
**04-8 IUTAM Symposium on Elementary Vortices and Coherent Structures: Significance in Turbulence Dynamics
Kyoto, Japan, October 26-28, 2004**

a) Scientific Committee

S.Kida (Chairman, Japan), M.E.Brachet (France), M.S.Chong (Australia), F.Hussain (U.S.A.), J.Jimenez (Spain), T.Miyauchi (Japan), K.Moffatt (U.K.), D.Pullin (U.S.A.)

b) Short summary of scientific progress achieved

By the elementary vortices, we mean those tubular swirling vortical structures with concentrated vorticity which are commonly observed in various kinds of turbulent flows as the smallest coherent structure. The elementary vortices play key roles in turbulence dynamics (e.g. enhancement of mixing, diffusion and resistance) and characterizes turbulence statistics (e.g. intermittency). They tend to gather into larger and stronger coherent vertical motions (e.g. spanwise rollers in free shear flows and hairpin vortices in wall-bounded flows). There are dynamical and statistical similarities between small- and large-scale vertical motions (e.g. formation and structure of tornadoes and trailing vortices from aircrafts). Because of their dynamical importance, manipulation of elementary vortices and coherent structures is expected to be effective and useful in turbulence control as well as in construction of turbulence modeling. Besides its dynamical significance, the vortical structure is convenient in describing and understanding turbulence structure such as skeleton representation by vortex axes, and the topological characterization by knottedness and crossing number. In this symposium, new perspectives in theory, prediction, and control of turbulence have been developed with the vortical structures as the core concept. The topics chosen for the sessions include 'Dynamics and structures of turbulent flows', 'Chaotic advection and mixing', 'Statistical properties of turbulence', 'Mathematical aspects of fluid equations'. There were 21 oral presentations (including 5 keynote lectures) and 21 poster presentations.

c) Countries represented and number of participants

The meeting attracted 79 participants from 11 countries: Australia (1), Czechoslovakia (1), France (6), Israel (1), Italy (1), Japan (53), Poland (1), Russia (1), Spain (1), United Kingdom (5), United States (9).

d) Publication of Proceedings of the Symposium

The proceedings of selected papers in the symposium will be published in a Proceedings Book by Springer Publishers. Editors are S. Kida, M. Yamada and S. Yoden.

e) Financial supports

The organizers extend their thanks to the following for sponsorship of this IUTAM symposium:

- International Union of Theoretical and Applied Mechanics.
- The Commemorative Organization for the Japan World Exposition ('70),
- Inoue Foundation for Science,
- The 21st Century COE Programs for Research and Education on Complex Functional Mechanical Systems, for Elucidation of the Active Geosphere (KAGI21), for Formation of an International Center of Excellence in the Frontiers of Mathematics and Fostering of Researchers in Future Generations, and for Center for Diversity and Universality in Physics.

f) Scientific program**October 26, 2004****Sectional lecture**

J. Jiménez, G. Kawahara, M.P. Simens, *The near-wall structures of turbulent wall flows*

Regular lectures

T. Miyauchi, S.-J. Kang, M. Tanahashi, *Coherent fine scale eddies in the logarithmic region of turbulent channel flows*

P. Orlandi, S. Leonardi, R.A. Antonia, *Vortex structures in a rough-wall channel flow and their influence on heat transfer*

Sectional lecture

J.C. Vassilicos, J. Davila, S. Goto, E. Hascoet, D. Osborne, L. Rossi, *Persistent multiple-scale stagnation point structure*

Regular lectures

S. Goto, J.C. Vassilicos, *Streamlines, coherent vortices and particle pair diffusion in two-dimensional turbulence*

M. Nishioka, S. Sakaue, K. Komada, H. Sakoshi, I. Furukawa, *On the mixing transition in supersonic streamwise vortices*

F. Moisy, J. Jiménez, *Geometry and clustering of intense structures in isotropic turbulence*

J.G. Brasseur, W. Lin, *Influence of mean shear on the dynamics of turbulent vorticity and strain-rate*

Y. Tsuji, T. Ishihara, *Statistical property of pressure fluctuation in fully developed turbulence*

Y. Cuypers, P. Petitjeans, A. Maurel, *The turbulent energy cascade built by a vortex burst*

M.S. Chong, M. Giacobello, A. Ooi, *Invariants of the velocity gradient tensor in eddying motion and turbulence.*

October 27, 2004

Poster presentations

K. Horiuti, Y. Takagi, S. Abe, *Multi modes for the vortex sheet-tube transformation process and viscoelastic effect*

M. Asai, Y. Konishi, *Instability of low-speed streaks leading to wall turbulence*

T. Ogasawara, S. Toh, *Self-similarity of ballistic motion in turbulent relative dispersion*

Y. Sakai, H. Kuwahara, K. Maeyama, H. Tsunoda, *Study on the two-particle diffusion and the fine-scale structures of turbulence by DNS*

P. Otheguy, P. Billant, J.-M. Chomaz, *Instability of corotating vertical vortices in a stratified fluid*

Y. Kitamura, Y. Matsuda, *Energy cascade processes in stratified turbulence*

Y. Kaga, S. Yanase, *Action of coherent vortices in rotating duct flows*

J.E. Ruppert-Felsot, M. Caldoro, M. Farge, K. Schneider, H.L. Swinney, *Coherent structures in rotating turbulent flow: laboratory and numerical experiments*

J. Hasegawa, K. Ishioka, S. Yoden, *Asymmetrization of jet profiles in b-plane turbulence*

T. Mashiko, Y. Tsuji, M. Sano, *Dynamics of velocity field in developed thermal turbulence*

T. Watanabe, T. Gotoh, *Intermittency, field structures and accuracy of DNS in a passive scalar turbulence*

P. Chakraborty, S. Balachandar, R.J. Adrian, *Local vortex identification criteria: Formulation, inter-relationships and issues*

A.-k. Xiong, K. Kobayashi, S. Izawa, Y. Fukunishi, *Discussions on the methods for vortex identification*

K. Fukuda, K. Kamemoto, *A grid-free redistribution model for a vortex method and turbulent flow analysis*

H. Mouri, A. Hori, Y. Kawashima, *Vortex tubes in velocity fields of laboratory turbulence at high Reynolds numbers*

T. Iwayama, T.G. Shepherd, *Self-similarity of vorticity dynamics in decaying two-dimensional turbulence*

K. Bajer, M. Branicki, *Flow due to a point vortex in oscillating ambient strain*

T. Sakajo, *Motion of unstable polygonal ring of vortex points on sphere with pole vortices*

A. Mitani, M. Tsubota, W.F. Vinen, *Decay of quantum turbulence by Kelvin wave cascade*

L. Skrbek, *Flow phase diagram for the helium superfluids*

S.K. Nemirovskii, M. Tsubota, *Trial distribution functional of vortex tangle in superfluid helium*

Regular lecture

E. Sharon, *Experimental study of rotating turbulence - The effect of coherent structures on statistics and dynamics*

Sectional lecture

M. Tsubota, *Superfluid turbulence and dynamics of quantized vortices*

Regular lectures

D. Dritschel, *A new twist to rotating stratified turbulence*

Y.K. Sasaki, *Tornadoic vortex in the atmosphere: Observation, structure, genesis theory and numerical simulation*

J.-M. Chomaz, F. Gallaire, *Spatio-temporal instabilities and breakdown of swirling flows*

J.M. Faddy, D.I. Pullin, *Evolution of vortex structure in a model of the turbulent trailing vortex*

N. Takahashi, T. Miyazaki, *Interaction between a columnar vortex and external turbulence*

October 28, 2004

Sectional lecture

P. Constantin, *Reconnection studies and sub-grid models*

Regular lectures

L. van Veen, S. Kida, G. Kawahara, *Periodic motion in high symmetric flow*

T. Itano, S. Toh, *Co-supporting cycle of a large-scale structure and near-wall structures in wall turbulence*

Y. Kimura, *Motion of 3D vortex filament and particle transport*

Sectional lecture

U. Frisch, J. Bec, W. Pauls, T. Matsumoto, *The analytic structure of Euler flow*

Regular lectures

R.M. Kerr, *What role for helicity in vortex reconnection?*

M.-E. Brachet, C. Cichowlas, *Singularities and Kolmogorov scaling in 3-D incompressible inviscid flows with spectral truncation*

Y. Fukumoto, Y. Hattori, *Linear and nonlinear instability of a vortex ring*

Report composed by Shigeo Kida