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ACCEPTED MANUSCRIPT

# Numerical Determination of Hysteresis Friction on Different Length Scales and Comparison to Experiments

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**Abstract**

The interaction between tread materials of tires and rough pavement structures mainly depends on the characteristics of the road surface, the slip velocity, the contact pressure, temperature conditions and the elastomeric material itself. The subsequent description introduces two different numerical approaches, a three-dimensional multiscale homogenization methodology, which considers the asperities at different length scales of the surface texture and a microscale approach, which reduces the surface texture to a two-dimensional microscopic characterization. The results of the numerical approaches, which base on the same input information, are compared to experimental data in order to validate the outcome. Since local stress concentrations are the origin of wear, a realistic modeling of rubber friction on rough surfaces concerning different length scales of surface texture provides an important input to a subsequent modeling of wear of the tire tread as well as of the pavement asperities.

*Keywords:* Multiscale Friction, Dissipation, Finite Element Analysis, Computational Homogenization

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