

This PhD dissertation deals with the multivariate statistical analysis of microclimatic data for preventive conservation of cultural heritage in several locations: Ariadne's house (Pompeii, Italy), l'Almoina Archaeological Museum (Valencia, Spain) and mudejar church of Santa Maria in Ateca (Zaragoza, Spain).

The main objective of this thesis is to propose a methodology for statistical analysis of microclimatic data which can be extended to curators and restorers. The usefulness of the proposed methodology is shown, as it has been successfully applied to the studied cultural heritage sites.

Furthermore, corrective actions have been proposed and taken in accordance with the results obtained from the analysis of data recorded at Ariadne's house and the Archaeological Museum of l'Almoina. The effectiveness of such corrective measures has been evaluated through a second monitoring campaign.

In the case of Ariadne's house, two monitoring campaigns were conducted. During the first, in 2008, the analysis of the recorded data showed that the transparent polycarbonate roof installed in the 1970s was causing a greenhouse effect harmful to the conservation of the frescoes. The sensors also helped identifying differences between orientations and heights. Following our recommendations, in 2010 the roofs were changed by some opaque fibrocement and thermo-hygrometric data recorded in a second monitoring campaign allowed us evaluating the adequacy of the corrective actions in configuring a more stable microclimate.

The Archaeological Museum of l'Almoina is exposed to passers-by through a skylight that covers part of the ruins. A first monitoring campaign in 2010 allowed the thermo-hygrometric characterization of the inner microclimate and the identification of the significant influence of the skylight on the temperature and relative humidity values, causing sharp rises and falls during the daylight hours. In 2013 two corrective measures were implemented and evaluated subsequently through a second microclimatic monitoring campaign conducted at the museum.

The mudejar church of Santa Maria is located in Ateca, a town in the province of Zaragoza characterised by cold winters and warm summers. Given the low temperatures in winter, a heating system is used. The results of our analysis have shown that the heating system is turned on only for the celebration of Mass or religious festivities (half hour before the entrance of public at the church), causing extreme cycles of temperature and humidity, especially at the upper parts of the altarpiece due to the rising of hot air (hourly increase of 7 °C in temperature and a decrease of 11% relative humidity) that are detrimental for the conservation of this artwork.