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# NUMERICAL MODELING OF A NATURAL CONVECTION PROBLEM IN A POROUS MEDIUM

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**Abstract**. The study of problems ruled by natural convection through obstacles is relevant in many areas of engineering. We found examples where the obstacles can be modeled explicitly (eg. heat exchangers) and examples where to consider the obstacles as a porous medium is appropriate (eg. core and winding of a power transformer). So, it is interesting to improve the understanding of natural convection around obstacles both for comparison with the case without barriers and to evaluate the behavior of porous media models.

In this paper, two-dimensional numerical solutions for a variant of the classical problem of natural convection in a square cavity (fixed temperature on the vertical walls and adiabatic horizontal ones) are presented. The cavity was divided into two regions separated by an imaginary vertical line. In the left region, the flow circulates freely. In the right region, the flow circulates through a medium consisting of an array of square rods and vertical channels (porous medium).

Results for different Rayleigh numbers in the laminar regime and for different geometries of the porous medium are presented. This allow to quantify the behavior of the phenomenon in terms of the porous medium parameters such as permeability and porosity. A stabilized finite element code is used to carry out the simulations.