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Analysis of the Vortex-Decay Process in the Kármán Street[1] FERNANDO PONTA, Michigan Tech University — In this talk we shall explore the effect of viscosity upon the vorticity distribution and rate of decay of vortex cores in the Kármán vortex street behind a circular cylinder. We used direct numerical simulation data, which we contrasted against well-known experimental measurements. By decomposing the incompressible velocity field in its solenoidal and harmonic components, we identified the eddy structures associated with the formation, shedding and rearrangement of the vortices into the Kármán street. We then follow their evolution during the subsequent decay process. This allowed us to extend the conclusions of the partially-viscous model of Hooker (1936), who assumed several simplifying hypothesis: initial infinite-length filament-vortex wake, circular Lamb vortices of equal age at subsequent times, and no overlapping of the vortex cores. We found that the vortex cores exhibit a Gaussian vorticity profile, and a vorticity-stream function scatter-plot clearly consistent with the Lamb-vortex model. The vorticity peak on the core decays downstream with the systematic hyperbolic law given by Lamb's solution, with a rate of decay determined by the amount of circulation contained into the core at the early stages of the street formation.

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Fernando Ponta
Michigan Tech University

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