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Numerical simulation of artificial and natural rough surfaces ROBIN ANDERSSON, Luleå University of Technology, PATRIK ANDREASSON, Vattenfall Research and Development, Luleå University of Technology, GUNNAR HELLSTRÖM, ANDERS ANDERSSON, Luleå University of Technology — Flow in hydraulic tunnels is characterized by high velocities, non-uniform and fluctuating distributions of pressure and velocity. Pressure fluctuations may in the long run lead to unwanted effects such as erosion and in extreme cases the complete collapse of a tunnel. Natural rough surfaces, such as in hydropower tunnels, typically have the property of self-similarity. When observing the surfaces from a far, a large scale roughness is visible, but when observed from a very short distance a similar pattern of surface roughness can be observed. One procedure when evaluating flow over rough surfaces is to account for the large scale roughness and replace the small scale roughness with numerical wall functions, the self-similarity is excluded and is replaced by a numerical shear stress. The objective for this work is to gain a deeper understanding the impact that the small scale roughness has on the flow. In this work simulations where performed on a rough surface from a laser scanned hydropower tunnel, the simulation was then compared with an artificially generated rough surface. The reported results include evaluation and comparison of the friction velocity and Reynolds-stresses. Also, a characteristic roughness length scale k_s is evaluated from the logarithmic law of the wall.

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