

# **Microstructure Measures and the Minimum Size of a Representative Volume Element: 2D Numerical Study**

Dariusz ŁYDŹBA and Adrian RÓŻAŃSKI

Wrocław University of Technology, Institute of Geotechnics and Hydrotechnics,  
Wrocław, Poland; e-mails: [dariusz.lydzba@pwr.wroc.pl](mailto:dariusz.lydzba@pwr.wroc.pl),  
[adrian.rozanski@pwr.wroc.pl](mailto:adrian.rozanski@pwr.wroc.pl) (corresponding author)

## **A b s t r a c t**

In the paper, a numerical study of the size of a representative volume element (RVE) for both the heat flow as well as the linear elasticity problems is presented. A particular two-phase random microstructure is studied and the method is applied to the digital image of reconstructed 2D realization of random media. The minimum size of RVE is determined by the investigation of the convergence of apparent properties as the size of RVE is increasing. Then, two estimates of the minimum RVE size are proposed and it is shown that the estimates are in a good agreement with the results determined by the investigation of the convergence of apparent properties. The minimum size of RVE can be successfully predicted based only on the microstructure morphology. The statistical measures used in this work are: the two-point probability and the lineal-path functions.

**Key words:** representative volume element, RVE, two-point probability, lineal-path.