREATMENT



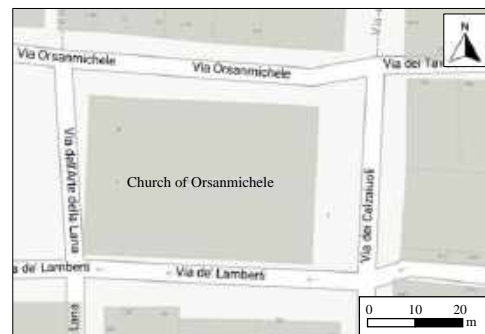
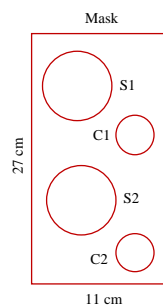
Area 3 Orsanmichele



Area 2 Orsanmichele



Area 4 Lana



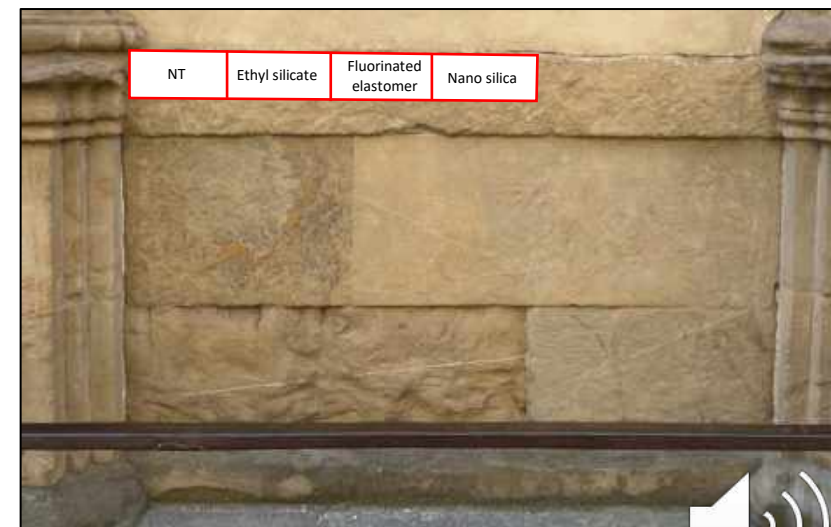
Area 1 Calzaiuoli



Area 5 Lamberti



Area 6 Lamberti



MONITORING

Colorimetry



- ✓ D65 illuminant
- ✓ 10° standard observer conditions
- ✓ SCI mirror- like components included
- ✓ Small aperture size (SAV) of 5 mm.

- Sponge diameter of 5 cm ✓
- Contact plate with a lid (1034 ✓
Rodac®)
- 15/16 g of demineralized water ✓
- 1 min to contact time ✓

Contact sponge method



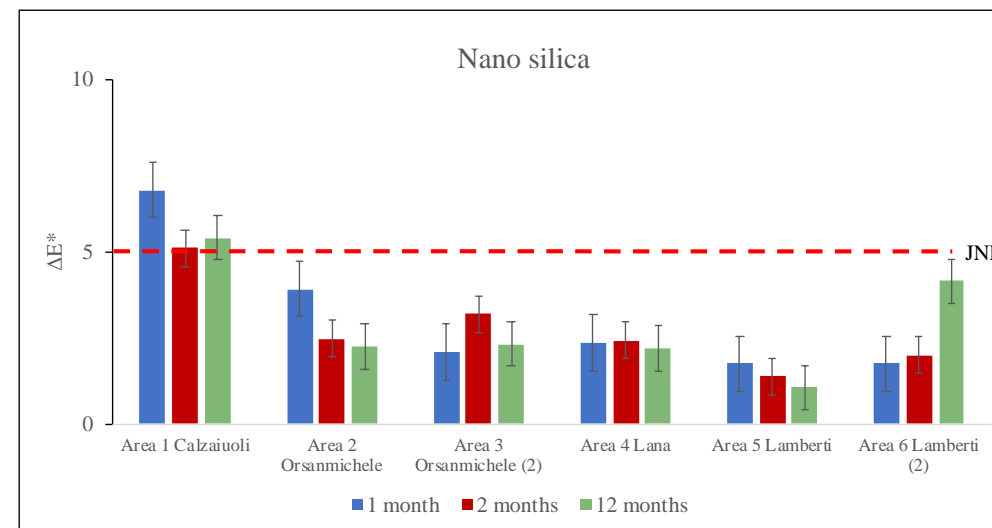
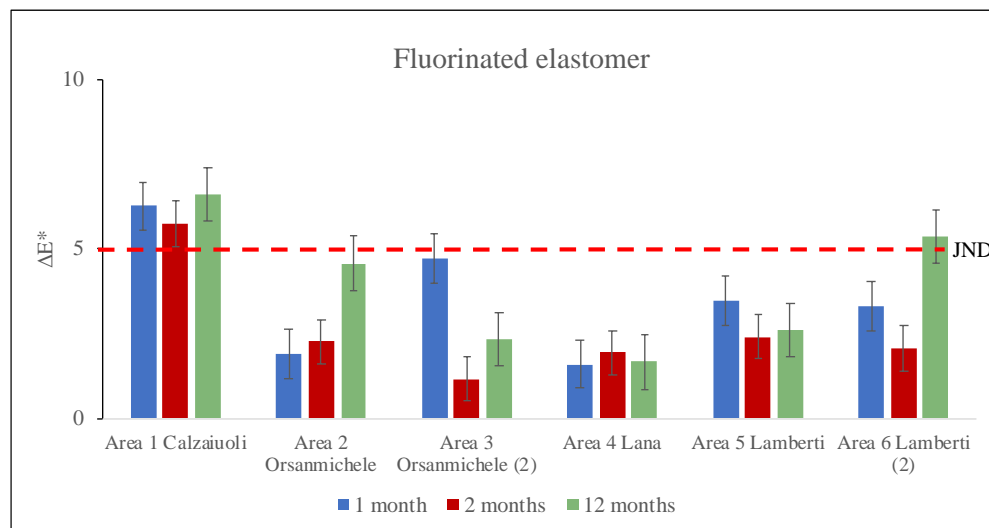
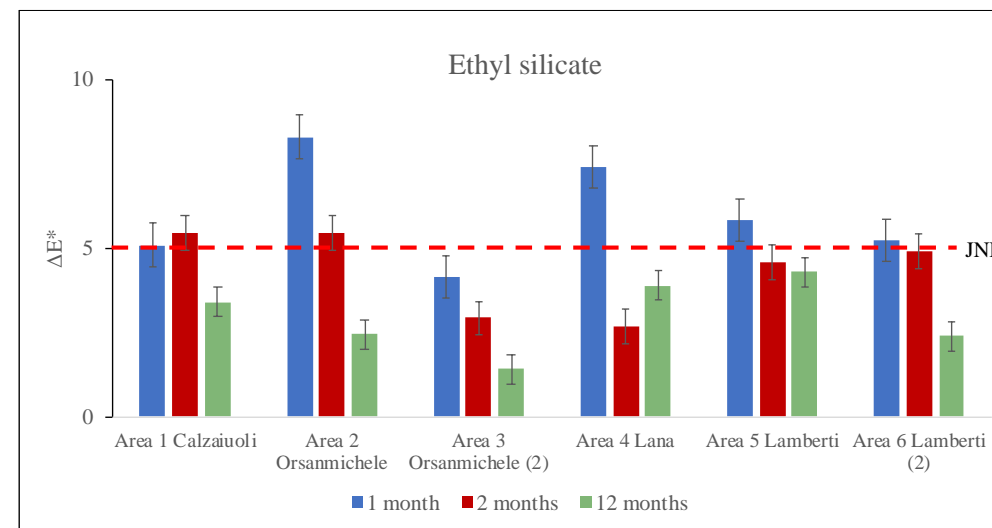
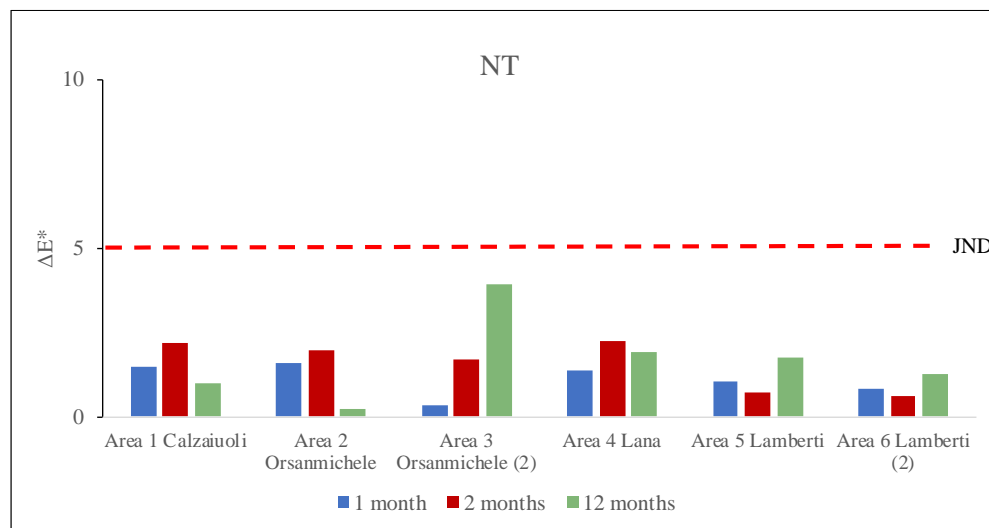
MONITORING



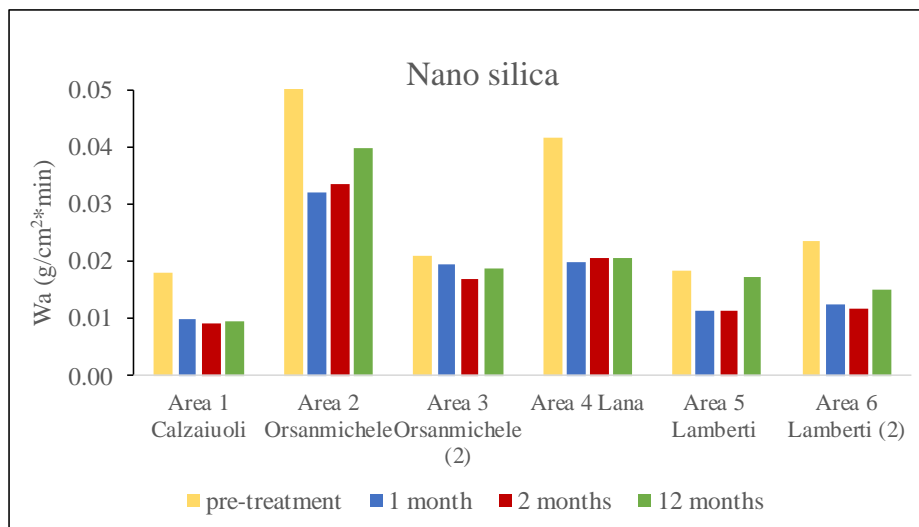
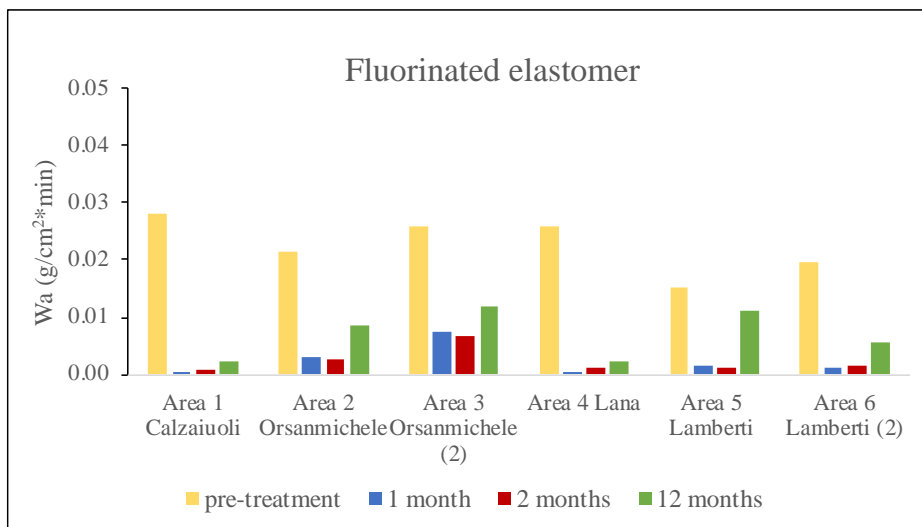
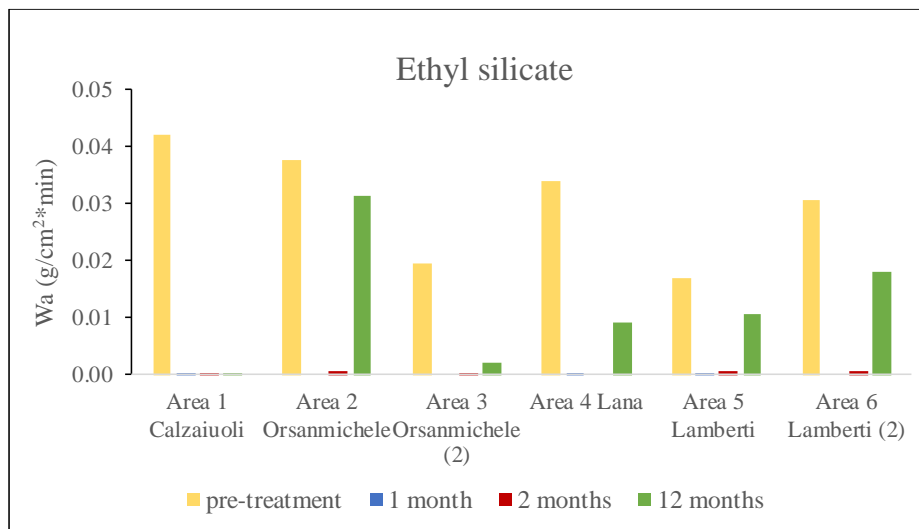
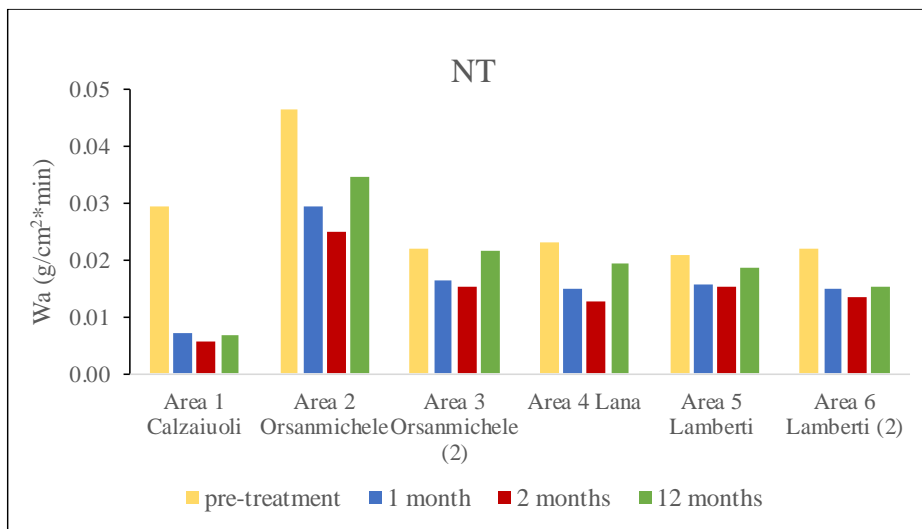
Date	Time	RH (%)	T (°C)
12-May-2022	NT (all areas before treatments)	36	24
19-Oct-2022	Treatment application	70	23
25-Nov-2022	1 month after treatment application	90	10
15-Dec-2022	2 months after treatment application	76	13
20-Oct-2023	12 months after treatment application	62	25



IN SITU INVESTIGATION



IN SITU INVESTIGATION



CONCLUSION



Ethyl silicate treatment caused the color of the rock to change after the first month with gradual restoration to its initial color after one year. This treatment significantly reduced water absorption, although its efficacy appeared transient in all areas except area 1, where absorption values tended to increase after one year.

Fluorinated elastomer treatment showed minimal color change over time, with slight increases in ΔE^* values. Water absorption patterns were very similar to those of Ethyl silicate treatment, although the rock exhibited lesser water repellence.

Nano silica treatment did not induce appreciable color changes over time, but minor discrepancies in absorption values were observed before and after treatment.





Thank you for your attention

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