The Dome of the Siena Cathedral: Monitoring and Structural Analysis

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Abstract The paper reports the results of a recent experimental survey aimed at assessing the static behaviour of the masonry dome of the Siena Cathedral (Italy). This Dome, an irregular polygonal masonry structure, includes an internal layer (thickness 45 cm and diameter 15.5 m) and an external one (thickness 15 cm and diameter about 18.5 m). The internal and external layer are connected by 40 horizontal stone trusses disposed along the radial direction. The research activities were motivated by the fact that the most part of these connecting stones were cracked. In order to assess the static safety of the building, an experimental in-situ investigation was planned and the results of the experimental survey were used to define a numerical model able to reproduce, as closely as possible, the actual behaviour of the building. The comparison between measurements and model results allowed for the validation of main assumptions adopted in the numerical model and with the identified model it was possible both to offer a preliminary explanation of the observed fault and to propose some restoration works.

Keywords numerical modelling, static assessment, dynamic assessment, finite element modelling.