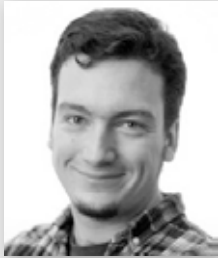


Pierre-Yves Henry



Department of Civil
and Environmental
Engineering

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Hydraulics of unlined tunnels: Numerical and analytical investigations

WP leader:
Nils Reidar B. Olsen
Project leader:
Jochen Aberle



Background

This project addresses the hydraulic resistance of unlined (rough) hydropower tunnels, essential both for power production and flood control. The determination of the hydraulic capacity of such tunnels requires the knowledge of friction factors whose determination is mostly based on empirical approaches. Thus, despite their significance, friction factors are considered as an uncertain component in the design of tunnel waterways.

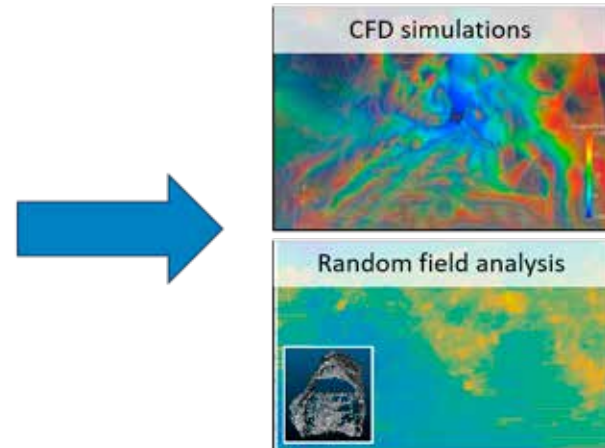


Courtesy: Kari Bråtveit & Hibbard Inshore.

Methodology and outcome

- Assessment of geometrical roughness using statistical analysis of tunnel topography and linking near-wall turbulent flow field features to tunnel roughness characteristics .
- Hi-res. 3D-numerical simulations validated by detailed PIV on the scale model data.

The Tunnel Roughness project is a Knowledge-building Project for Industry funded by the Norwegian Research Council and a consortium including NVE, TrønderEnergi, BKK and NVKS. More information and updates can be found at www.ntnu.edu/nvks/tunnelroughness



Courtesy: Mari Voll & Jie Quin.