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Electro-hydrodynamic force field and flow patterns generated by a DC corona discharge in the air.[1] NICOLAS MONROLIN, FRANCK PLOURABOUE, OLIVIER PRAUD, None — Ionic wind refers to the electro-convection of ionised air between high voltage electrodes. Microscopic ion-neutral collisions are responsible for momentum transfer from accelerated ions, subjected to the electric field, to the neutral gas molecules resulting in a macroscopic airflow acceleration. In the past decades it has been investigated for various purposes from food drying through aerodynamic flow control and eventually laptop cooling. One consequence of air acceleration between the electrodes is thrust generation, often referred to as the Biefeld-Brown effect or electro-hydrodynamic thrust. In this experimental study, the ionic wind velocity field is measured with the PIV method. From computing the acceleration of the air we work out the electrostatic force field for various electrodes configurations. This enables an original direct evaluation of the force distribution as well as the influence of electrodes shape and position. Thrust computation based on the flow acceleration are compared with digital scale measurements. Complex flow features are highlighted such as vortex shedding, indicating that aerodynamic effects may play a significant role. Furthermore, the aerodynamic drag force exerted on the electrodes is quantified by choosing an appropriate control volume.

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