Int. J. Heat Mass Transfer. Vol. 17, pp. 527 528. Pergamon Press 1974. Printed in Great Britain

BOOK REVIEWS

Proceedings of the 1972 Heat Transfer and Fluid Mechanics Institute, edited by R. B. Landis and G. J. Hordemann. Stanford University Press, Stanford, California, 1972, 430 pp. £8.75.

THE 1972 Proceedings includes 25 papers covering an extremely wide field of experimental and analytical research in heat, mass and momentum transfer, including papers on radiation, chemical and multi-phase phenomena. As in previous meetings, there is no unifying theme. Unfortunately, brief abstracts of an additional five invited lectures are included in the text. These may be of interest as a record of the proceedings, but they do little for the reader except whet his appetite for further details, though presumably these are available by now in the literature. A brief survey of the contents of this volume follows.

Min and Emmons describe a theoretical and experimental investigation into the drying of porous media with low moisture content (15% by weight). Evaporation occurs at a discontinuous moisture front, with pressure-driven convective flow plus molecular diffusion of the gaseous components. Ball and Azer measure the eddy diffusivities of air in turbulent, fully-developed, annular flow with the inner pipe heated, and find variations with available results. Sylvester *et al.* provide a good literature survey and analysis of a non-Newtonian thin film and predict the wavy regime between laminar and turbulent flow. Bundy and Weissberg analyze fully developed laminar spiral flows for a wide range of suction and injection in a porous pipe. No such stable flows were found experimentally. Kochan and Denny solve numerically the downstream effects of discontinuous, foreign gas injection in inert laminar boundary layer flows. Compressibility and variable properties are included.

Knuth, in an analysis motivated by a study of the feasibility of direct sampling of air pollutants, uses the "sudden freeze" approximation in identifying two dimensionless correlation parameters, and shows that the relaxation time depends both upon the process as well as on the fluid state. Hulcher and Behrens measure the flow properties in the near wake of a flat plate at 15° incidence, $M = 6$, and Reynolds number of 186 000. Separation occurs at 0·7 of the chord from the leading edge. Schneider analyzes normal shock waves in water near the thermodynamic critical point and obtains the acoustic velocity anomaly. The density, pressure and temperature ratios across the shock approach 1·0 for M as large as 10, but the constant pressure specific heat varies widely. Ferland and Howell analyze the influence of water vapor, carbon dioxide and particulates on the atmospheric temperature profile, by combining the Edwards exponential wide-band model and the Curtis–Gordon transformation. They include five carbon-dioxide and four water-vapor bands.

Andres uses a mathematical model to simulate the saltation dynamics of sand grains for application to terrestrial and Martian surfaces. Fair agreement with observed saltation thresholds is obtained. Rao *et al.*, basing their analysis on a simple differential field theory, find the diffusion of pollutants from a line source in a neutral turbulent shear layer. The variation of the effective turbulent viscosity is governed by a rate equation, and the data are compared with available results. Ashton measures the heat transfer from a turbulent water flow to a slowly melting wavy ice wall of small amplitude. Lee *et al.* analyze free turbulent mixing, using the turbulence kinetic energy equation for treating the momentum exchange coefficient. Convection and dissipation of turbulence are found to be of the same order of magnitude, and good agreement with heated coaxial hydrogen–air jets is obtained. Wilcox and Alber apply a set of turbulence model equations to three rapidly changing high speed flows, obtaining good agreement with observations. Reynolds stresses and turbulent heat flux are represented in terms of an eddy viscosity assumed to be a function of the specific turbulent energy and the fluctuating vorticity. Donaldson and Hilst present theoretical results concerning chemical reactions in inhomogeneous mixtures. They reveal the need for measurements over a range of turbulence scales and reaction rate constants.

Bartlett *et al.* give the numerical solution to the boundary layer flow of chemically reacting propellant gases in gun barrels. The problem is motivated by the wear in high velocity guns which is related to the high heat rate. Clever and Catton verify early predictions of flow patterns and heat transfer for the steady natural convection of high Prandtl number fluids in partially filled vertical cylinders. Platten shows a variational method suitable for virtually every stability problem including temperature, magnetic and chemical reaction effects. Tatom gives measurements and analysis revealing heat transfer through the turbulent boundary layer to the bulk of a naturally convecting fluid. Goodman and Kennedy investigate the rate of frost growth from a laminar free convection boundary layer onto a cold surface.

Schneider analyzes radiant exchange among suspended particles and its effect on thermal relaxation in gas–particle mixtures. Chew and Depew present measurements and analysis for heat transfer to gas–solids suspensions flowing in vertical circular tubes. Smaller particles are shown to have the greater influence on heat transfer. Crowe and Pratt give an analysis for predicting the flow of subsonic, two-dimensional, particle laden flows.

Murphy and Bergles provide experiments and analysis of the sub-cooled boiling of fluorocarbons, and investigate hysteresis and dissolved gas effects. Clements and Colver present correlations of their measurements of saturated pool nucleate boiling of light hydrocarbons and their mixtures. Pressure and composition effects are included.

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