

The crypt of Saint Decenzio in Pesaro (11th century): indoor microclimate monitoring for conservative purposes

M. L. Amadori¹, S. Barcelli¹, S. Della Ferrera¹ and
M. R. Valazzi²

¹Università degli Studi di Urbino Carlo Bo, Istituto di Scienze
Chimiche, Piazza Rinascimento n.6, Urbino (PU), Italy

m.letizia@uniurb.it

²Soprintendenza ai Beni Artistici, Storici ed Etnoantropologici delle
Marche, P.za rinascimento 1, Urbino (PU), Italy

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INTRODUCTION

The oldest crypt of San Decenzio is located in the public cemetery area of Pesaro, below the Saints Decenzio and Germano church.



Saints Decenzio and Germano church
(1856, Romolo Liverani)
*OMICCIOLI, CECINI, DASSORI, BISCHI,
L'Isauro e la Foglia. Pesaro e i suoi
Castellini disegni di Romolo
Liverani, Pesaro-Urbino, 1986, p. 218.*



The crypt of Saint Decenzio in Pesaro
(1840, Romolo Liverani)
*OMICCIOLI, CECINI, DASSORI, BISCHI,
L'Isauro e la Foglia. Pesaro e i suoi
Castellini disegni di Romolo
Liverani, Pesaro-Urbino, 1986, p. 218*

The crypt was built using recycled roman age materials and it is composed by four small aisles with eight granite columns and one red marble pillar.



Red marble pillar



Granite columns

The groin vaults are decorated by mural paintings, dating back to the second half of the 11th c. AD



Mural paintings (medallions with Apostles)



Mural paintings (braided belts)



Mural paintings (lozenge and flowers)



Mural painting (the Patron Saints Decenzio and Germano,) Civic Museums of Pesaro



Mural paintings (Matthew the Evangelist)

An inspection in 2005 evidenced that brick walls and vaults were entirely covered by cement plaster which prevented the transpiration of the wall, favouring the considerable salt flowering.

In 2007 the crypt was restored through the consolidation of mural paintings and the removal of the cement plaster.

Today, the crypt still suffers from a high level of relative humidity (RH) and capillary rising damp; that cause a lot of problems to the painting materials, most of them are fragmented and hardly readable.

Climate conditions have also worsened due to heating by air-conditioned system and because of the continuous opening of the windows.



Salt flowering



Cement plaster



Decay caused by capillary rising damp



Plaster detachment



Capillary rising damp



Granite erosion

METHODS

As a high level of humidity causes an irreversible damage to the mural paintings, an indoor microclimate monitoring (T and RH) has been carried out in the crypt from summer 2008 to spring 2009 with the purpose of obtaining information on the microclimate variations.

The data has been collected using EasyLog Datalogger (EL-USB-2, RH/TEMP DATA LOGGER, Lascar), a portable measuring instrument set at 5 minute intervals for a total of 288 measurements a day, in order to investigate the seasonal trends and the daily ranges of T and RH.

The study included scientific investigations on the state of conservation of mural paintings and stone materials too.

The samples have been analysed using optical microscopy, scanning electron microscopy with microanalysis and X-ray diffractometer.

RESULTS

The results of the *microclimatic monitoring* confirm the critical situation of the indoor environment.

In all seasons the average humidity is above 60% while the daily variations are over 10%; in particular, during summer and autumn daily fluctuation reaches 20% while in spring and winter these are considerably lower.

Sometimes the average RH is over 90%.

The temperature varies within the recommended range of minimum 6°C in winter and maximum 25°C in summer.

RESULTS

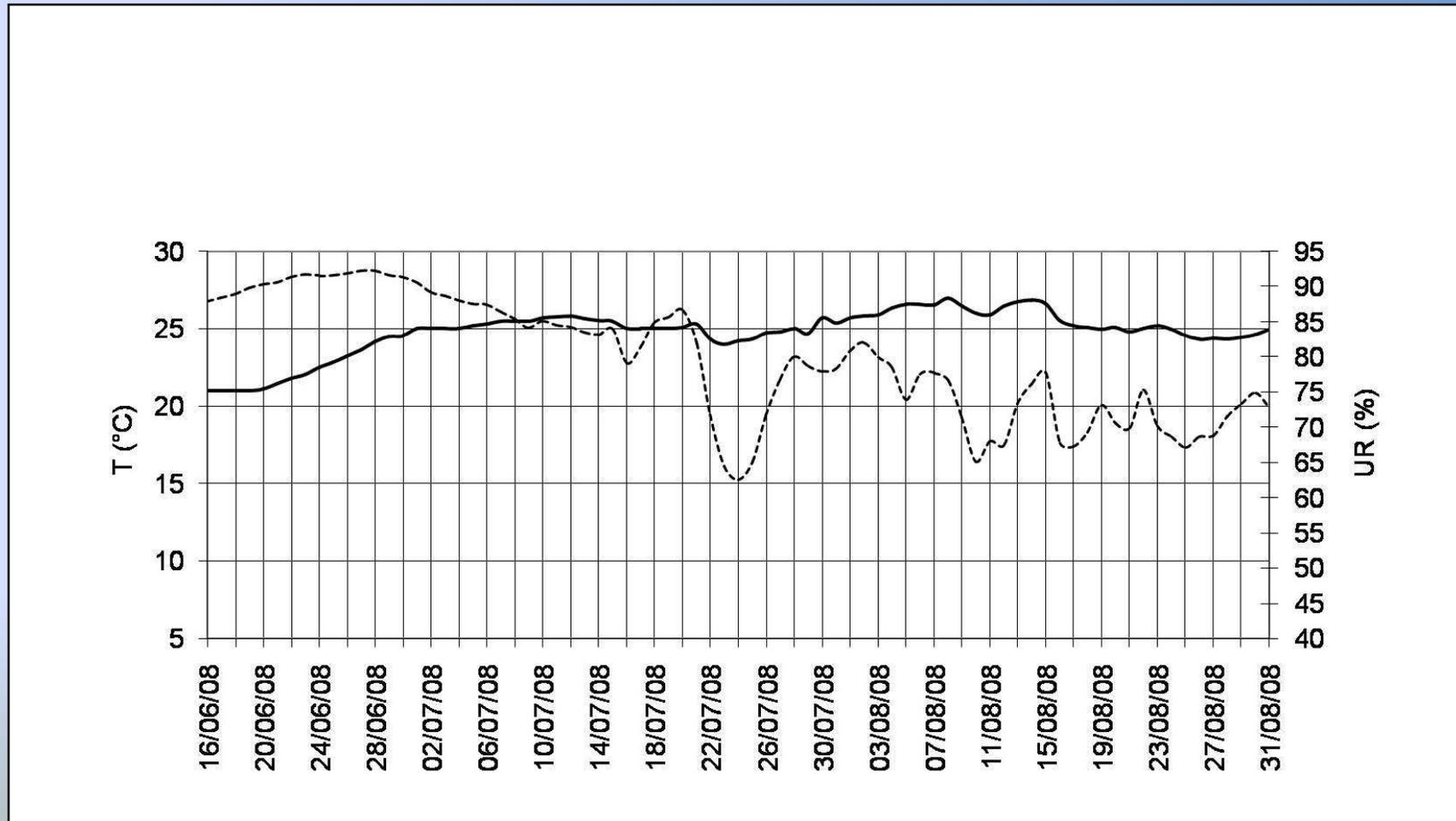
The data have been compared with the D.M. 10/05/2001 (*Technical and scientific criteria and standard operations and development for museums*) which suggests a humidity of 45-60% for mural paintings, a minimum temperature of 6°C in winter and a maximum in summer of 25°C with a daily gradient of 1,5°C/h.

Concerning the investigation results the preparation of mural paintings is composed by carbonatic plaster with a coarse aggregate.

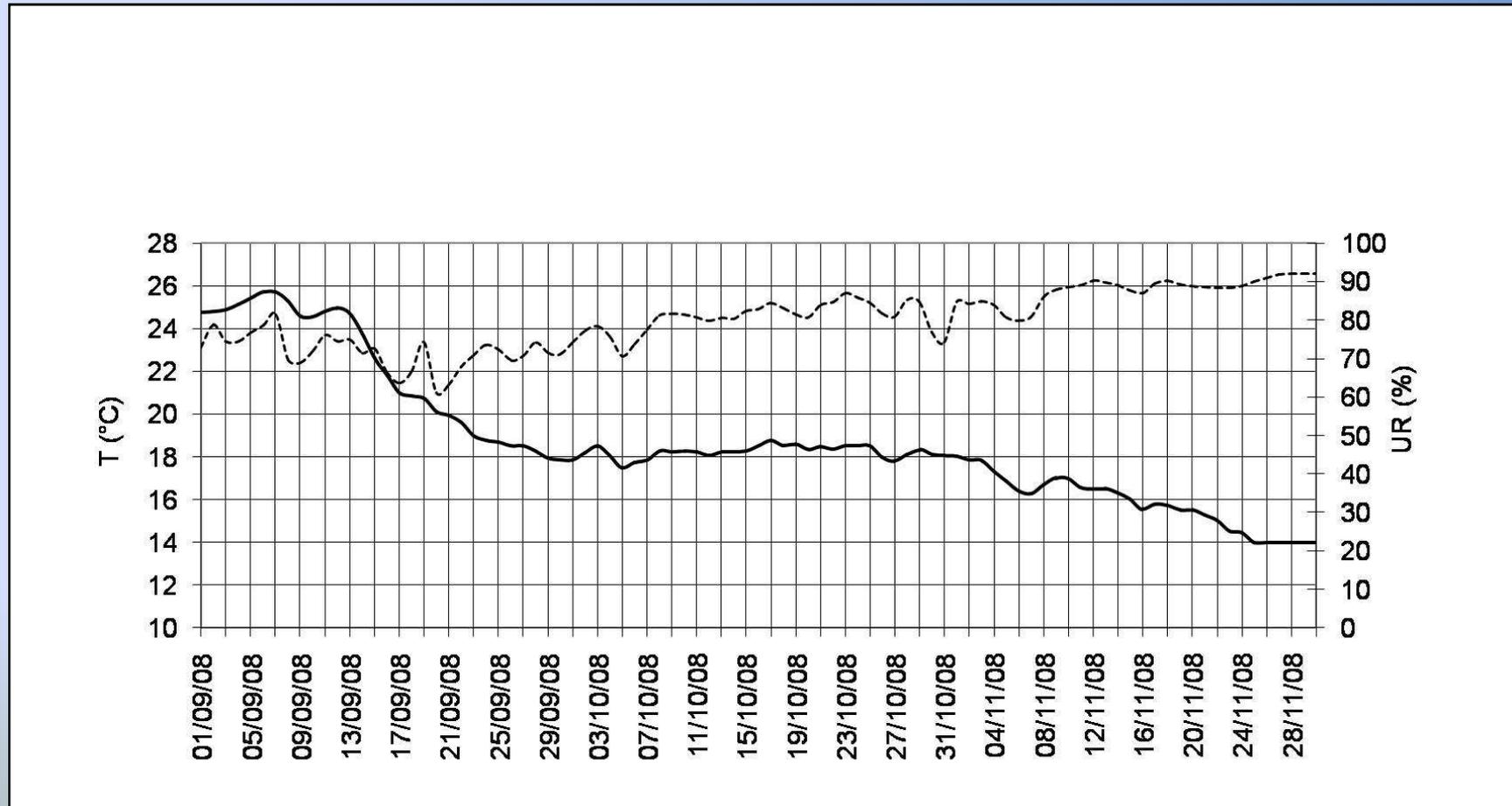
The mural paintings have been painted on nearly-dry plaster by a *mezzo-fresco* technique using red, green and yellow ochre with particles of black carbon.

The stone used to realized the columns is granodiorite excavated from Sardinia island.

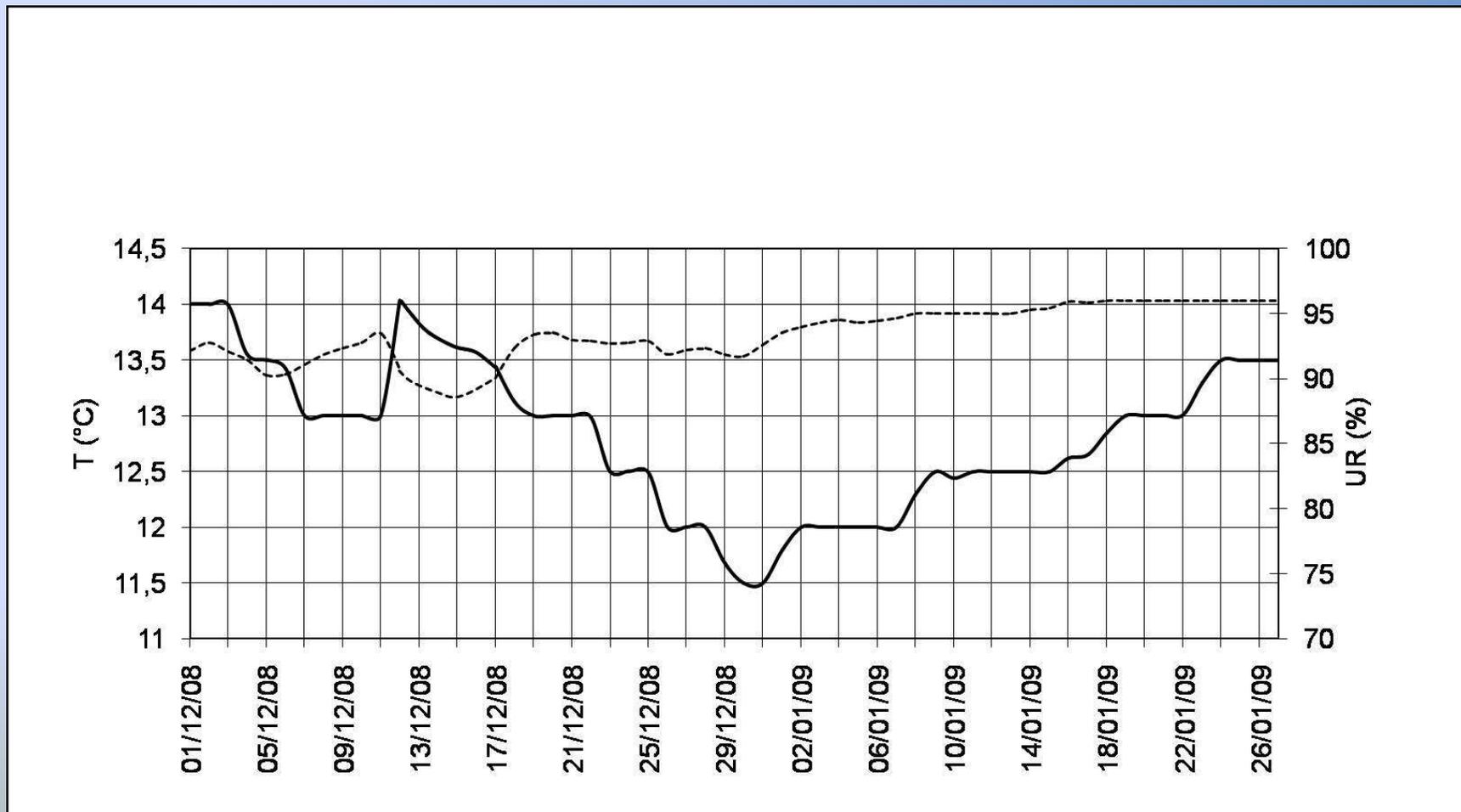
Temperature (T-continue line) and Relative Humidity (UR-dotted line) monitoring in summer



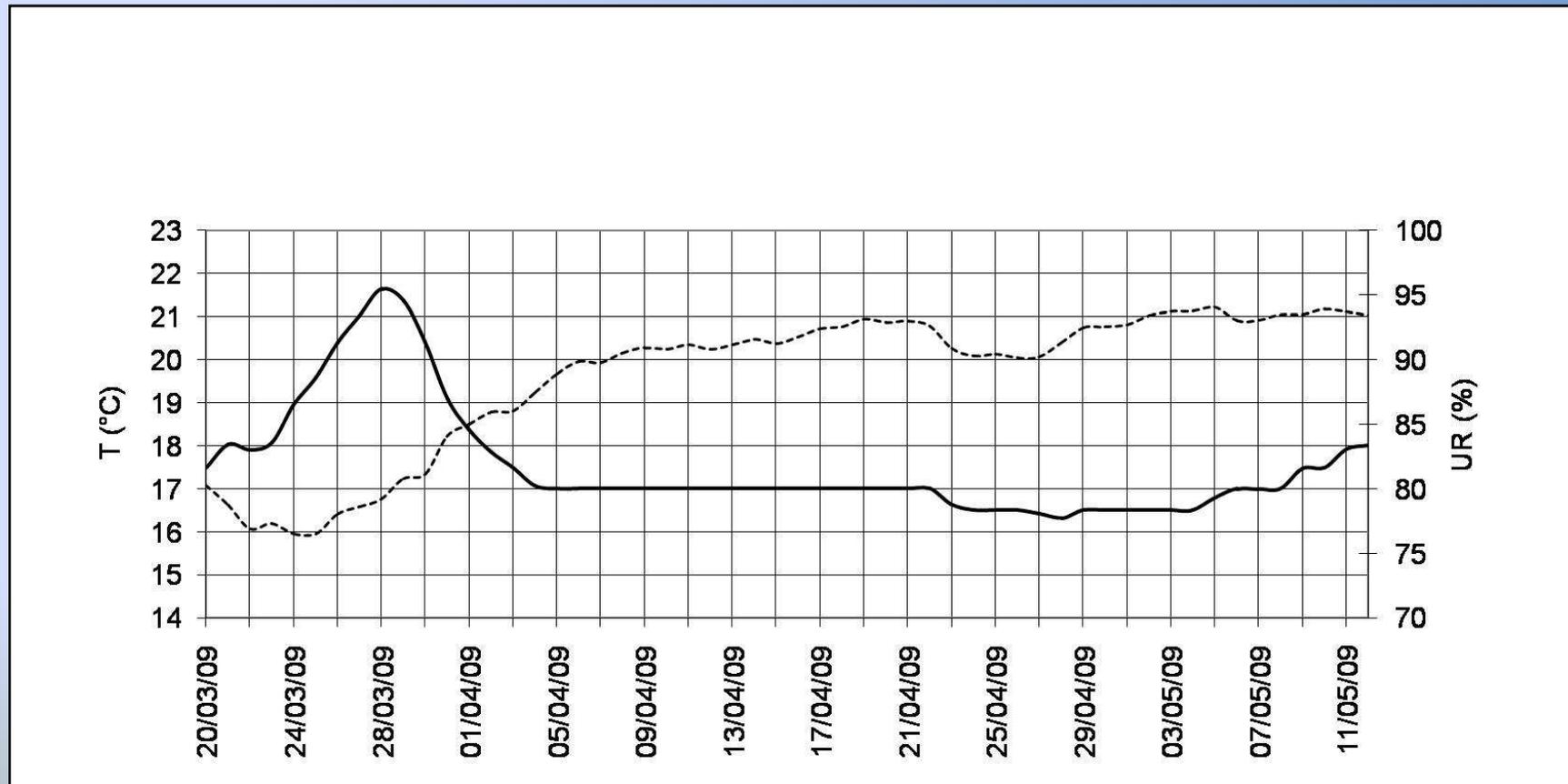
Temperature (T-continue line) and Relative Humidity (UR-dotted line) monitoring in autumn



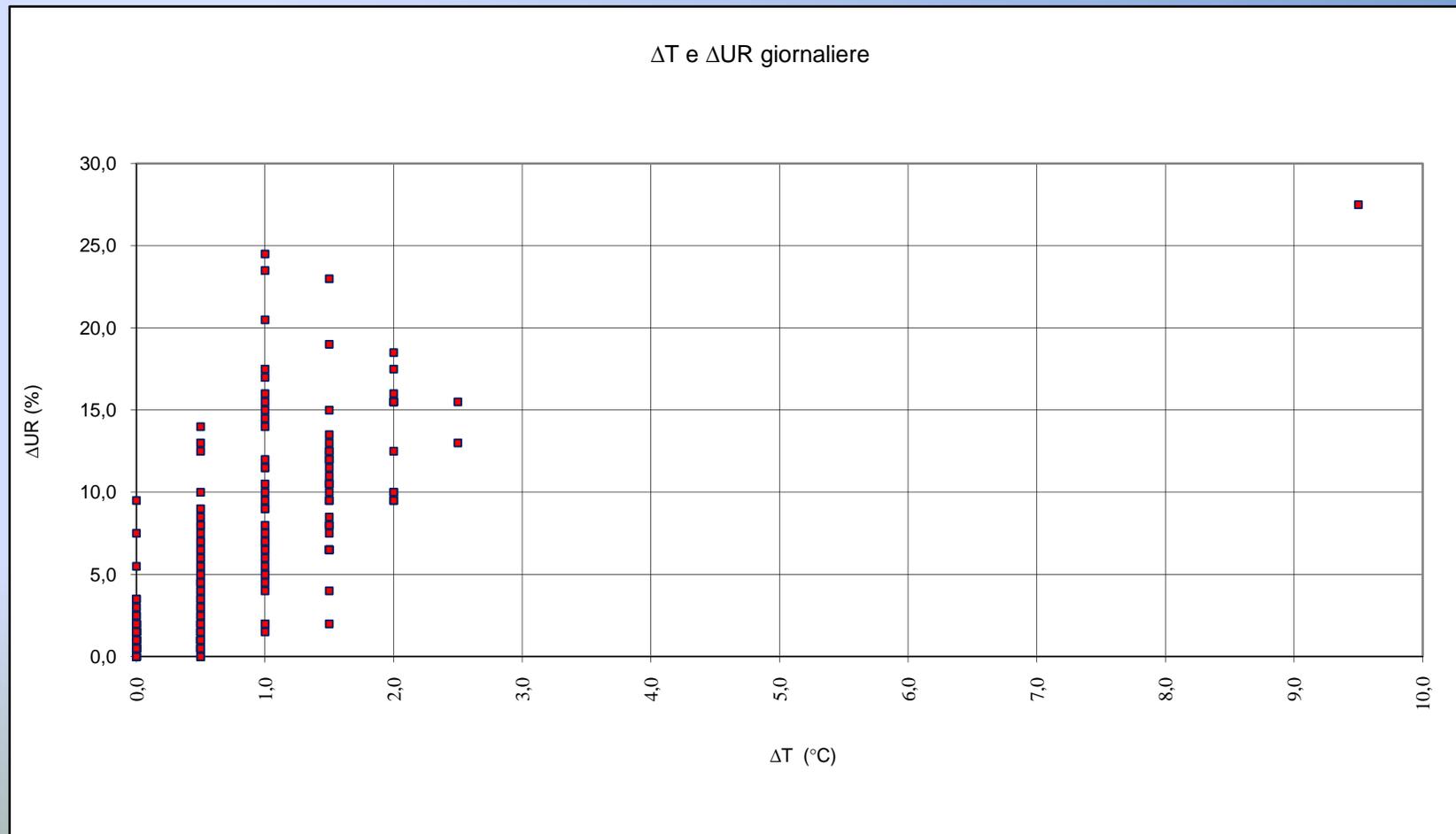
Temperature (T-continue line) and Relative Humidity (UR-dotted line) monitoring in winter



Temperature (T-continue line) & Relative Humidity (UR-dotted line) monitoring in spring

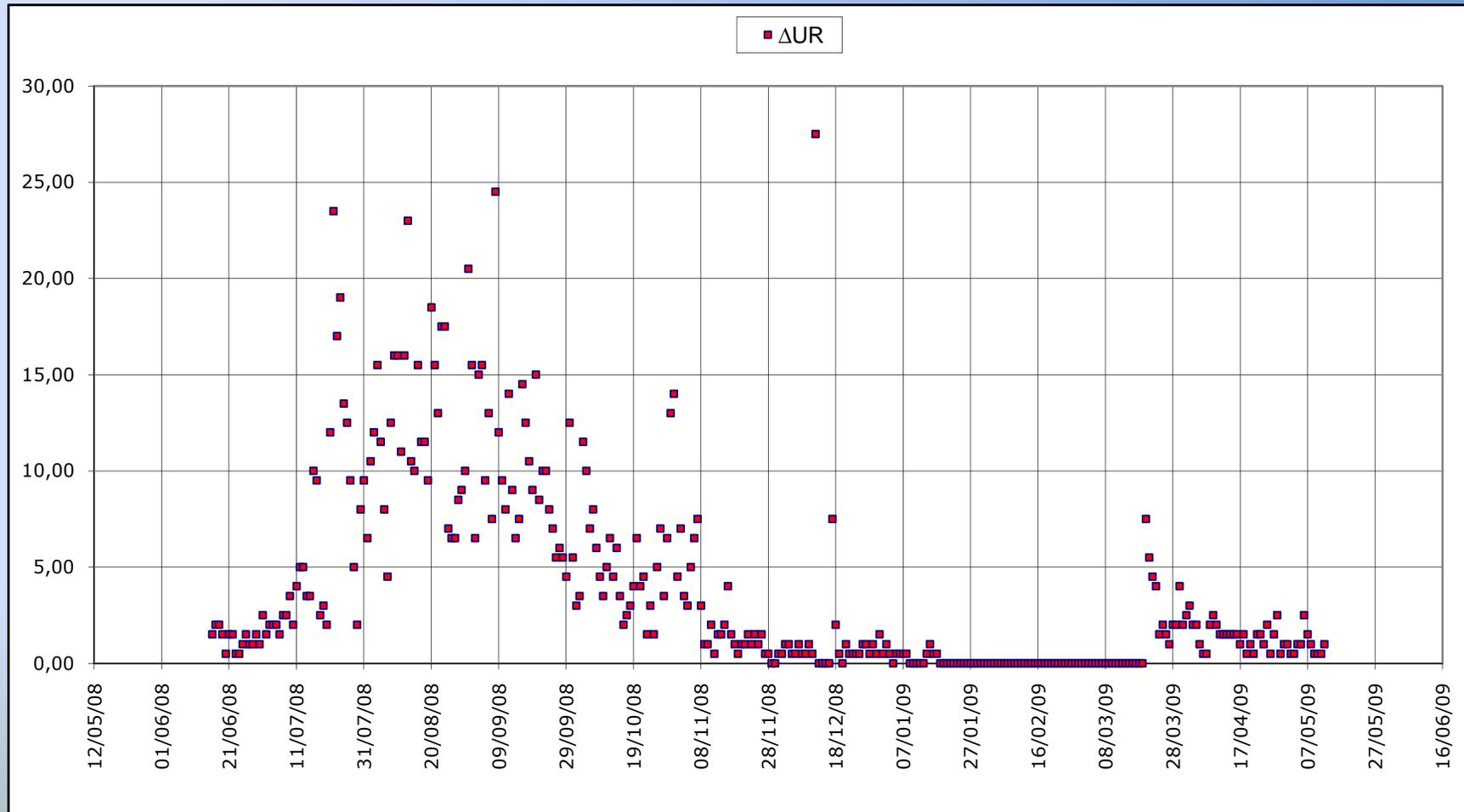


Temperature and Relative Humidity daily variations (16 June 2008-12 May 2009)



Relative Humidity daily variations

(16 June 2008-12 May 2009)



CONCLUSION

The high level of RH registered during the whole monitoring period is closely-related to the contact of the walls with the ground as the crypt is located in the basement.

The microclimate data indicate that the indoor conditions of the crypt are not suitable for the conservation of mural paintings. The use of a coarse aggregate and the scarce penetration of the pigment in the plaster may have contributed, together with a high level of humidity, to the irreversible damage of the mural paintings.

This study represents the beginning of a preventive conservation policy that will guarantee the most suitable environment to the oldest crypt in Pesaro and will provide useful data for the preview maintenance and restoration intervention.

REFERENCES

- E. Russo, *Testimonianze monumentali di Pesaro in Pesaro tra Medioevo e Rinascimento*, a cura di Maria Rosaria Valazzi, Venezia, 1989, pp. 128-129
- D.M. 10/05/2001: *Atto di indirizzo sui criteri tecnico - scientifici e sugli standard di funzionamento e sviluppo dei musei*, ambito VI, *Gestione e cura delle collezioni*, sottoambito I, *Conservazione e restauro*, punto 2.6 *Valori di riferimento per assicurare le condizioni ottimali di conservazione dei manufatti*.
- A. BERNARDI, *Conservare opere d'arte. Il microclima negli ambienti museali*, Padova, Le Pleiadi, 2003, pp. 9-10, 12, 19, 80-81, 98-99