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# A Three-Scale Model for Flow in Paleo-Karst Reservoirs

*Tuesday, 1 June 2021 15:40 (15 minutes)*

A three-scale model for flow in karst conduit networks in carbonate rocks is constructed based on a reiterated homogenization procedure. The first upscaling, performed from the high-fidelity flow model, is based on a topological model reduction considering a discrete network of conduits. The subsequent macroscopization procedure projects the reduced model into the cells of a coarse computational grid, where homogenized equivalent properties are numerically constructed. Such a two-level upscaling gives rise to a macroscopic flow model characterized by mass-transfer functions between the geological structures. A notable consequence of the approach proposed herein is the appearance of a new karst index concept, based on the generalization of the traditional Peaceman's theory of well index, along with two skin factors. The former skin is of geometrical nature, and stems from non-circular cross-section, whereas the latter captures the presence of the damage zone arising from the presence of collapsed-breccia in the vicinity of the conduit network. Computational simulations are obtained by discretizing the coupled 1D/3D flow model by a Mixed Multiscale Method in its recursive form seated on a domain decomposition approach.

## Time Block Preference

Time Block B (14:00-17:00 CET)

## References

[1] MA Murad, TV Lopes, P Pereira, FH Bezerra, AC Rocha
A three-scale index for flow in karst conduits in carbonate rocks. Advances in Water Resources vol 141 (2020)

[2[ TV Lopes, .AC Rocha„ MA Murad, E L Garcia„ PA Pereira, CL Cazarin: A new computational model for flow in karst-carbonates containing solution-collapse
breccias. Computational. Geosciences. vol 24, (2019)

[3] RG Loucks. A Review of Coalesced, Collapsed-Paleocave Systems and Associated Suprastratal Deformation Acta Carsologica, vol 26 (2007)

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**Primary authors:** MURAD, Marcio (Laboratorio Nacional de Computacao Cientifica); PEREIRA, Patricia

(Laoratório Nacional de Compuitação Científica); Ms VALENTE, Sandro (LNCC/MCTI); FERRAZ, Paola (University of Campinas (UNICAMP)); ABREU, Eduardo (University of Campinas, Sao Paulo, Brazil)

**Presenter:** MURAD, Marcio (Laboratorio Nacional de Computacao Cientifica)

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