Mechanical Engineering Department Seminar

3:35pm January 24, 2018
1130 Mechanical Engineering
111 Church Street SE, Minneapolis, MN 55455

Renewable Energy in Natural Rivers:
Opportunities for Applied and Basic Research

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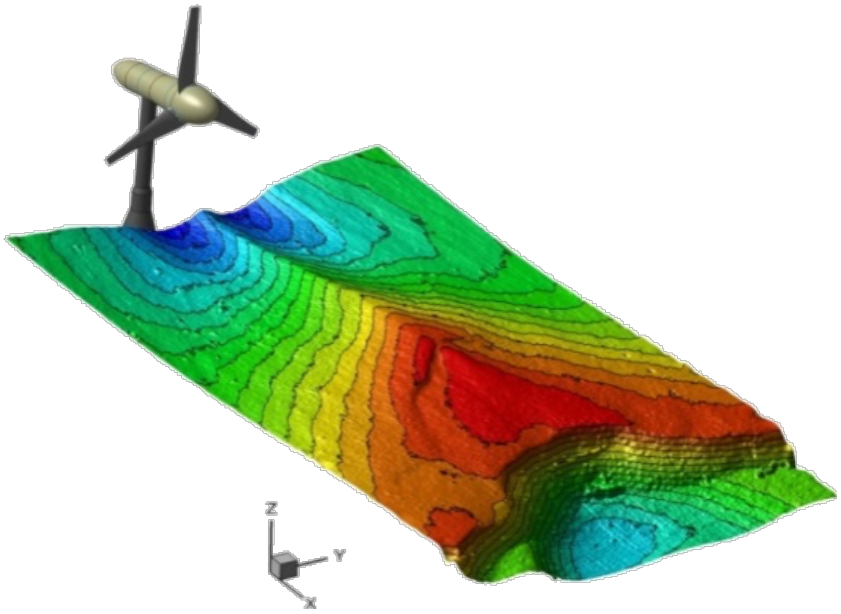
Energy production from renewable sources as wind, rivers or tidal streams poses new challenges with respect to conventional hydro-power. Not only the velocity of the flow impinging on the energy extracting device is varying in time but also the boundary conditions may be subject to slow variations. One example is the scour-depositional patterns occurring around in-stream horizontal axis turbines in rivers, or the effect of migrating sediment waves approaching the turbine rotor plane. I will present experimental results on the interactions between turbulent boundary layer flows, turbine wakes, and sediment transport, designed to quantify the effects of turbine siting on both energy performance and erodible channel morphodynamics. I will also discuss how far these hydrokinetic energy converters exhibit a similar behavior as compared to wind turbines, and thus how much they could profit from better control strategies. The work of PhD students Kevin Howard, Craig Hill, Mirko Musa, Michael Heisel is gratefully acknowledged.



Bio: Michele Guala is interested in the physical mechanisms governing basic and environmental fluid mechanics. His research activities cover a wide range of scales and phenomena – from geophysical flows to vortex dynamics and particle-turbulence interactions – and relate to many different environments, from the Utah desert to Alpine glaciers. As an experimentalist, he plans to develop novel measuring techniques and statistical tools for data analysis for both wind tunnel and field work in the atmospheric surface layer. Guala's research at SAFL is on the mutual interactions between the large scales of turbulence, topographic perturbations, sediment transport, and near-surface processes. Practical applications involve stream restoration projects, optimization of hydrokinetic devices, and sustainable energy production with wind turbines.