# *DRAG FORCE ON A HEATED SPHERE*

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The law developed by G.G. Stokes 150 years ago for the motion of a sphere in a fluid is used extensively ever since in various fields of physics and engineering. It presents, for example, a basis for the low Reynolds number hydrodynamics and aerosol physics, where the behavior of small particles and droplets is determined using the Stokes law. We examine here the validation of the Stokes formula for the case of mixed convection when non-isothermal conditions are considered.

We present novel experimental results on the hydrodynamic force acting on a small sphere at low Reynolds numbers. The sphere is suspended in an electrodynamic chamber (EDC). The experimental method developed by the authors, described in detail in a previous work, is based on levitation of a small single sphere (that is, in the order of a hundred microns in diameter or less) inside a three-dimensional electrodynamic chamber (EDC).

The sphere temperature is higher than that of the ambient, causing free convection flow around the sphere. As a result, the drag force exerted on the sphere by forced flow deviates significantly from the Stokes law. This deviation is represented quantitatively for various directions of the forced flow.

It is concluded that when there is a difference between the temperature of a droplet and the temperature of the host gas it may alter the droplet's dynamics, and thus, should be accounted for by an appropriate modification of the Stokes formula.