



ME – MTech(Res) Thesis Defence



TURBULENT MOIST FREE CONVECTION OVER HORIZONTAL SURFACES

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Abstract

The heat and moisture loss from water surfaces are important in many natural and industrial systems. Here, heat and mass transport are coupled with each other, making the problem more complex. The current thesis deals with turbulent moist free convection over a horizontal surface. Experiments aim to understand the dynamics of moist plumes near a heated water surface. The study focused on exploring near-wall flow structure and measured the heat transfer and evaporation rate. The average plume spacing, temperature, and relative humidity distribution above the surface are obtained experimentally. Visualization studies confirmed the existence of the line plumes close to the water surface. Based on experimental observations, we propose a model consisting of a 2-D periodic array of line plumes and associated boundary layers. Results from the model are obtained using similarity solutions and numerical simulations. The model predicts average plume spacing, distribution of mean and rms of fluctuations of temperature, vapour density, and supersaturation which are in reasonable agreement with the experiments. To understand the effects of condensation on plume dynamics, we perform additional simulations, including phase change.

About the Speaker

Parth completed his bachelor's from the BVM engineering college, Anand, in 2018. He joined IISc in 2019 as an M.Tech (research) student and is working with Prof. Jaywant H. Arakeri in the Fluid Mechanics Laboratory, Department of Mechanical Engineering. His research interests include fluid mechanics, thermodynamics, and heat and mass transfer.

