

**Prof.dr. K. Hanjalic International Fellow of the Royal Academy of Engineering**



In 2005, Prof.dr. K. Hanjalic was elected International Fellow of the Royal Academy of Engineering in the UK. Being among only 3 persons to be honored by this election (next to one Italian and one Indian professor), he received the scroll personally from Prince Philip.

**Professor Kemal Hanjalić**, FEng, FIAS, FInstP, F-ANUBiH

Emeritus Professor, Faculty of Applied Sciences, Delft University of Technology, NL. (2005-)

DAAD Guest Professor, Darmstadt University of Technology, Germany (2005-)

Adjunct Professor, Faculty of Mechanical Engineering, University of Sarajevo, Bosnia Herzegovina (1996-)

**Education:**

1964 Dipl. Ing. (Mechanical Engineering - Energy Engineering) Univ. Sarajevo, Bosnia Herzegovina

1966 M.Sc. (Thermodynamics and Related Studies) Univ. Birmingham, U.K.

1970 Ph.D. (Fluid Mechanics) Imperial College, Univ. London, U.K.

**Professional Career/Employment:**

*Academic/Research positions:*

1979-91 Professor of Fluid Mechanics and Turbomachinery, Mech. Eng. Dept., Univ. of Sarajevo

1991-93 Guest Professor of the German Research Association (DFG), Univ. Erlangen, Germany

1993-94 Professor, Mechanical Eng. Dept., Michigan Technological University, USA

1994-05 Professor and Head of Thermofluids Section, Delft University of Technology, Delft, NL

*Administrative positions:*

1975-78 Head of Department of Mechanical Engineering, University of Sarajevo

1980-84 Director, Institute for Process- Power and Environmental Engineering, Sarajevo

1984-85 Dean of the Faculty of Mechanical Engineering, University of Sarajevo

1985-87 Mayor of Sarajevo

1987-91 Minister of Science and Technology in the Government of Bosnia and Herzegovina

**Professional and Research Areas:**

Fluid Mechanics, Heat Transfer, Turbulence, Thermal/fluids Machinery, Energy & Environmental Engng.

**Honours and Awards (selected):**

- FEng – (International) Fellow of the Royal Academy of Engineering, UK (2005)
- FInstP - Fellow of the Institute of Physics (2004)
- Elected Member of the Academy of Sciences and Arts of Bosnia and Herzegovina, (from 1981)
- D.Sc.(Eng), University of London (1998) (higher doctorate)
- Max-Planck Research Prize "for achievements in turbulence research" (with F. Durst), Germany, (1992)
- Special Issue of the Int. J. Heat and Fluid Flow, Vol. 21, No 3, 3000 (Elsevier) "dedicated to K. Hanjalic..".
- Award 27 July (The highest State Award of Bosnia Herzegovina) 1989
- Award "Veselin Masleša" for scientific achievements, 1973

**Visiting fellow / professor (by invitation)**

- Imperial College of Sci. and Techn., Mech. Eng. Dept., London, 1972, 1973; University of California at Davis, USA, 1978, 1979, 1980; "Friedrich-Alexander Univ.", Erlangen-Nuernberg, Germany, 1984, 1991-93; Institute for Computer Applications in Scie. and Engineering - ICASE/NASA Langley Res. Lab., USA, 1995; Kyoto University Foundation, Kyoto University, Japan, 1996; Cambridge University, Isaac Newton Inst. for Mathematical Sciences, UK, 1999; Chalmers University of Technology, Gothenburg, Sweden, 2000; Imperial College of Scie, Techn. and Medicine, Aeronautics Dept. London, UK (2001, 2002); University of Rome "La Sapienza" 2003; National University of Singapore – Institute for Mathematical Sciences, 2004; Darmstadt University of Technology, Germany, (01.04.05-30.09.06).

**Journal Editorship (current):**

- *Editor-in-Chief*, Int. Journal "Flow, Turbulence and Combustion" (Springer)
- *Member of the Editorial Advisory Boards*: Int. J. Heat and Fluid Flow (Elsevier); J. of Turbulence, (electronic journal, Taylor and Francis); Int. J. of Thermal Sciences (Elsevier); Int. J. of Fluid Dynamics
- *Honorary Editorial Advisory Board*: Int. J. Heat and Mass Transfer and of Int. Communications in Heat and Mass Transfer (Springer)

***Current Membership and Functions in Professional Organizations:***

- Vice-Chairman (former Chairman) of the Executive Committee and Member of the Scientific Council of ICHMT (Int. Center for Heat Mass Transfer, Secretariat in Ankara, Turkey)
- Chairman of the ERCOFTAC Special Interest Group for Turbulence Modelling
- Chairman of the IAHR Working Group on Refined Flow Modelling
- Member of the Scientific Programme Committee and of the Ind. Advisory Committee, ERCOFTAC
- Member of professional associations/societies: ASME, APS, IAHR, ERCOFTAC, EMS

***Former functions (selected):***

- President of the Yugoslav Association of Republican Research Foundations (1987/89)
- Representative of Yugoslavia in the OECD Environmental Committee - Air Management Policy and Energy and Environment Groups (1984-1991)

***Organizer and (Co-)Chairman of International Conferences and Workshops (1990-2006):***

10 intern. conferences + 1 intern. workshop (Sarajevo, Lisbon, Erlangen, Delft, Nagoya, Antalya, Dubrovnik). Member of the Scientific and Advisory Committees of a number of international conferences

***Invited keynote, panel and other lectures at international conferences/workshops/courses:***

- over 50 invited keynote lectures at international conferences and workshops in the last 10 years
- *lectures series in short graduate/doctoral courses/instructional conferences:* Delft Univ. of Technology – JM Burgerscenter, NL; Isaac Newton Institute of Mathematical Science, Univ. of Cambridge, UK; Von Karman Inst. of Fluid Dynamic, Belgium; Institute of Thermal Physics, Siberian Academy of Sciences, Novosibirsk, Russia; Polish Academy of Science/Polish ERCOFTAC Pilot Centre, Poland; Universities of Erlangen, Darmstadt and Stuttgart, Germany; Univ. of Tokyo/JSME Thermal Eng. Division, Tokyo, Japan; Michigan State Univ., Univ. of California, Davis, USA; Nat. Univ. of Singapore – Inst. For Mathem. Sciences.

***Teaching and student guidance:***

Universities in Sarajevo, Banja Luka (B&H), Zagreb (Croatia), Novi Sad, Podgorica (SCG), Erlangen (Germany), Michigan Techn. Univ. (USA), Delft Univ. of Technology (NL), Darmstadt University of Technology (Germany): Thermodynamics, Fluid Mechanics, Gas Dynamics, Transport Phenomena, Thermal Turbomachinery, Turbulence and its Modeling,

*Theses supervision:* 20 Ph.D., around 35 M.Sc. over 100 Dipl.-ing.

***Publications:***

- Number of papers in the international peer-refereed journals: ~130
- Number of papers in refereed international conference proceedings: ~230
- Books:
  - K. Hanjalić: Dynamics of compressible fluid flow (in Serbo-Croatian, 220 pages) Svjetlost Publ. Sarajevo, 1978;
  - K. Hanjalić and co-workers: Mathematical models of turbulence (in Serbo-Croatian, 197 pages), Academy of Sciences and Arts of Bosnia and Herzegovina, 1987
  - Edited 7 conference proceedings (see Conference Organizer) published by Taylor & Francis, Begell House, Delft University Press, Aichi Shuppan.

*Bibliometric record:* Over 1500 journal citations and over 30 book citations.

***Patents and software:***

- Two patents on detonation wave technique for on-line cleaning of gas-side surfaces in steam boilers fired by fossil fuels (with I. Smajević) (Belgrade, Yugoslavia, 1989)
- Several semi-commercialized software, notably SCORPATH for computer-simulation of screw compressors (with N. Stosić), in use by compressor industries worldwide.

***Consulting:*** with a number of industries in Europe and the USA.

## **Kemal HANJALIĆ, Publication list 2000-2005 ( update: Dec.2005)**

### **In 2005**

#### ***Special publications:***

K. Hanjalić, 2005, "Reconciling the Irreconcilable" Valedictory Address, Delft University of Technology, ISBN 90-9019710-9, (28p).

#### ***Keynote and other Invited Lectures:***

1. Hanjalić, K, 2005, "Synergy of Experiments and Computer Simulations of Turbulent Flows and Convective Heat Transfer", *Keynote lecture*, 6<sup>th</sup> World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Matsushima, Miyagi, Japan, April 17-21, 2005.
2. Hanjalić, K, 2005, "Prospects for RANS modelling of turbulent flows and heat transfer", *Keynote lecture*, 4th Int. Conference on Computational Heat and Mass Transfer, Paris, France, May 17-20, 2005
3. Hanjalić, K, 2005, "Some Issues and Challenges in Merging RANS and LES Strategies for high Re and Ra numbers", *Keynote lecture*, Mini-Symposium "Turbulence Modelling for Industrial CFD", 3<sup>rd</sup> M.I.T. Conference on Computational Fluid and Solid Mechanics, Massachusetts Inst. of Techn., Cambridge MA, USA, June 14-17, 2005.
4. Hanjalić, K, 2005, "Heat transfer in complex turbulent flows: Complementarity of Measurements and Modelling", *Keynote lecture*, UK National Heat Transfer Conference, Manchester, UK, September 5-6, 2005.
5. Hanjalić, K, 2005, "A Perspective on Combining RANS and LES Strategies for the Computation of Complex Turbulent Flows and Heat Transfer", *Keynote lecture*, Intern. Conference on Jets, Wakes and Separated Flows, Tobasha Mie, Japan, October 5-8, 2005.
6. Hanjalić, K, 2005, "Accommodating LES to high Re numbers: RANS-based or a new strategy?" *Keynote lecture*, Symposium on Hybrid RANS-LES Methods, 14-15 July 2005, Stockholm, Sweden.
7. Hanjalić, K, 2005, Combining two laser diagnostic techniques (LDA and CARS) to measure simultaneously fluid velocity and temperature in a jet flame, *Invited lecture*, International Workshop on Measurement and Diagnosis of Heat Transfer and Fluid Flow Systems, sponsored by 21<sup>st</sup> Century COE Programme "International Centre of Excellence of Flow Dynamics, Tohoku University, Sendai, Japan, 22-23 April 2005.

#### ***Seminar lectures:***

Imperial College of Science, Technology and Medicine, Mech, Eng. Dept. 26 Oct. 2005

#### ***Journal publications:***

1. Borello, D., **Hanjalić, K.**, Rispoli, F. 2005, Prediction of cascade flows with innovative second-moment closures, *ASME J. Fluids Engineering*, Vol. 127, pp 1059-1070
2. Geers, L., **Hanjalić, K.**, Tummers, M., 2006 (electronic version published in 2005), Wall imprints of turbulent structure and heat transfer in multiple impinging jet arrays, *J. Fluid Mech.*, Vol. 546, pp. 255-284.
3. Geers, L., Tummers, M., **Hanjalić, K.**, 2005, PIV-based identification of coherent structures in normally impinging multiple jets, *Physics of Fluids*, Vol.17, 055105:1-13.
4. **Hanjalić, K**, 2005, Will RANS survive LES: a view of perspectives, *ASME J. Fluids Eng.*, Vol. 127, pp. 831-839.
5. **Hanjalić, K**, 2005, Synergy of experiments and computer simulations in research of turbulent convection, *Int. J. Heat Fluid Flow*, vol. 26(6), pp. 828-842.
6. **Hanjalić, K.**, Kenjereš, S., 2005, Dynamic simulation of pollutant dispersion over complex urban terrains: a tool for sustainable development, control and management, *Energy*, Vol. 30, 1481-1497.
7. **Hanjalić, K.**, Kenjereš, S., 2005, RANS-based VLES of thermal and magnetic convection at extreme conditions, *ASME J. Appl. Mechanics*, (in press)
8. Kenjereš, S., Gunarjo, S.B., **Hanjalić, K.**, 2005, Contribution to elliptic relaxation modeling of turbulent natural and mixed convection, *Int. J. Heat Fluid Flow*, Vol. 26(4), 569-586.
9. Ničeno, B., **Hanjalić, K.**, Basara, B. 2005, Unstructured large-eddy simulation for vehicle-components aerodynamics: flow over an idealized car mirror, *Progress in Computational Fluid Dynamic*, Vol. 5 No 8, 427-443.
10. Peng, Shia-Hui, Davidson L., **Hanjalić, K.**, 2005, Numerical analysis of Rayleigh-Benard convection using Large-eddy Simulation at high Rayleigh numbers, *J. of Turbulence*, (in press).
11. Reeuwijk, van, M., Jonker, H.J.J., **Hanjalić, K.**, 2005, Identification of the wind in Rayleigh-Bénard convection, *Physics of Fluids* 17, 051704:1-4.
12. Stawiarski, K., **Hanjalić, K.**, 2005, On physical constraints for multi-scale turbulence closure models, *Progress in Computational Fluid Dynamics*, Vol. 5 (No 3-4), 120-135..

13. Temmerman, L., Hadžiabdić, M., Leschziner, M.A., **Hanjalić, K.** 2005, A hybrid two-layer URANS-LES approach for large-eddy simulation at high Reynolds numbers, *Int. J. Heat and Fluid Flow*, vol. 26, 173-190.
14. Thielen, L., **Hanjalić, K.**, Jonker, H. Manceau, R. 2005, Predictions of flow and heat transfer in multiple impinging jets with an elliptic-blending second-moment closure, *Int. J. Heat and Mass Transfer*, Vol. 48, 1583-1598.
15. Yang, S.L., Siow, Y.K., Teo, C.Y., **Hanjalić, K.**, 2005, A KIVA code with Reynolds-stress model for engine flow simulation, *Energy*, 30, 427-445

#### **Chapters in Books/Edited Volumes:**

1. Ničeno, B., **Hanjalić, K.**, 2005, Unstructured large-eddy- and conjugate heat transfer simulations of wall-bounded flows, in *Modeling and Simulation of Turbulent Heat Transfer* (Chapter 2), (Developments in Heat Transfer Series), Editors: M. Faghri and B. Sunden, WIT Press.

#### **Conference Proceedings:**

1. Borello, D., Rispoli, F., **Hanjalić, K.**, 2005, Numerical simulation of turbulent flows in 3D decelerating cascade using second-moment closure modelling, 6<sup>th</sup> European Gas Turbine Conference. March 7-11, 2005, Lille, France
2. Brohmer, A., Mehring, J., Schneider, J., Basara, B., Tatschl, R., **Hanjalić, K.**, Popovac, M., 2005, Fortschritte in der 3D-CFD Berechnung des gas- und wasserseitigen Wärmeübergangs in Motoren, 10 Tagung "Der Arbeitsprozess des Verbrennungsmotors", 22-23 September 2005, Graz, Austria
3. Hadžiabdić, M., **Hanjalić, K.**, 2005, LES of flow and heat transfer in a round impinging jet, ERCOFTAC Workshop on Direct and Large-eddy Simulations, September 12-14, 2005, Poitiers-Futuroscope, France
4. **Hanjalić, K.** Laurence, D., Popovac, M., Uribe, J.C.M., 2005, v2/k-f turbulence model and its application to forced and natural convection, 6<sup>th</sup> Int. Symp. Engineering Turbulence Modelling and Measurements, May 23-25, 2005, Sardinia, Italy.
5. Jakirlić, S. **Hanjalić, K.**, Tropea, C., 2005, Anisotropy evolution in relaminarizing turbulent boundary layers: a DNS-aided second-moment closure analysis, STAB meetn 2004, Bremen Germany (to appear I Notes on Numerical Fluid Dynamics)
6. Kenjereš, S., **Hanjalić, K.**, 2005, Simulation of magnetic field control of heat transfer in buoyancy-driven flows, 4<sup>th</sup> Int. Conf. On Computational Heat and Mass Transfer (ICCHMT), 17-20 May 2005, Paris-Cachan, France.
7. Kenjereš, S. **Hanjalić, K.** 2005 "LES, T-RANS and Hybrid Simulations of Thermal Convection at High Ra Numbers", Paper No.164 in the Proceedings of ERCOFTAC 6th Int. Symp. On Engineering Turbulence Modelling and Measurements, ETMM-6, Sardinia, Italy, 23-25 May, 2005, p 369-378.
8. Kenjereš, S., **Hanjalić, K.**, Gunarjo, S.B., 2005, Dynamical Simulations Towards Optimal Indoor Climate and Safety Control, CD Proc. Dubrovnik International Conference on Sustainable Development of Energy, Water and Environmental Systems, June 5-10, 2005, Dubrovnik, Croatia.
9. Kenjereš, S. Renaudier, S., **Hanjalić, K.**, Stefani, F., 2005, "Computational Study of Flow and Magnetic Field Interactions in Riga-Dynamo", Proceedings of the 6th Pamir International Conference on Fundamental and Applied MHD, Riga Jurmala, Latvia, June 27 - July 1, 2005, pp.1-6.
10. Peng, Sh.-H. Davidson, L., **Hanjalić, K.**, 2005, Numerical analysis of Rayleigh-Bénard convection using large-eddy simulation at high Rayleigh number, Proc. 4th Int. Symp. Turbulence and Shear Flow Phenomena, Edts. J.A.C. Humfrey et al., June 27-29, 2005, Williamsburg, Virginia, USA, p 983-988..
11. Popovac, M., **Hanjalić, K.** 2005, Compound wall treatment for complex turbulent flows and heat transfer, 3<sup>rd</sup> MIT Conference on Computational Fluid and Solid Mechanics, June 14-17, 2005, Cambridge, MA, USA
12. Popovac, M., **Hanjalić, K.** 2005, A combined WF and ItW treatment of wall boundary conditions for turbulent convective heat transfer, Proc. 9th UK National Heat Transfer Conf., Manchester 5-6 September 2005
13. Reeuwijk, M. van, Jonker, H.H. **Hanjalić, K.**, 2005, The role of the wind in unbounded Rayleigh-Bénard convection, Proc. 9th UK National Heat Transfer Conf., Manchester 5-6 September 2005...
14. Reeuwijk, M., Jonker, H.H., **Hanjalić, K.**, 2005, Applying the Leray- $\alpha$  model to unbounded Rayleigh-Bénard convection, Proc. ITI Conf. on Turbulence, Ed.: M. Oberlack et al., 25-28 September, Bad Zwischenau, Germany
15. Tummers, M., Flikweert, M.A., **Hanjalić, K.**, Rodink, R., Moshfegh, B., 2005, Impinging jet cooling of wall mounted cubes, Proc. 6<sup>th</sup> Int. Symp. Engineering Turbulence Modelling and Measurements, Edt: W. Rodi and ??, May 23-25, 2005, Sardinia, Italy, p. 773-782.
16. Verdoold, J., Witte, P., Hoek, L., Tummers, M., **Hanjalić, K.**, 2005, Identification and electromagnetic control of structures in Rayleigh-Bénard convection, Proc. 4th Int. Symp. Turbulence and Shear Flow Phenomena, Edts: J.A.S.C. Humfrey et al., June 27-29, 2005, Williamsburg, Virginia, USA, p 1107-1112.

## **In 2004**

### ***Keynote and other Invited Lectures:***

1. Hanjalic, K. 2004, "Will RANS survive LES: a view of perspectives" *Keynote lecture*, LES Symposium, ASME HT-FED Summer Conference, Charlotte NC, July 11-15, 2004
2. Hanjalic, K. 2004, "Some developments in CFD modelling of indoor climate" *Keynote lecture*, Journées Modélisation et Energie: applications aux stockage, genie civil, habitat, 17-18 Juin 2004, Univ. de Limoges, France
3. Hanjalic, K. 2004, Von Karman Institute (VKI) Lecture Series, Introd. . to Turbulence and its Modelling March 2004-08-03
4. Hanjalic, K. 2004, Lecture series and seminars "Wall-bounded and free-surface turbulent flows and their computations", National Univ. Singapore – Inst. Math. Sciences, July 2004.

### ***Journal publications***

1. Cadiou, A., **Hanjalic, K.**, Stawiarski, K. 2004, A two-scale second-moment turbulence closure based on weighted spectrum integration, *Theoretical and Computational Fluid Dynamics*, 18, 1-26.
2. Geers, L., **Hanjalic, K.**, Tummers, M., 2004, Experimental investigation of impinging jet arrays, *Experiments in Fluids*, 2004, 36, 946-958
3. **Hanjalic, K.**, Popovac, M., Hadziabdic, M., 2004, A robust near-wall elliptic relaxation eddy-viscosity turbulence model for CFD, *Int. J. Heat and Fluid Flow*, 25, 1047-1051
4. Kenjereš, S., **Hanjalić, K.**, 2004, Visualization of turbulence structure reorganization in thermal convection subjected to external magnetic field (1 page highlights), *Journal of Visualization*, Japan, 2004, 7(1), 6.
5. Kenjereš, S., **Hanjalić, K.**, 2004, Large eddy simulation of turbulent thermal convection at high Rayleigh number (1 page highlights), *Journal of Visualization*, Japan, 2004, 7(2), 105
6. Kenjeres S, Gunarjo SB, **Hanjalic K.**, 2004, Visualization of air flow and smoke spreading for realistic indoor-climate situations , *Journal of Visualization* 7 (4): 268-268.
7. Kenjereš, S., **Hanjalić, K.**, 2004, Numerical simulation of magnetic control of heat transfer in thermal convection, *Int. J. Heat and Fluid Flow*, 25, 559-568.
8. Kenjereš, S., **Hanjalić, K.**, Bal, D., 2004, A DNS-based second-moment closure for turbulent magnetohydrodynamic flows, *Physics of Fluids*, vol 16, 1229-1241. .
9. Smajevic, I., **Hanjalic, K.** 2004, Twenty-years of successful application of on-load detonation-wave technique for cleaning gas-side boiler surfaces in a coal-fired power plant, *Power Techn. (also in German, VGB)*, 5, 1-5.
10. Tummers, M., van Veen, E., George, N., Rodink, R., **Hanjalic, K.**, 2004, Measurement of velocity-temperature correlations in a turbulent diffusion flame, *Experiments in Fluids*, 37, 364-374.

### ***Chapters in Books/Edited Volumes:***

1. **Hanjalic, K.**: Closure models for incompressible turbulent flows (lecture series). In J.P.A.J. Beeck and C. Benocci (Eds) *Introduction to Turbulence Modeling*, Von Kaman Institute for Fluid Dynamics, Belgium, 1-75.
2. **Hanjalić, k.**, Hadžiabdić, M., Temmerman, L. and Leschziner, M.A., 2004, Merging LES and RANS strategies: zonal or seamless coupling (*Invited lecture*) . In R. Friedrich, B. Geurts and O. Métais (Eds) *Direct and Large-Eddy Simulations V*, Kluwer Publ. 451-464

### ***Conference Proceedings:***

1. **Hanjalić, K.** 2004, "Will RANS survive LES: a view of perspectives", *Proceedings of the ASME HT FED Summer Conference* (cdrom), Charlotte NC, July 11-15, ASME, 2004
1. Kenjereš, S Gunarjo, SB, **Hanjalić, K.** Contribution to elliptic relaxation modelling of turbulent natural and mixed convection.. In G de Vahl Davis & E Leonardi (Eds.), *Proceedings of the CHT-04 ICHMT Int. Symp. on Advances in Computational Heat Transfer* (cdrom), Begell House, New York.
2. Looy, R van, Kenjereš, S, **Hanjalić, K.**, Bataineh, KA Hollander, E, Colenbrander, G (2004). CFD Analysis of the mixing behaviour of a stable stratification in a cylindrical tank with a side-entry mixer.. In S Kawano, C Kleijn & V Kudriavtsev (Eds.), *Proceedings of 5th international Bi-annual ASME/JSME Symposium on Computational Technology* (pp. 1-7). California, USA: ASME.
3. Thielen, L, **Hanjalić, K.**, Jonker, HJJ, Manceau, R. Predictions of flow and heat transfer in multiple-impinging jets with an elliptic-blending second-moment closure. In G de Vahl Davis & E Leonardi (Eds.), *Proceedings of CHT-04 ICHMT Int. Symp. on Advances in Computational Heat Transfer* (cdrom) Begell House, New York.

## **In 2003**

### ***Keynote and other Invited Lectures:***

1. Hanjalić, K. 2003, "Turbulent convection at high Re and Ra numbers: at the crossroads of RANS and LES" *Keynote lecture*, 4<sup>th</sup> Baltic Heat Transfer Conference, Kaunas Lithuania, August 25-27, 2003.
2. Hanjalić, K. 2003, "Merging RANS and LES strategies: Reconciling the Irreconcilable", *Keynote lecture*, DLES-5, Workshop on Direct and Large-Eddy Simulations, München, August 27-29, 2003.
3. Hanjalić, K., 2003, "RANS-based VLES of thermal and magnetic convection at extreme conditions", *Invited lecture*, Charles Speziale Memorial Symposium, ASME-JSME-FED-03, Honolulu, Hawaii, 6-10 July, 2003.
4. Hanjalić, K., 2003, "Simulation of Airflow and Pollutant Dispersion over Urban Terrains as a Tool for Pollution Control: Application to Sarajevo Valley", *Plenary Lecture*, DAAAM International Symposium Intelligent Manufacturing and Automation: Focus on Reconstruction and Development, 22-25 October 2003, Sarajevo, Bosnia Hercegovina.
5. Hanjalić, K., 2003, two lectures in "Turbulenz 2003", Short Course (Kurzlehrgang), LSTM, Friedrich-Alexander University Erlangen-Nürnberg, 7-11 April 2003

### ***Journal publications:***

1. Bart, G.C.J., **Hanjalić, K.**, 2003, Estimation of shape factor for transient conduction, *Int. J. Refrigeration*, 26, pp.360-367.
2. **Hanjalić, K.**, Kenjereš, S., 2003, "Simulation and identification of deterministic structures in thermal and magnetic convection", *Annals of the New York Academy of Science* 972, pp 1988-2002
3. Hübner, A.W., Tummers, M.J., **Hanjalić, K.**, Van den Meer, Th.H. 2003, Experiments on a rotating-pipe swirl burner, *Experimental Thermal and Fluid Science*, 27, pp 481-489.
4. Kenjereš, S., **Hanjalić, K.**, Krstović, G., 2003, "Numerical simulation of combined effects of terrain orography and thermal stratification on pollutant distribution in a town valley" *Lecture Notes Computer Science* 2329, Springer, pp.266-275.
5. Thielen, L., Jonker, H.J.J., 1. **Hanjalić, K.**, 2003, Symmetry breaking of flow and heat transfer in multiple impinging jets, *Int. J. Heat and Fluid Flow*, Vol. 24, pp. 444-453.

### ***Books:***

1. **K. Hanjalić**, Y. Nagano and M. Tummers (Editors), "Turbulence, Heat and Mass Transfer 4", Proceedings of the Fourth International Symposium on Turbulence, Heat and Mass Transfer, Antalya, Turkey, October 12-17, 2003, (in press)

### ***Conference Proceedings:***

1. **Hanjalić, K.**, Kenjeres, S., T-RANS-based VLES of thermal and magnetic convection at extreme conditions, Proc. 4<sup>th</sup> ASME/JSME Joint Fluid Engineering Conference, July 6-11, 2003, Honolulu, Hawaii, USA, Paper FEDSM2003-45344.
2. Kenjeres, S., **Hanjalić, K.**, Simulation and control of thermal convection using external magnetic field with different orientation and distribution, Proc. 3<sup>rd</sup> Int. Symposium on Turbulence and Shear Flow Phenomena, Edts. N. Kasagi et al., Sendai, Japan, 25-27 June 2003, Vol. 3, pp. 1061-1066.
3. Sadiki, A., Jakirlić, S., **Hanjalić, K.**, Towards a thermodynamically consistent anisotropy-resolving turbulence model for conjugate flow, heat and mass transfer, Proc. 4<sup>th</sup> Int. Symposium on Turbulence, Heat and Mass Transfer, Edts. K. Hanjalić et al., Antalya, Turkey, 12-17 October, 2003, pp. 529-537.
4. Smajević, I., **Hanjalić, K.**, Twenty-years of experience with on-load detonation-wave deposit removal from gas-side boiler surfaces in a coal-fired power plant, Proc. 2003 International Joint Power Conference, June 16-19, 2003, Atlanta, Georgia, USA, Paper IJPG2003-40127, 7 pages.
5. Temmerman, L., Leschziner, M. A., **Hanjalić, K.**, A combined RANS-LES strategy with arbitrary interface location for near-wall flows, Proc. 3<sup>rd</sup> Int. Symposium on Turbulence and Shear Flow Phenomena, Edts. N. Kasagi et al., Sendai, Japan, 25-27 June 2003, Vol. 3, pp. 929-934.
6. Tummers, M. J., Veen, E.H. van, George, N., Rodink, R., **Hanjalić, K.**, Combined LDA-CARS measurements of velocity-temperature correlations in turbulent flames, Proc. 3<sup>rd</sup> Int. Symposium on Turbulence and Shear Flow Phenomena, Edts. N. Kasagi et al., Sendai, Japan, 25-27 June 2003, Vol. 3, pp. 1013-1018.
7. Verdoold, J., Rossi, L., Tummers, M., **Hanjalić, K.**, Towards electromagnetic control of thermal convection, Proc. 7<sup>th</sup> Int. Symposium on Fluid Control, Measurements and Visualization, Sorrento, Italy, September, 2003.

## **In 2002**

### **Keynote and other Invited Lectures:**

1. Hanjalić, K. Kenjeres, S., 2002, Simulation and identification of semi-deterministic structures in turbulence. Keynote lecture, *International Symposium on Visualization and Imaging in Transport Phenomena*, VIM-01, May 5-10, 2002, Antalya, Turkey
2. Hanjalić, K. Kenjeres, S., 2002, Dynamic simulation of pollutant dispersion over complex urban terrains: a tool for sustainable development, control and management, Keynote lecture, *Unesco-sponsored International Conference on Sustainable development of Energy, Water and Environmental Systems*, June 2- 7, Dubrovnic, Croatia.
3. Hanjalić, K. A series of 3 lectures at the Institute for Thermal Physics of the Russian Academy of Sciences – Siberian Branch, May 23-24, 2002.

### **Seminar lectures:**

Invited seminar lectures at University Joseph Fourier, Grenoble (January 2002), Kings College, London (April 2002), Imperial College London (April 2002)

### **Journal publications:**

1. Bart, G.C.J., IJzerloo van, A.J., Geers, L.F.G., Hoek, L., **Hanjalić, K.**, 2002 Heat transfer of phase locked modulated impinging-jet arrays, *Experimental Thermal and Fluid Science*, 26, p. 299- 304.
2. Dahoe, A.E., **Hanjalić, K.**, Scarlett, B., 2002, Determination of the laminar burning velocity and the Markstein length of powder-air flames, *Powder Technology*, 122, p. 222-238.
3. **Hanjalić, K.**, 2002, One-point closure models for buoyancy driven turbulent flows. *Annual Review Fluid Mechanics*, 34, p. 321-348.
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5. Hanjalic, K., 2001, Invited lecture series, ERCOFTAC Summer School on "Recent developments in mathematical modelling of turbulent flows" September 24-28, 2001, Lansk, Poland,

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5. Ničeno, B. and **K. Hanjalić**, "Large-eddy simulation (LES) on distributed memory parallel computers, using an unstructured finite-volume solver" In Jenssen, C.B. et al. (Edts.) *Parallel Computational Fluid Dynamics – Trends and Applications* Elsevier Scie. B.V., (2001), pp 457- 464.

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2. Geers, L.F.G., M.J. Tummers, G.C.J. Bart and **K. Hanjalić**, "LDA and PIV Measurements applied to single and multiple Impinging Jets", *Proc. 5th World Conference on Exp. Heat Transfer, Fluid Mechanics and Thermodynamics*, Thessaloniki, Greece, September 2001, p. 6
3. Geers, L.F.G., M.J. Tummers, **K. Hanjalić**, "PIV Measurements in Impinging Jets at a high Reynolds Number", ", *Proc. Second Int. Symposium on Turbulence and Shear Flow Phenomena*, Edts. E. Lindberg et al., KTH - Stockholm, 2001, Vol. 2, pp. 289-294.
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12. Ničeno, A.D.T. Dronkers and **K. Hanjalić**, "Unstructured LES of Turbulent Heat Transfer on a compound surface-mounted cube", Proc. Int. Symp. on Advances in Computational Heat Transfer, (Palm Cove, Australia, May, 2001), Edts: G. de Vahl Davis and E. Leonardi, Begell House Inc., New York, p. 1243-1250
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2. Hanjalić, K., "Some recent development in second-moment turbulence closure modelling", *Distinguished Lecture* (invited), Ohio Aerospace Institute, Cleveland, Ohio, 19 June 2000.
3. Hanjalić, K., "Introduction to the Modelling of Turbulence", Invited lecture series for the Von Karman Institute for Fluid Dynamics, Belgium, Rhode Saint Genèse, 13 - 17 March 2000.
4. Hanjalić, K., "Computational fluid Dynamics Fundamental and Practical Issues", Invited lecture series, University of Tokyo, JSME Thermal Engineering Division, Tokyo Japan, April 7-8 2000
5. Hanjalić, K., "Second-Moment Turbulence Closure Models", Invited lecture series in the Michigan State University, course on Computational Fluid Dynamics, Fundamental and Practical Issues, June 14-16, 2000.
6. Hanjalić, K., "Very large Eddy simulation - Applicability in Chemical Engineering", invited *opening lecture* at the NOW/CW annual meeting, Studiegroep Procestechologie, Lunteren, 10-11 januari 2000.

#### ***Seminar lectures:***

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2. **Hanjalić, K.** and S. Kenjereš, "Reorganization of turbulence structure in magnetic Rayleigh-Bénard convection: A T-RANS study", Journal of Turbulence, JoT 2000, <http://jot.iop.org/> (internet publication), 22 pages
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