

**SEVENTH SYMPOSIUM ON TURBULENT SHEAR FLOWS**  
Stanford University, August 21-23, 1989

**CONTENTS OF VOLUME 2**  
**SESSIONS 16-30**

**SESSION 16 - APPLICATIONS - II**

- 16-1 Corotating disk flow in an axisymmetric enclosure with and without a bluff body  
*H.-M. Tzeng, J. A. C. Humphrey*
- 16-2 Air pollutant deposition and flow structure near the leading edge of a forest  
*E. W. Adams, B. Ruck*
- 16-3 Computation of a jet discharging into a cross-flow with a Reynolds stress transport equation turbulence model  
*J. Alvarez, W. P. Jones, A. J. Marquis*
- 16-4 Periodic mean and turbulent flow for a turbine airfoil row  
*O. P. Sharma*

**SESSION 17 - CLOSURES**

- 17-1 A new model for the pressure/scalar-gradient correlation and its application to homogeneous and inhomogeneous free shear flows  
*T. J. Craft, B. E. Launder*
- 17-2 A Reynolds stress closure for the dissipation in anisotropic turbulent flows  
*M. Hallbäck, J. Groth, A. V. Johansson*
- 17-3 An "eddy dissipation" Reynolds-stress turbulence model closed by an equation related to the turbulent transport time scale  
*I. S. Ertesvåg, S. Byggstøl, B. F. Magnussen*
- 17-4 A finite-volume calculation procedure for turbulent flows with second-order closure and colocated variable arrangement  
*S. Obi, M. Perić, G. Scheuerer*
- 17-5 The stochastic velocity-dissipation model applied to turbulent shear flows  
*S. B. Pope*

**SESSION 18 - OCEANOGRAPHY**

- 18-1 Wave-turbulence interaction beneath an air-water interface  
*J.-Y. Jiang, R. L. Street, S. P. Klotz*
- 18-2 Rings in numerical models of ocean general circulations  
*E. P. Chassignet, J. Verron*
- 18-3 Point vortices embedded in thin jet stream: a model for transition and ring formation processes in the Gulf Stream  
*A. K. Suri, N. Pinardi*
- 18-4 A proposal: extension of the  $q^2$ - $\epsilon$  model for stably stratified flows with transport of internal wave energy  
*R. E. Uittenbogaard, F. Baron*

## **SESSION 19 - INSTRUMENTATION - I**

- 19-1** The structure of supersonic turbulent boundary layers as revealed by density cross sections  
*M. Smith, V. Kumar, A. Smits, R. Miles*
- 19-2** Measuring the distributions of eddy diffusivity with magnetic resonance imaging  
*D. O. Kuethé*
- 19-3** A hot-wire measurement technique for moderate intensity, skewed turbulent flows  
*M. H. Al-Beirutty, F. B. Gessner*

## **SESSION 20 - HEAT TRANSFER**

- 20-1** Effects of free-stream turbulence on turbulent boundary layers with convective heat transfer  
*V. Baskaran, O. E. Abdellatif, P. Bradshaw*
- 20-2** Active and inactive motions in a turbulent boundary layer - Interactions with free-stream turbulence  
*P. L. Johnson, J. P. Johnston*
- 20-3** Effects of very high turbulence on heat transfer  
*P. K. Maciejewski, R. J. Moffat*
- 20-4** The measurement and prediction of heat transfer in a turbulent boundary layer in water  
*D. K. Hollingsworth, W. M. Kays, R. J. Moffat*
- 20-5** Application of a low-Reynolds-number two-equation turbulence model to mercury and sodium flows in the turbulent mixed convection regime  
*M. A. Cotton, J. D. Jackson, L. S. L. Yu*

## **SESSION 21 - ROTATING FLOWS**

- 21-1** Experiments on the turbulent boundary layers on spinning cones in axial flows  
*M. Itoh, Y. Yamada, H. Suzuki*
- 21-2** An improved algebraic Reynolds stress model and application to curved and rotating channel flows  
*H. Ekander, A. V. Johansson*
- 21-3** The numerical predictability of strongly swirling flows  
*W. A. Abd Al-Masseeh, D. Bradley, P. H. Gaskell, A. K. C. Lau*
- 21-4** The transition from laminar to turbulent flow in the thin liquid film on a rotating disk  
*T. Azuma*

## **SESSION 22 - INSTRUMENTATION - II**

- 22-1** Turbulence statistics measurement in a two-dimensional channel flow using a three-dimensional particle tracking velocimeter  
*K. Nishino, N. Kasagi*
- 22-2** Three dimensional imaging of turbulent flows  
*R. R. Prasad, K. R. Sreenivasan*
- 22-3** Correlation of optical phase distortion with turbulent structure in a homogeneous shear flow  
*C. R. Truman, M. J. Lee*
- 22-4** Vorticity field measurements using laser induced photochemical anemometry (LIPA)  
*R. E. Falco, C. P. Gendrich, C. C. Chu*

## SESSION 23 - COMBUSTION I

- 23-1 Stabilization of combustion by controlling the turbulent shear flow structure  
*E. Gutmark, T. P. Parr, D. M. Hanson-Parr, K. C. Schadow*
- 23-2 Quantitative evaluation of length and time scales of turbulent engine combustion from 2D laser sheets  
*K. N. C. Bray, T. C. Chew, R. R. Maly*
- 23-3 Mixing models for turbulent flows with exothermic reactions  
*J.-Y. Chen, W. Kollmann*
- 23-4 A Lagrangian intermittent model for turbulent combustion - theoretical basis and comparisons with experiments  
*M. Gonzalez, R. Borghi*
- 23-5 Computation of strongly-swirling, reacting flow in a model combustor with second-moment closure  
*S. I. Hogg, M. A. Leschziner*

## SESSION 24 - COHERENT STRUCTURES

- 24-1 On intermittency in the near-wake of a circular cylinder  
*L. Zucherman, J. G. Kawall, J. F. Keffer*
- 24-2 Evidence for double-roller eddies in a turbulent wake from two-component velocity measurements  
*J. A. Ferré, F. Giralt, R. A. Antonia*
- 24-3 Coherent structures in a boundary layer and shear layer of a turbulent backward-facing step flow  
*S. Jovic, L. W. B. Browne*
- 24-4 Analysis of experimental vortex-shedding data with respect to turbulence modelling  
*R. Franke, W. Rodi, B. Schönung*
- 24-5 A new aspect of the structures in a turbulent boundary layer  
*G.-X. Shen*

## SESSION 25 - TURBULENCE CONTROL

- 25-1 Initial conditions influence on the characteristics of a separated boundary layer  
*M. Sokolov, Z. Ginat*
- 25-2 Turbulent plane jet excited mechanically by an oscillating thin plate in the potential core  
*M. Miyata, N. Kurita, I. Nakamura*
- 25-3 Experimental manipulation of turbulent boundary layers in zero pressure gradient flows through external and internal devices  
*E. Coustols, J. Cousteix*
- 25-4 Manipulating large-scale turbulence in a channel and a boundary layer  
*H. Klein, R. Friedrich*
- 25-5 Influence of drag reducing additives on turbulent shear flows  
*S. Riediger*

## SESSION 26 - COMBUSTION - II

- 26-1 Modelling and numerical simulation of premixed turbulent combustion in a boundary layer  
*B. Rogg*
- 26-2 Coherent flame model in nonuniformly premixed turbulent flames  
*D. Veynante, F. Lacas, E. Maistret, S. M. Candel*
- 26-3 Effects of strain rate on turbulent premixed flames and transient one-dimensional flames  
*C. J. Rutland, S. H. El Tahry, J. H. Ferziger*
- 26-4 Investigation on the combustion-turbulence interaction in premixed stagnation flames of  $H_2$ - $CH_4$  mixtures  
*Y. Liu, B. Lenze, W. Leuckel*
- 26-5 Speckle photographic measurement of turbulence properties in a premixed flame  
*K. Oberste-Lehn, W. Merzkirch*

## **SESSION 27 - FUNDAMENTALS - HOMOGENEOUS FLOWS**

- 27-1 Theory for self-preserving homogeneous turbulent shear flow  
*W. K. George, M. M. Gibson*
- 27-2 The energy decay power-law and similarity of scales in grid turbulence  
*M. S. Mohamed, J. C. LaRue*
- 27-3 A critical comparison of turbulence models for homogeneous shear flows in a rotating frame  
*C. G. Speziale, T. B. Gatski, N. M. G. Mhuiris*
- 27-4 Length scales of sheared and unsheared stratified homogeneous turbulence deduced from direct simulations  
*T. Gerz, U. Schumann*
- 27-5 Experimental study of homogeneous turbulence in the presence of transverse shear  
*V. Moulin, O. Leuchter, P. Geffroy*

## **SESSION 28 - COMPLEX FLOWS**

- 28-1 Transverse and vertical Reynolds stress measurements in a shear layer region of a compound channel  
*K. Shiono, D. W. Knight*
- 28-2 Laminarization in 3-dimensional accelerating flow through curved rectangular ducts  
*B. E. Launder, P. A. Loizou*
- 28-3 Lift on a grounded sphere under a tornado vortex  
*P. N. Joubert, M. H. Wang*
- 28-4 An experimental study of a turbulent jet impinging on a wedge  
*H. Yamada, I. Nakamura, S. Yamashita, H. Yano*
- 28-5 The effect of extra-strain rates of streamline curvature and divergence on mixing layers  
*A. E. Johnson, P. E. Hancock*

## **SESSION 29 - SCALAR TRANSPORT MODELING**

- 29-1 Nonlocal turbulent mixing in boundary layers evaluated from large-eddy simulations  
*U. Schumann, R. B. Stull, E. E. Ebert*
- 29-2 Optimisation of a  $\overline{\theta^2}$ - $\epsilon_\theta$  model for a turbulent far wake  
*E. G. Tulapurkara, R. A. Antonia, L. W. B. Browne*
- 29-3 A four-equation turbulence model including the effects of large density non-uniformity  
*J. M. MacInnes*
- 29-4 The intermittency factor of dispersing scalars in turbulent shear flows. Some applications of a new definition  
*P. C. Chatwin, P. J. Sullivan*
- 29-5 Estimating statistics of concentration fluctuations from measurements  
*N. Mole*

## **SESSION 30 - FUNDAMENTALS - SMALL SCALE STRUCTURES**

- 30-1 Cut-and-connect of two antiparallel vortex tubes: a new cascade mechanism  
*M. V. Melander, F. Hussain*
- 30-2 Measurement of small scale turbulence in an axisymmetric jet using moving hot-wires  
*H. J. Hussein, W. K. George*
- 30-3 Multifractal spectra in shear flows  
*L. R. Keefe, A. E. Deane*
- 30-4 On the similarity of the small-scale structure of turbulence  
*V. C. Wong*
- 30-5 Spectral transfer analysis for subgrid scale modeling  
*K. Dang, C. Teissèdre*