

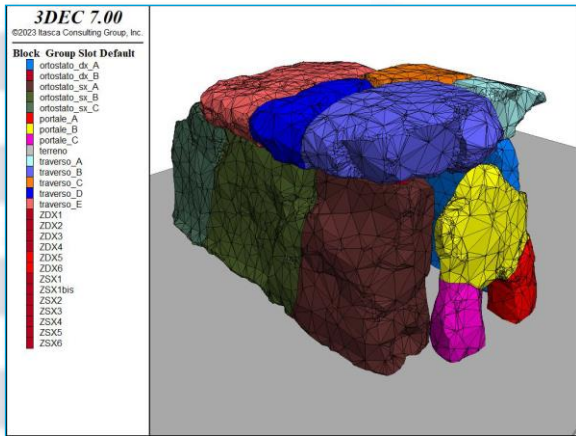
Structural analysis of megalithic complexes with 3D discrete elements modeling

Motivations and aims

The Sa Covaccada Dolmen is an archaeological complex located in the region of Sardinia. This monument dates back to the period between 3000 and 2000 B.C. It holds significant importance both for its size and for its role in the evolution of burial architecture in the Mediterranean Area. Unfortunately, the rear block and its covering have been lost. After a first restoration work in 2011, the monument is protected by a structure designed to preserve it from the elements. Due to extensive damage, further restoration works are still needed, including the assessment of structural stability.



Methods and results



Structural analyses were carried out with a three-dimensional approach of the discrete element method (DEM), using 3DEC software. Geometric modeling was automated using the digital model obtained from the in-situ survey. Regarding mechanical modeling, reference was made to formulas and values found in the literature, since limited experimental results were available. Stability was evaluated by determining a pseudo-collapse multiplier, defined as the ratio between the vertical acceleration activating the collapse mechanism and the gravity. The analysis provided an estimate of the pseudo-collapse multiplier of the Dolmen greater than four, indicating a good structural stability. The collapse mechanism, evidenced by the divergence of displacements, is activated in the configuration without portal and without ashlar resting entirely on the two orthostats.

Conclusions and future developments

Comparing the results with those of two-dimensional analyses, it was noted that the latter underestimated the stability of the monument, thus highlighting the importance of considering the overall geometry of the dolmen in assessing its stability. The definition of mechanical properties is a limiting aspect, often made complex by the need for experimental tests for accurate calibration, which is not always feasible or allowed.

