

Mapping stones and deterioration morphologies distribution at the *Torre dell' Orologio* (St. Mark square - Venice) in the frame of the Hyperion EU project

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Abstract

The *Torre dell'Orologio* (clock tower) in Venice is an early Renaissance (1499) building in Lombard style overlooking the entrance to the *Mercerie* on the north side of St. Mark's square. Its historical and artistic importance in the city as well as in the general landscape of the Italian Renaissance, is undeniable, as it is the representative expression of the architectonic stone materials most in vogue in that historical period. As part of the European project HYPERION (Horizon 2020), which is dealing with resilience and sustainable reconstruction of historical areas, the main façade of this elegant monument was mapped in order to obtain an overview of the composition of the building, its state of conservation and the history of its restoration.

The mapping of deterioration morphologies was carried out following the ICOMOS-ISCS glossary of decay forms together with a quantification of the same inspired by the work of Fitzner and Heinrich (2001).

To support the drafting of the maps, in-depth investigations were carried out on a series of micro-samples of both stone and deterioration products following a multi-analytical approach including petrographic and biological analyses by optical and scanning electron (SEM-EDS) microscopy, as well as through powder X-ray diffraction, ion chromatography and infrared spectrometric investigations using FTIR. The final output was the production of a series of monographic maps: one concerning the building materials, a series of maps focused on the five macro-categories of deterioration morphologies as defined in ICOMOS-ISCS (i.e. cracks and deformations, detachment, features induced by material loss, discolouration and deposit, biological colonisation). A further map was produced to graphically summarise the total state of decay of the building by reporting a Total Decay Index (TDI).

In general, the most abundant and/or intense forms of deterioration detected were black crusts, patinas, discolouration and patterns related to erosion processes. The stones used in the façades are: regional (*Rosso Verona* and *Scaglia Rossa*) and extra-regional limestones as well as a series of marbles and stones already used in classical times: three crystalline marbles (*Carrara* and *Pavonazzeto Toscano* from the *Apuan Alps*; *Proconnesian* from the *micro-Asiatic island of Marmara*), the *Rouge de Languedoc* (a French limestone in Italy called *Rosso di Francia*), and the famous Egyptian volcanite known as *Porfido rosso antico*.

References

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