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**A numerical study of the laminar necklace vortex system and its effect on the wake for a circular cylinder** GOKHAN KIRKIL, Kadir Has University, GEORGE CONSTANTINESCU, University of Iowa — Large Eddy Simulation is used to investigate the structure of the laminar horseshoe vortex (HV) system and the dynamics of the necklace vortices as they fold around the base of a circular cylinder mounted on the flat bed of an open channel for Reynolds numbers defined with the cylinder diameter, D, smaller than 4,460. The study concentrates on the analysis of the structure of the HV system in the periodic breakaway sub-regime which is characterized by the formation of three main necklace vortices. For the relatively shallow flow conditions considered in this study (H/D 1, H is the channel depth), at times, the disturbances induced by the legs of the necklace vortices do not allow the SSLs on the two sides of the cylinder to interact in a way that allows the vorticity redistribution mechanism to lead to the formation of a new wake roller. As a result, the shedding of large scale rollers in the turbulent wake is suppressed for relatively large periods of time. Simulation results show that the wake structure changes randomly between time intervals when large-scale rollers are forming and are convected in the wake (von Karman regime), and time intervals when the rollers do not form.

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