

## **CFD Modeling as Analysing Method for the Conservation Studies.**

### **A case study: the Domus Aurea in Rome.**

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The Domus Aurea, built under the Emperor Nero between the 64 and 68 century d.C., was the most important imperial residence of the ancient Rome. Today only a part remains, survived because it was used as foundations of the Traiano's thermal baths. It is known with the name of Pavilion of the Opium Hill, it measures in plant 250x60m, and it is located under the garden of the Opium Hill. Now, it represents therefore a complete hypogeum structure. Its position and the presence of numerous openings put it in contact with the external atmosphere and this situation has caused great problems of decay of the masonries and frescoes. In fact, the variations of the external climate have influenced the inner microclimate. For studying in details the inner microclimate and its variations it has been predisposed a monitoring program to evaluate the behaviours for a year of the relative humidity (RH), air temperature (Ta) and the velocity of the air flows (v).

Because of the complexity of the structure and its vulnerability at the external climatic variations, it was clear that the number of the probes was not sufficient for a complete punctual analysis. Therefore, it is chosen to carry out a fluid dynamic study through the CFD analysis (Computational Fluid Dynamic), where the measured data was used as initial conditions for the simulations. In particular, the microclimate of the Gilded Hall and the influence of the solar irradiation in the Octagonal Hall has been chosen like case studies, considering their artistic importance and a good number of data from the monitoring.

After a validation of the simulations by comparison with conservative problems, present in the Halls, the CFD simulation were used to suggest intervention ways to preserve the precious frescoes and structures inside the Domus Aurea.

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