EXPERIMENTATION AND MODELLING OF HISTORICAL STRUCTURES

Research group: **Giovanni Castellazzi**, Camilla Colla, Alberto Custodi, **Stefano de Miranda**, Elena Ferretti, Cristina Gentilini, Luisa Molari, Lucio Nobile, Giovanni Pascale, Lino Sciortino, Francesco Ubertini, Erasmo Viola

KEYWORDS: radar tomography, sonic tomography, FEM simulations, structural rehabilitation

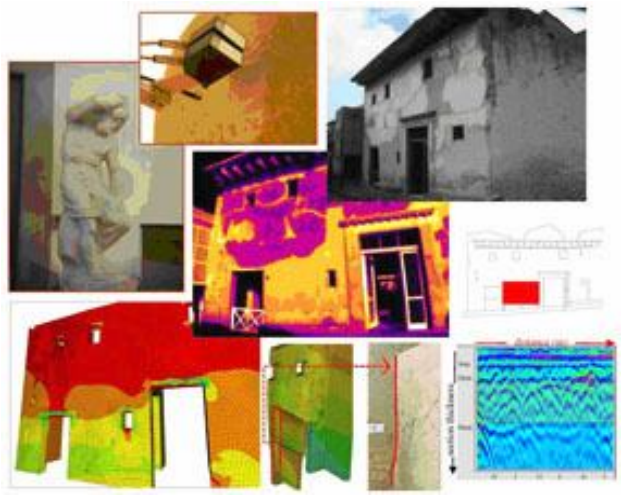

Fig.1 Cases of experimental testing and numerical modeling

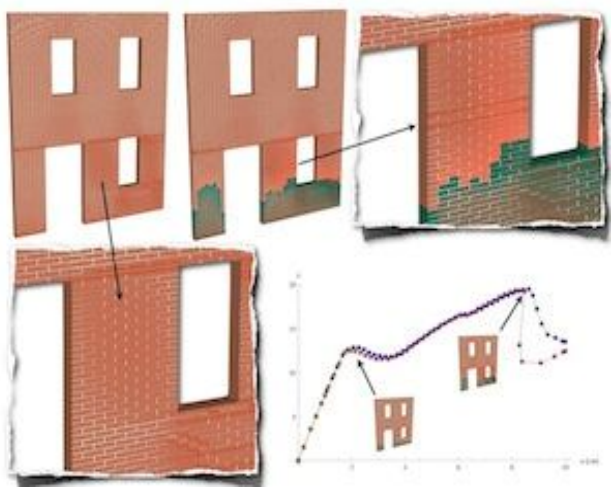

Fig.2 Effect of salt diffusion in masonry on damage evolution

This research line deals with the analysis, preservation and rehabilitation of historical structures. In particular, the research focuses on techniques for the health state evaluation and monitoring of historical structures. The research is supported by means of advanced modeling for structural analysis of historical constructions. Solutions based on innovative materials and technologies for structural rehabilitation are developed and tested.

Some aspects of this research are briefly outlined:

- radar and sonic tomography, ultrasonics, impact echo and other NDT methods for assessment of structural elements made of brick, stone, wood and concrete belonging to architectural heritage, buildings and infrastructure;
- microelectronic and optical sensors for structural health monitoring;
- advanced structural modelling and computer simulation of historical monuments and buildings;
- advanced modeling of coupled problems in masonry such as salt diffusion in masonry walls;
- development, mechanical characterisation and improvement of fibrous composites with polymer or cementitious matrix;
- technologies for restoring ancient structural elements made of masonry, stone, wood, concrete and steel.

Links

giovanni.castellazzi@unibo.it
stefano.demiranda@unibo.it
www.lamc.ing.unibo.it
www.gis.ing.unibo.it
www.larm.ing.unibo.it

MAIN PUBLICATIONS

G. Castellazzi, S. de Miranda, G. Formica, F. Ubertini. (2010). Fully coupled diffusion-damage analysis in historical masonry walls, XVIII Convegno Italiano di Meccanica Computazionale - GIMC 2010, pp. 1-4.

C. Colla, S. de Miranda, F. Ubertini. (2008). On site diagnostic investigations for the assessment of the Casa del Tramezzo di Legno, in Herculaneum, International RILEM Conference On Site Assessment of Concrete, Masonry and Timber Structures - SACoMaTiS2008, pp.945-954.

C. Colla, A. Largo, P. Corvaglia, F. Ubertini. (2008). Thermography investigation of Roman archaeological masonry, International RILEM Conference On Site Assessment of Concrete, Masonry and Timber Structures - SACoMaTiS2008, pp.923-932.

E Ferretti, E. Casadio, A. Di Leo. (2008). Masonry Walls under Shear Test: a CM Modeling, COMPUTER MODELING IN ENGINEERING & SCIENCE (CMES), Vol. 30, No. 3, pp. 163-190, 2008.

G. Castellazzi, A. Custodi, L. Sciortino, A. Vagnetti, C. Colla, S. de Miranda, F. Ubertini, (2008). Modellazione e simulazione di strutture archeologiche in area vesuviana, Convegno Internazionale VESUVIANA, Bologna, 14-16 Gennaio 2008.

G. Castellazzi, C. Colla, S. de Miranda, G. Pascale, F. Ubertini.(2008). Diagnostica e modellazione per l'analisi strutturale di costruzioni romane nell'area Vesuviana, Convegno Internazionale VESUVIANA, Bologna, 14-16 Gennaio 2008.

G. Castellazzi, A. Custodi, S. de Miranda, L. Sciortino, F. Ubertini, (2008). Pompei, Insula del Centenario [IX, 8]: metodologie per il trattamento informatizzato di dati e loro diffusione in rete, Con. Int. VESUVIANA, Bologna, 14-16 Gen. 2008.

C. Colla, G. Pascale, (2007). Prove soniche superficiali per l'indagine dello stato fessurativo di murature in laterizio, Conferenza Nazionale sulle Prove non Distruttive, Milano, 11-13 ottobre 2007.

A. Custodi, L. Sciortino, G. Castellazzi, (2006). Multidisciplinary data collection for structural analysis: application to the studies for conservation and restoration of the "Insula del Centenario" [IX, 8] in Pompeii. V Int. Conference on Structural Analysis of Historical Constructions, Vol. 3, pp. 1859 - 1866.

A. Custodi, L. Sciortino, (2006). Survey, analysis and structural modelling of ancient masonry building: the case of the "Insula del Centenario [IX, 8]" at Pompeii. V Int. Con. on Struct. Analysis of Historical Constructions, Vol. 3, pp. 1851 - 1858.

C. Colla, G. Pascale, (2006), Non-Destructive Defect Location and Sizing in Concrete Columns and Masonry Pillars from Impact-Echo Testing, Structural Faults + Repair-2006, 13th - 15th June 2006, Edinburgh, Scotland, UK.

T. Stratford, G. Pascale, O. Manfroni, B. Bonfiglioli, (2004). Shear strengthening masonry panels with sheet GFRP, ASCE JOURNAL OF COMPOSITES FOR CONSTRUCTION, Vol. 8(5), Sept./Oct. 2004, 434-443

RESEARCH PROJECTS

- 3ENCULT - Efficient Energy for EU Cultural Heritage, FP7-2010, Collaborative EU project. Project Ref.: 260162.
- SMooHS - Smart Monitoring of Historical Structures, FP7-2008, Collaborative EU project. Project Ref.: 212939.
- Homogenization of elementary cells of masonry by means of the Cell Method, PRIN2006 - Research Unit of Bologna, coordinator: Prof. A. Di Leo.
- From survey to structural analysis of Roman constructions in the Vesuvio area, PRIN2005 - Research Unit of Bologna, coordinator: Prof. F. Ubertini.
- Pompei, Insula IX 8: experimentation and modeling of materials and structures, PRIN2003 - Research Unit of Bologna, coordinator: Ing. A. Custodi.

ALMA MATER STUDIORUM • UNIVERSITÀ DI BOLOGNA
VIALE DEL RISORGIMENTO, 2 - 40136 BOLOGNA - ITALIA - TEL. +39 051 2093237 - 2093502 - FAX +39 051 2093253
VIA TERRACINI, 28 - 40131 BOLOGNA - ITALIA - TEL. +39 051 2090312 - FAX +39 051 2090322
www.dicam.unibo.it