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The usefulness of high-performance computing in small scale hydropower technology: Investigating the hydrodynamic effects of hydrokinetic turbines through validated CFD models

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Hydrokinetic energy generation devices within water infrastructure are becoming an ever-increasing alternative power source. In these applications the extent and characteristics of the downstream wake are of great importance. The vortex formation and diffusion of the wake has a complex formation and is dependent on numerous factors. Validated Computational Fluid Dynamics (CFD) models provide a detailed insight into these formations. These models allow analysis of the wake behaviour which are helpful in design and installation of these systems. Additionally, the effects of submergence depth and blockage ratio are also possible. Previously costly laboratory testing and simplified inaccurate numerical modelling was utilized due to the large computational resources needed to accurately simulate these applications. The presentation will discuss the simulations made possible through the CHPC resource, the challenges, success, and relevance of the results.

Student?

No

Supervisor name

Supervisor email

Primary author: Ms NIEBUHR, Chantel (University of Pretoria)

Co-authors: Mr DE WET, Christiaan (Aerotherm); Mr VAN DIJK, Marco (University of Pretoria)

Presenter: Ms NIEBUHR, Chantel (University of Pretoria)

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