

The underground church of Piedigrotta in Pizzo (VV)

A digitalization project between drawing and matter

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The subject of the analysis¹ is the underground church of Piedigrotta near Pizzo (VV), a city on the Tyrrhenian side of southern Calabria. It is a suggestive negative architecture, both enigmatic in its genesis, both interesting from a touristic and cultural standpoint. The church is included in the list of architectural and/or monumental cultural heritage protected by specific ministerial decrees pursuant to Law 1089/39 cultural heritage, for which protection is the exclusive responsibility of the state authority². Compared to the Calabrian underground cultural heritage, which is scattered from north to south with hypogeum of different nature, age and intended use, this underground church is unique for its location close to sea level and for its construction history, which is not yet sufficiently documented.



Fig. 1. Main elevation. Point cloud post-processing (elaboration of the authors).

¹ This work is an emblematic case study developed in occasion of a degree thesis, that was discussed at the "Mediterranean" University of Reggio Calabria, Department of Architecture and Territory. Thesis discussed on June 8, 2021. Supervisor: Prof. Arch. Gaetano Ginex; Co-supervisor: Arch. Francesco Stilo; Graduating: Lorella Pizzonia.

² QTRP tome 1- cognitive framework. Regional Urban Planning Tool.

Visited annually by thousands of tourists, it is located in a high and rocky stretch of coast. The access is via a staircase that leads from the street level (+31.00 m asl) to the actual entrance to the cavity (+3.50 m asl), a path that finally, after a few steps carved into the limestone, leads up to the beach and ultimately to the sea. The church as museum is managed by a local cooperative, and even if it has been reworked over the time, it still represents an important resource for the city and for the community of believers that goes there in devotion. The first direct documentary source attests the presence of the church starting from 1725, although numerous clues and indirect sources suggest a much ancient realization; the historical aspect, however, is still under investigation. What is certain, is that the cult of this sacred place was born in a small fishing village and is linked to the legend of a shipwreck and to the veneration of the painting of the Madonna di Piedigrotta (the holy Mary of Piedigrotta), which survived it.

A digital architectural survey was designed and executed with Structure From Motion technology (SFM), to expand the knowledge about the artefact. This low-cost technique is well suited to be used in environments characterized by rough surfaces and uneven floor surfaces and helps overcoming the risks and the problems that might be occur when using much more expensive and delicate tools.

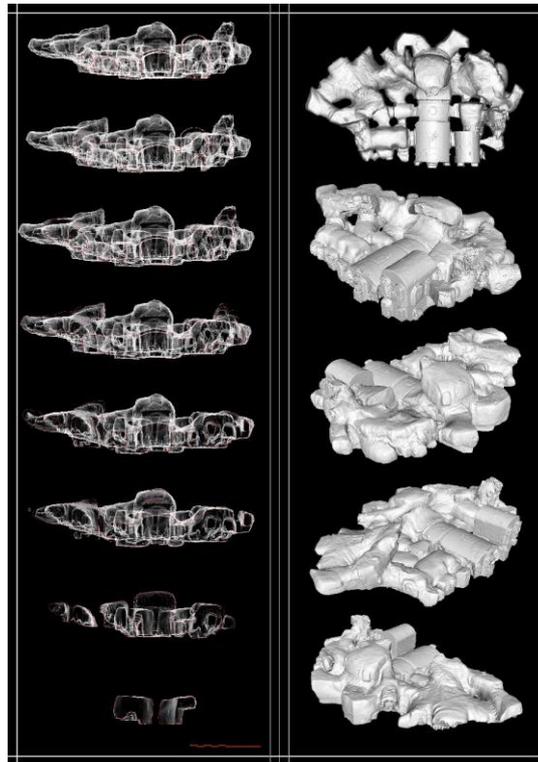


Fig. 2. X-Ray sections and Plaster Digital Model (elaboration of the authors).

The church present a single façade above ground, which was partly modeled in the rock and partly made of mixed masonry of rough stone and bricks; a wall face of about 80 cm thick, that was highlighted in the post-processing phase both with respect to the overall design and with respect to the texture of the materials. It was possible to obtain some preliminary information on the internal scanning of the spaces, highlighted by the processing of the point cloud (fig. 1), from the elevation, that was designed to cover a void. It is quite easy to produce in a relatively short time, a complete documentation of the artefact by a constant comparison between 2D and 3D representations, as well as between reality and model. The main goal of the research was to produce a three-dimensional documentation able to tell the negative architectural form of this church-cave. This was greatly achieved

by creating a highly detailed digital model, that could support the production of 2D representations (digital or printed) as well as allowing virtual tours of the underground areas. Creating this has proved of great help, especially during the unprecedented times of the pandemic, improving the capability of the site to accommodate new ways of tourism and discovery. The target audience of the operation is vast, in fact, if on the one hand it was decided to advance the state of the art on the knowledge of the church, providing the scientific community with graphic drawings with a high degree of detail and precision, from others have laid the foundations for the creation of a viewer for the virtual tour.

Screenshots with a Piranesian flavor have been prepared, to photograph the interior of the cavity that can be explored in point cloud mode, a solution that enhances the almost magmatic features of the surfaces and the irregularity of the environments. The concepts of Plaster Digital Model (PDM), a visualization that recalls the idea of the plaster cast, and of X-Ray sections, a graphic solution that recalls the X-ray plates or the results of a CT scan, were devised. The PDM and X-Ray sections are contrasting concepts, used to symbolically represent the body and soul of the church: a solid body, to recall the idea of the plaster cast and its roughness, and a liquid soul, one look through the hollow body. In it the sacred path ends, retraced starting from the sequences gemmed by the two fundamental sections, transversal that cuts the sea, and longitudinal that cuts the hill (fig. 2).

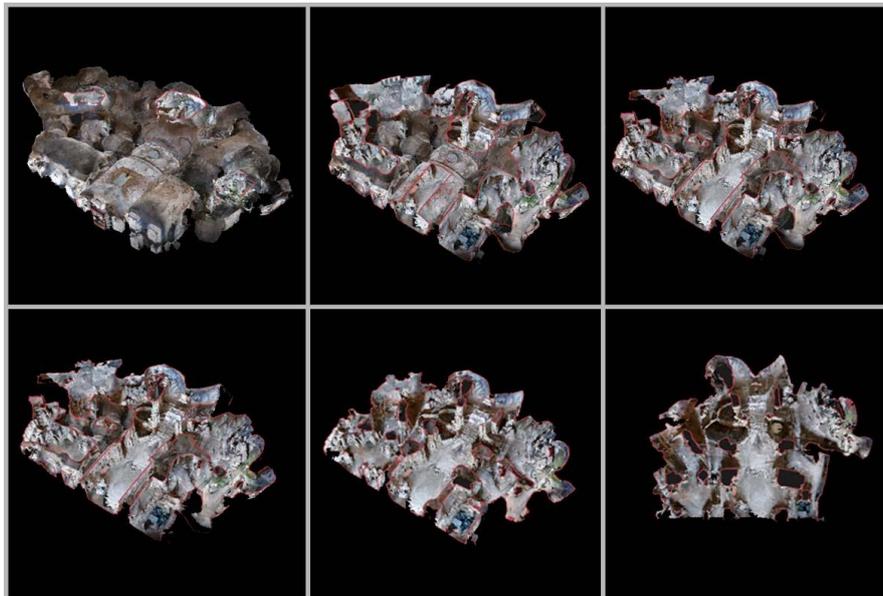


Fig. 2 Frames taken from the multimedia section (elaboration of the authors).

This digitization process made it possible to create a multimedia section in motion, that allows a comprehensive overlook to the different altimetric levels (fig. 3). The possibility of a virtual tour, necessary in these unprecedented times of need of escapism, opens up to a more accessible use of the church, inaccessible to the public in certain environments, given its intrinsic fragility. The sedimentary rock, so easy to excavate, is at the same time subject to erosion phenomena; furthermore, being formed by large and medium-sized granules interspaced by air pores, it allows water infiltration, with the need for periodic maintenance to ensure its conservation. Beyond the contingent data, the pandemic one, the creation of a virtual tour has the purpose of guaranteeing accessibility to the hypogeum even in the periods of scheduled and extraordinary maintenance, and to make the church open also to those users who due to disabilities cannot access it. In any case, the choice of making

a virtual tour using specific software is matched by the possibility of study and use by groups of users with different interests.

The architectural survey took place when the church was closed to the public, courtesy of the Kairos cooperative. The alarming levels of pandemic spread have led the church to increasingly restrictive levels of use, in line with state directives. Lastly, it should be noted that the transmission of the covid-19 virus is dangerously accentuated in underground environments, due to the lower air exchange of these environments, and in this case also due to spaces which, without the aid of contingent entrances, do not allow for adequate social distancing.

Author Contributions

Conceptualization: Pizzonia L., Stilo F.

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Investigation: Pizzonia L.

Methodology: Stilo F.

Resources: Pizzonia L., Stilo F.

Supervision: Stilo F.

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