About benefits and limitations of Finite Elements and Thrust Network in analyzing homogeneous masonry domes: the case study of the Temple of Diana in Baiae

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Abstract: The temple of Diana in Baiae represents one of the most important examples of masonry dome built in ancient times; presenting a very peculiar ogival shape, partially collapsed, is built in Opus Caementitium. In order to assess the structural vulnerability of such an important vestige, the present contribution aims to investigate the performance of different analysis strategies: the Trust Network Analysis (TNA) and classical Finite Elements (FEM). While TNA proved to be very efficient for masonry structures presenting well-defined structural elements (rock blocks) the continuous nature of the roman concrete cast does not permit an univocal and effective discretization of the network.
On the other hand, while FEM are generally very efficient in analyzing continuous elements, their solution is strongly influenced by external boundary conditions that, because of ground settlements due to bradyseism, represent a critical action for the present case study. A numerical comparison between the outcomes of both strategies in presence of different external actions will present an insight on the limitations and the benefits of these analytical methodologies.