

## Microclimatic monitoring for the assessment of the conservation conditions of the stucco statues in the UNESCO site of the Longobard Temple in Cividale del Friuli – Udine (Italy)

Adriana Bernardi<sup>1</sup>, Alessandra Quendolo<sup>3</sup>, Francesca Becherini<sup>1</sup>, Maria C. Di Tuccio<sup>1,2</sup>, Arianna Vivarelli<sup>1</sup>

- 1) National Research Council – Institute of Atmospheric Science and Climate, C.so Stati Uniti 4, 35122, Padua, Italy
- 2) University of Milano, Department of Physics, Astrophysics and Applied Physics, via Celoria 16, 20133 Milano, Italy, E-mail: MC.DiTuccio@isac.cnr.it
- 3) .....

The Longobard Temple, built around the middle of the 8<sup>th</sup> century, is part of wider complex including the Saint Maria in Valley monastery edified in the following centuries, located in Cividale del Friuli - Udine (Italy). Both the temple and the monastery have been declared by UNESCO world heritage sites in 2011.

The Temple constitute one of the few extraordinary testimonials preserved of the Longobard architecture, testify also by the six saints in high relief placed leaned to the west wall side by side in ternary groups, to the right and to the left of the blind lancet window.

A microclimatic monitoring of the temple was performed between 2011 and 2012 by the Padova Unit of the Institute of Atmospheric Sciences and Climate, as part of the diagnostic project promoted by the City Council of Cividale del Friuli, in order to investigate the causes of the different damage features affecting the statues on the two sides of the west wall and to eventually identify suitable actions for the improvement of the current conservation conditions.

In order to assess the microclimatic conditions, air temperature and relative humidity were recorded automatically for one year nearby the two central female figures. In addition, seasonal thermographic measurements were carried out to evaluate the thermal variations of the material and then they were compared to the microclimatic measurements. Furthermore some anemometers were installed in strategic points of the Temple for the automatic monitoring of the movement of the air masses to evaluate the impact of the air masses on the statues.

The results of the microclimatic monitoring of the Longobard Temple showed that the different conservation conditions of the statues at the two sides of the west wall cannot be directly related to the actual microclimatic conditions. They could be more reasonably related to the history of the Temple (it seems that in the past they have been exposed to weather impact) and to past restoration works.

In fact, according to the microclimatic results, the two sides of the west wall are subjected during the course of the year to similar daily thermal variations, even if in different seasons, due to the natural course of solar radiation during the whole year.

Moreover, the movement of air masses observed and also simulated by means of a fluid-dynamic model resulted to have a different impact on the two wall sides. Nevertheless, this phenomenon can be more properly related to the risk of airborne particle deposition processes.

In conclusions, the actual microclimatic conditions cannot be considered responsible for the different conservation conditions of the statues of the two sides of the west wall, but, if not improved, they could have a different impact on the statues that have different state of conservation.