ME – M.Tech(Res) Thesis Colloquium

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 are carried out over a heated water surface to understand the planform structure and the heat & mass transfer for different input conditions. Visualization studies confirm the existence of the line plumes close to the water surface. We measure the average plume spacing, evaporation rate, and distribution of temperature and relative humidity above the 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 the condensation, we perform additional simulations, including phase change in the equations.

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.