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Corner failure in masonry buildings: an updated macro-modeling approach with frictional resistances

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Abstract. *The failure mode of a free corner in masonry buildings, still studied by few models, is one of the most common failure mechanisms occurring and clearly recognizable in the aftermath of a seismic event. It is characterized by the formation of a masonry wedge, mainly due to the thrust of roof elements in addition to inertial forces, and it generally involves rocking-sliding motions along the cracks on the interlocked orthogonal walls. The onset of this failure mode is herein analyzed by means of an upgraded macro-block model, based on the kinematic approach of limit analysis and accounting for the influence of frictional resistances on the collapse load multiplier and the related crack pattern. An original criterion weighting the role of rocking vs. sliding motion on the collapse load factor is developed and a formulation with general applicability is obtained. Several parametric analyses are performed in order to highlight the influence of symmetric and non-symmetric geometrical, mechanical and loading parameters (with and without openings) on the seismic capacity of the corner. The reliability of the proposed model and solution procedure is confirmed through the comparison with the results provided by other macro-block models existing in the literature. The final perspective is the next implementation of the proposed model in FaMIVE (Failure Mechanism Identification and Vulnerability Evaluation) applicative.*

Keywords: Limit analysis, 3D macro-block model, rocking-sliding failure, frictional resistances, interlocked orthogonal walls.