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NUMERICAL SIMULATIONS OF PERIODIC STRUCTURES IN LAMINAR OSCILLATORY FLOWS

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Abstract. It is commonly found in literature the use of a unitary cell enforced with periodic boundary conditions to represent, for instance, the case of macroscopic flows in an infinite porous medium. The validity of the use of the Representative Elementary Volume in the calculation of time-dependant flows is discussed in this study. For that purpose, numerical solutions of 2D periodic cells formed by staggered square rods are analyzed. Three different cases are considered for each porosity or fluid/solid volume ratio: one unitary cell, 4 unitary cells and 9 unitary cells, respectively. The Reynolds number is set between 100 and 250 to cover steady laminar flow and the onset of the laminar oscillatory flow. Solutions for each case are compared to determine the influence of the domain's size in the numerical solution.