SIMULATION OF VELOCITY, TEMPERATURE, RELATIVE HUMIDITY AND PARTICLE CONCENTRATION IN A BOUNDARY LAYER ON A FLAT PLATE

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Abstract

This paper is aimed to present the simulation of velocity, temperature, relative humidity and particle concentration in a boundary layer on a flat plate using the finite volume method. The velocity and temperature are governed by the continuity, momentum and energy equations. For relative humidity computation, it is necessary to know the ratio of dry air and water vapor. The equation of the water vapor mass fraction is used to compute the mass of the water vapor in the air by treating the air as a gas mixture between dry air and water vapor without chemical reaction. Assuming that the particles considered are very tiny (about 0.5 micron in diameter), the concentration of the particles is modeled via only the convective term in the equation of the particle concentration mass fraction. The numerical results of the velocity and the temperature are closed to the exact solutions of Blasius and Pohlhausen, respectively. The calculated relative humidity is in good agreement with the data from the psychrometric chart and the computed concentration of the particles agrees with the physical behavior of the flows.