Flow–blade interaction in a Vertical Axis Wind Turbine
ROBERTO DOMINGUEZ, SAUL PIEDRA, EDUARDO RAMOS, Universidad Nacional Autonoma de Mexico — We present an analysis of the interaction between an incoming wind and three airfoils symmetrically located, and free to rotate around a common axis. The geometrical configuration considered is a two dimensional model of Vertical Axis Wind Turbine. The model is based in the conservation equations of the fluid coupled with the Newton-Lagrange equations for the interaction with the airfoils. The presence of the rigid body in the fluid is simulated using immersed boundary conditions. The interaction of the wind with the airfoil located further upstream generates a force on the airfoil and vortices that are swept downstream and collide with the other airfoils. This effect generates a complex interplay of dynamical forces whose resultant is a torque that sets the system in motion. We describe the flow around the airfoils and examine the efficiency of the system as a function of geometric variables. Our conclusions are potentially useful for the design of VAWT's.

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