References

References marked with ($\star$) can be found as reprints in [35].

Physical and Technical Background - Books

1. Batchelor G.K. (2000): *An Introduction to Fluid Dynamics*, Cambridge University Press, Cambridge, England.
2. Bendat J.S., Piersol A.G. (2000): *Random Data: Analysis and Measurement Procedures*, Wiley-Interscience, New York.
3. Born M., Wolf, E. (2000): *Principles of Optics*, Cambridge University Press, Cambridge.
4. Bracewell R.N. (1999): *The Fourier transform and its applications, 3nd Edition*, McGraw-Hill Science McGraw-Hill Science.
5. Brigham E.O. (1974): *The fast Fourier transform*, Prentice-Hall, Englewood Cliffs, New Jersey.
6. Deen W. (1998): *Analysis of Transport Phenomena*, Oxford University Press, New York.
7. Fomin N.A. (1998): *Speckle Photography for Fluid Mechanics Measurements*, Springer, Berlin.
8. Goldstein R.J. (1996): *Fluid Mechanics Measurements, 2nd Edition*, Taylor & Francis, Washington, DC.
9. Gonzalez R.C., Wintz P. (1987): *Digital image processing, 2nd Edition*, Addison-Wesley Publishing Company, Reading, Massachusetts.
10. Goodman J.W. (2004): *Introduction to Fourier optics*, Roberts & Company Publishers, Greenwood village.
11. Hecht E., Zajac A. (2001): *Optics*, Addison-Wesley Pub. Company, Massachusetts.
12. Horner J.L. (1987): *Optical Signal Processing*, Academic Press, Orlando.
13. van de Hulst H.C. (1957): *Light scattering by small particles*, John Wiley & Sons, Inc., New York (republished 1981 by Dover Publications, New York).
14. Inoué S., Spring K.R. (1997): *Video Microscopy: The Fundamentals, 2nd Edition*, Plenum Press, New York.
15. Jähne B. (2005): *Digitale Bildverarbeitung, 6th Edition*, Springer-Verlag, Berlin Heidelberg (also available in English: *Digital image processing*).

16. Jain A.K. (1989): *Fundamentals of digital image processing*, Prentice Hall, Englewood Cliffs, New Jersey.
17. Kneubühl F.K., Sigrist M.W. (1999): *Laser*, Teubner Studienbücher, Stuttgart.
18. Lauterborn W., Kurz T., Wiesenfeldt M. (2003): *Coherent optics – Fundamentals and applications*, Springer Verlag, Berlin.
19. Merzkirch W. (1987): *Flow Visualization*, New York: Academic.
20. Papoulis A. (1977): *Signal Analysis*, Mc Graw Hill, New York.
21. Papoulis A., Pillai, S. (2002): *Probability, Random Variables and Stochastic Processes*, Mc Graw Hill, New York.
22. Pratt W.K. (2007): *Digital Image Processing: PIKS Scientific Inside, 4th Edition*, Wiley-Interscience, John Wiley & Sons, New York.
23. Press W.H., Teukolsky S.A., Vettering W.T., Flannery B.P. (1992): *Numerical recipes in C, 2nd Edition*, Cambridge University Press, Cambridge.
24. Rastogi, P.K. (2001): *Digital Speckle Pattern Interferometry and Related Techniques*, John Wiley and Sons, ISBN 0-471-49052-0.
25. Rosenfeld A., Kak A.C. (1982): *Digital picture processing, 2nd Edition, Volumes 1 & 2*, Academic Press, Orlando.
26. Rotta J. (1990): *Die Aerodynamische Versuchsanstalt in Göttingen, ein Werk Ludwig Prandtls*, Vandenhoek & Ruprecht, Göttingen (Germany).
27. Settles G.S. (2006): *Schlieren and Shadowgraph Techniques*, Berlin: Springer.
28. Solf K.D. (1986): *Fotografie: Grundlagen, Technik, Praxis*, Fischer Taschenbuch Verlag, Frankfurt.
29. Yaroslavsky L.P. (1985): *Digital Picture Processing*, Springer Verlag, Berlin.

Reviews and books on PIV

30. Adrian R.J. (1986): Multi-point optical measurements of simultaneous vectors in unsteady flow – a review, *Int. Journal of Heat and Fluid Flow*, **7**, pp. 127–145 ($\star$).
31. Adrian, R.J. (1991): Particle-imaging techniques for experimental fluid mechanics, *Ann. Rev. Fluid Mech.*, **23**, pp. 261–304 ($\star$).
32. Adrian R.J. (1996): Bibliography of particle image velocimetry using imaging methods: 1917 – 1995, TAM Report 817, UILU-ENG-96-6004, University of Illinois (USA).
33. Adrian R.J. (2005): Twenty years of particle image velocimetry, *Exp. Fluids*, **39**, pp. 159–169.
34. Dracos Th., ed. (1996): *Three-Dimensional Velocity and Vorticity Measuring and Image Analysis Techniques*, Kluwer Academic Publishers, Dordrecht (the Netherlands).
35. Grant I., ed. (1994): *Selected papers on particle image velocimetry* SPIE Milestone Series **MS 99**, SPIE Optical Engineering Press, Bellingham, Washington.
36. Grant I. (1997): Particle image velocimetry: A review, *Proceedings Institute of Mechanical Engineers*, **211**, pp. 55–76.

37. Hinsch K.D. (1993): Particle image velocimetry, in *Speckle Metrology*, ed. R.S. Sirohi, Marcel Dekker, New York, pp. 235–323.
38. Hinsch K.D. (1995): Three-dimensional particle velocimetry, *Meas. Sci. Tech.*, **6**, pp. 742–753.
39. Hinsch K. (2002): Holographic particle image velocimetry, *Meas. Sci. Tech.*, **13**, pp. R61–R72.
40. Kompenhans J., Raffel M., Willert C., Wiegel M., Kähler C., Schröder A., Bretthauer B., Vollmers H., Stasicki B. (1996): Investigation of unsteady flow fields in wind tunnels by means of particle image velocimetry, in *Three-Dimensional Velocity and Vorticity Measuring and Image Analysis Techniques* ed. Th. Dracos, Kluwer Academic Publishers, Dordrecht (the Netherlands), pp. 113–127.
41. Lauterborn W., Vogel A. (1984): Modern optical techniques in fluid mechanics, *Ann. Rev. Fluid Mech.*, **16**, pp. 223–244 ($\star$).
42. Meynart R. (1983): Mesure de champs de vitesse d' ecoulements fluides par analyse de suites d' images obtenues par diffusion d' un feuillet lumineux, Ph.D. thesis, Faculté des Sciences Appliquées, Universite Libre de Bruxelles.
43. Riethmuller M.L., ed. (1996): Particle Image Velocimetry, *von Karman Institute for Fluid Dynamics, Lecture Series* 1996–03, Rhode-St-Genèse (Belgium).
44. Riethmuller M.L., ed. (2000): Particle Image Velocimetry and Associated Techniques, *von Karman Institute for Fluid Dynamics, Lecture Series* 2000–01, Rhode-St-Genèse (Belgium).
45. Scarano F., Riethmuller M.L., ed. (2005): Advanced Measuring Techniques for Supersonic Flows, *von Karman Institute for Fluid Dynamics, Lecture Series* 2005–01, Rhode-St-Genèse (Belgium).
46. Samimy M., Wernet M.P. (2000): Review of planar multiple-component velocimetry in highspeed flows, *AIAA Journal*, **38**, pp. 553–574.
47. Stanislas M., Kompenhans J., Westerweel J. (Eds.) (2000): *Particle image velocimetry: Progress towards industrial application*, Kluwer Academic Publishers, Dordrecht (the Netherlands).
48. Stanislas M., Okamoto K., Kähler C.J. (2003): Main results of the first international PIV challenge, *Meas. Sci. Tech.*, **14**, pp. R63–R89.
49. Stanislas M., Westerweel J., Kompenhans J. (eds) (2004): *Particle Image Velocimetry: recent improvements. Proceedings of the EUROPIV 2 workshop, Zaragoza, Spain, March/April 2003*, Springer, Berlin Heidelberg New York. (ISBN 3-540-21423-2)
50. Stanislas M., Okamoto K., Kähler C.J., Westerweel J. (2005): Main results of the second international PIV challenge, *Exp. Fluids*, **39**, pp. 170–191.
51. Westerweel J. (1993): *Digital particle image velocimetry – Theory and application* Ph.D. Dissertation, Delft University Press, Delft.
52. Willert C., Raffel M., Kompenhans J., Stasicki B., Kähler C. (1997): Recent applications of particle image velocimetry in aerodynamic research, *Flow. Meas. Instrum.*, **7**, pp. 247–56.

Physical and Technical Background specified to PIV

53. Adrian R.J., Yao C.S. (1985): Pulsed laser technique application to liquid and gaseous flows and the scattering power of seed materials, *Appl. Optics*, **24**, pp. 44–52 (⋆).
54. Adrian R.J. (1995): Limiting resolution of particle image velocimetry for turbulent flow, in *Advances in Turbulence Research-1995*, Proc. 2nd Turbulence Research Assoc. Conf. Pohang Inst. Tech., pp. 1–19.
55. Bryanston-Cross P.J., Epstein A. (1990): The application of submicron particle visualisation for PIV (particle image velocimetry) at transonic and supersonic speeds, *Prog. Aerospace Sci.*, **27**, pp. 237–265.
56. Grant I., Smith G.H., Liu A., Owens E.H., Yan Y.Y. (1989): Measuring turbulence in reversing flows by particle image velocimeter, Proc. *ICALEO '89, L.I.A.,* **68**, pp. 92–100.
57. Hinsch K., Arnold W., Platen W. (1987): Turbulence measurements by particle imaging velocimetry, Proc. *ICALEO '87 — Optical Methods in Flow and Particle Diagnostics, L.I.A.,* **63**, pp. 127–134 (⋆).
58. Höcker R., Kompenhans J. (1991): Application of Particle Image Velocimetry to Transonic Flows, in *Application of Laser Techniques to Fluid Mechanics,* ed. R.J. Adrian et al., Springer Verlag, pp. 416–434.
59. Kompenhans J., Reichmuth J. (1986): Particle imaging velocimetry in a low turbulent wind tunnel and other flow facilities, Proc. *AGARD Conference on Advanced Instrumentation for Aero Engine Components, 19–23 May, Philadelphia (USA), (AGARD-CP 399–35).*
60. Kompenhans J., Raffel M. (1993): Application of PIV technique to transonic flows in a blow-down wind tunnel, Proc. SPIE 2005, *Intl. Symp. on Optics, Imaging and Instrumentation, 11–16 July, San Diego (USA), Optical Diagnostics in Fluid and Thermal Flow,* ed. S.S. Cha, J.D. Trollinger, pp. 425–436.
61. Lourenço L.M., Krothapalli A., Buchlin J.M., Riethmuller M.L. (1986): A non-invasive experimental technique for the measurement of unsteady velocity and vorticity fields, *AIAA Journal*, **24**, pp. 1715–1717.
62. Lourenço L.M. (1988): Some comments on particle image displacement velocimetry, *von Karman Institute for Fluid Dynamics, Lecture Series* 1988-06, Particle Image Displacement Velocimetry, Rhode-St-Genèse (Belgium).
63. Machacek M. (2003): A quantitative visualization tool for large wind tunnel experiments, Ph.D. thesis, ETH Zürich.
64. Molezzi M.J., Dutton J.C. (1993): Application of particle image velocimetry in high-speed separated flows, *AIAA Journal*, **31**, pp. 438–446.
65. Prandtl, L. (1905): Über Flüssigkeitsbewegung bei sehr kleiner Reibung, Proc. *Verhandlungen des III. Internationalen Mathematiker-Kongresses, Heidelberg, 1904, Teubner, Leipzig,* pp. 404–491.
66. Sinha S.K. (1988): Improving the accuracy and resolution of particle image or laser speckle velocimetry, *Exp. Fluids*, **6**, pp. 67–68 (⋆).

67. Thomas P. (1991): Experimentelle und theoretische Untersuchungen zum Folgeverhalten von Teilchen in kompressibler Strömung, *Deutsche Forschungsanstalt für Luft- und Raumfahrt, Research Report* DLR-FB 91–25.
68. Towers C.E., Bryanston-Cross P.J., Judge T.R. (1991): Application of particle image velocimetry to large-scale transonic wind tunnels, *Optics and Laser Technology*, **23**, pp. 289–295.

Seeding methods for PIV

69. Echols W.H., Young J.A. (1963): Studies of portable air-operated aerosol generators, NRL Report 5929, Naval Research Laboratory, Washington D.C.
70. Humphreys W.M., Bartram S.M., Blackshire J.L. (1993): A survey of particle image velocimetry applications in Langley aerospace facilities, Proc. *31st Aerospace Sciences Meeting, 11–14 January, Reno, Nevada, (AIAA Paper 93-041).*
71. Hunter W.W., Nichols C.E. (1985): Wind tunnel seeding systems for laser velocimeters, Proc. *NASA Workshop, 19–20 March, NASA Langley Research Center (NASA Conference Publication 2393).*
72. Kähler C.J., Sammler B., Kompenhans J. (2002): Generation and control of particle size distributions for optical velocity measurement techniques in fluid mechanics, *Exp. Fluids*, **33**, pp. 736–742.
73. Kähler C.J. (2003): General design and operating rules for seeding atomisers, Proc. *5th International Symposium on Particle Image Velocimety, Busan (Korea).*
74. Melling A. (1986): Seeding gas flows for laser anemometry, Proc. *AGARD Conference on Advanced Instrumentation for Aero Engine Components, 19–23 May, Philadelphia (USA), AGARD-CP 399-8.*
75. Melling A. (1997): Tracer particles and seeding for particle image velocimetry, *Meas. Sci. Tech.*, **8**, pp. 1406–1416.
76. Meyers J.F. (1991): Generation of particles and seeding, *von Karman Institute for Fluid Dynamics, Lecture Series* 1991-05, Laser Velocimetry, Rhode-St-Genèse (Belgium).
77. Wernet J.H., Wernet M.P. (1994): Stabilized alumina/ethanol colloidal dispersion for seeding high temperature air flows, Proc. *ASME Symposium on Laser Anemometry: Advances and Apllications, Lake Tahoe, Nevada (USA), 19–23 June.*

Mathematical Background of Statistical PIV Evaluation

78. Adrian R.J. (1988): Statistical properties of particle image velocimetry measurements in turbulent flow, in *Laser Anemometry in Fluid Mechanics III*, Springer-Verlag, Berlin Heidelberg, pp. 115–129 ($\star$).
79. Adrian R.J. (1997): Dynamic ranges of velocity and spatial resolution of particle image velocimetry, *Meas. Sci. Tech.*, **8**, pp. 1393–1398.
80. Foucaut J.M., Carlier J., Stanislas M. (2004): PIV optimization for the study of turbulent flow using spectral analysis, *Meas. Sci. Tech.*, **15**, pp. 1046–1058.

81. Guezennec Y.G., Kiritsis N. (1990): Statistical investigation of errors in particle image velocimetry, *Exp. Fluids*, **10**, pp. 138–146 (⋆).
82. Keane R.D., Adrian R.J. (1990): Optimization of particle image velocimeters. Part I: Double pulsed systems, *Meas. Sci. Tech.*, **1**, pp. 1202–1215.
83. Keane R.D., Adrian R.J. (1991): Optimization of particle image velocimeters. Part II: Multiple pulsed systems, *Meas. Sci. Tech.*, **2**, pp. 963–974.
84. Keane R.D., Adrian R.J. (1992): Theory of cross-correlation analysis of PIV images, *Appl. Sci. Res.*, **49**, pp. 191–215 (⋆).
85. Westerweel J. (2000): Theoretical analysis of the measurement precision in particle image velocimetry, *Exp. Fluids*, **29**, pp. S3–S12.

PIV Recording Techniques

86. Adrian R.J. (1986): Image shifting technique to resolve directional ambiguity in double-pulsed velocimetry, *Appl. Optics*, **25**, pp. 3855–3858 (⋆).
87. Brücker C. (1996): Spatial correlation analysis for 3-D scanning PIV: simulation and application of dual-color light-sheet scanning, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
88. Dieterle L. (1997): *Entwicklung eines abbildenden Messverfahrens (PIV) zur Untersuchung von Mikrostrukturen in turbulenten Strömungen*, PhD thesis, Deutscher Universitäts Verlag GmbH, Wiesbaden (Germany).
89. Gauthier V., Riethmuller M.L. (1988): Application of PIDV to complex flows: Resolution of the directional ambiguity, *von Karman Institute for Fluid Dynamics, Lecture Series* 1988-06, Particle Image Displacement Velocimetry, Rhode-St-Genèse (Belgium).
90. Gogineni S., Trump D., Goss L., Rivir R., Pestian D. (1996): High resolution digital two-color PIV (D2CPIV) and its application to high free stream turbulent flows, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
91. Goss L.P., Post M.E., Trump D.D., Sarka B. (1989): Two-color particle velocimetry, Proc. *ICALEO '89, L.I.A.,* **68**, pp. 101–111.
92. Grant I., Smith G.H., Owens E.H. (1988): A directionally sensitive particle image velocimeter, *J. Phys. E: Sci. Instrum.*, **21**, pp. 1190–1195.
93. Grant I., Liu A. (1990): Directional ambiguity resolution in particle image velocimetry by pulse tagging, *Exp. Fluids*, **10**, pp. 71–76 (⋆).
94. Hain R., Kähler C.J., Tropea C. (2007): Comparison of CCD, CMOS and intensified cameras, *Exp. Fluids*, **42**, pp. 403–411.
95. Heckmann W., Hilgers S., Merzkirch W., Wagner T. (1994): PIV-Messungen in einer Zweiphasenströmung unter Verwendung von zwei CCD-Kameras, Proc. *4. Fachtagung Lasermethoden in der Strömungsmesstechnik, 12–14 September, Aachen (Germany).*
96. Houston A.E. (1978): High-speed photography and photonic recording, *Journal of Physics E*, **11**, pp. 601–609.

97. Huang H.T., Fiedler H.E. (1994): Reducing time interval between successive exposures in video PIV, *Exp. Fluids*, **17**, pp. 356–363.
98. Landreth C.C., Adrian R.J., Yao C.S. (1988): Double-pulsed particle image velocimeter with directional resolution for complex flows, *Exp. Fluids*, **6**, pp. 119–128 (⋆).
99. Landreth C.C., Adrian R.J. (1988): Electrooptical image shifting for particle image velocimetry, *Appl. Optics*, **27**, pp. 4216–4220 (⋆).
100. Lecordier B., Mouquallid M., Vottier S., Rouland E., Allano D., Trinite (1994): CCD recording method for cross-correlation PIV development in unstationary high speed flow, *Exp. Fluids*, **17**, pp. 205–208.
101. Lourenço L.M. (1993): Velocity bias technique for particle image velocimetry measurements of high speed flows, *Appl. Optics*, **32**, pp. 2159–2162.
102. Reynolds G.O., DeVelis J.B., Parrent G.B., Thompson B.J. (1989): *The New Physical Optics Notebook: Tutorials in Fourier Optics*, SPIE Optical Engineering Press, Washington.
103. Raffel M., Kompenhans J. (1993): PIV measurements of unsteady transonic flow fields above a NACA 0012 airfoil, Proc. *5th Intl. Conf. on Laser Anemometry, Veldhoven (the Netherlands), pp. 527–535.*
104. Raffel M., Kompenhans J. (1995): Theoretical and experimental aspects of image shifting by means of a rotating mirror system for particle image velocimetry, *Meas. Sci. Tech.*, **6**, pp. 795–808.
105. Reuss D.L. (1993): Two-dimensional particle-image velocimetry with electrooptical image shifting in an internal combustion engine, Proc. SPIE 2005*, Optical Diagnostics in Fluid and Thermal Flow,* ed. S.S. Cha, J.D. Trollinger, pp. 413–424.
106. Rouland E., Vottier S., Lecordier B., Trinité M. (1994): Cross-correlation PIV development for high speed flows with a standard CCD camera, Proc. *2nd Int. Seminar on Opt. Methods and Data Processing in Heat and Fluid Flow, London.*
107. Sebastian B. (1995): Untersuchung einer Motorinnenströmung mit der Particle Image Velocimetry, Proc. *4. Fachtagung Lasermethoden in der Strömungsmesstechnik, 12–14 September, Rostock (Germany).*
108. Turko B.T., Yates G.J., King N.S. (1995): Processing of multiport CCD video signals at very high frame rates, *SPIE Proceedings of Ultra- and High-Speed Photography, Videography and Photonics*, **2549**, pp. 11–15.
109. Vogt A., Baumann P., Gharib M., Kompenhans J. (1996): Investigations of a wing tip vortex in air by means of DPIV, Proc. *19th AIAA Advanced Measurements and Ground Testing Technology Conference, June 17–20, New Orleans (USA), AIAA 96–2254.*
110. Wernet M.P. (1991): Particle displacement tracking technique applied to air flows, Proc. *4th Intl. Conf. on Laser Anemometry, Advances and Applications, Cleveland, Ohio (USA).*
111. Willert C., Stasicki, B., Raffel M., Kompenhans J. (1995): A digital video camera for application of particle image velocimetry in high-speed flows, Proc. SPIE 2546 *Intl. Symp. on Optical Science, Engineering and Instrumentation, 9–14 July, San Diego (USA),* pp.124–134.

112. Willert C., Raffel M., Stasicki B., Kompenhans J. (1996): High-speed digital video camera systems and related software for application of PIV in wind tunnel flows, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
113. Wormell D.C., Sopchak J. (1993): A particle image velocimetry system using a high-resolution CCD camera, Proc. SPIE 2005*, Optical Diagnostics in Fluid and Thermal Flow,* ed. S S Cha, J D Trollinger, pp. 648–654.

Processing of photographic PIV recordings

114. Ashley P.R., Davis J.H. (1987): Amorphous silicon photoconductor in a liquid crystal spatial light modulator, *Appl. Optics*, **26**, pp. 241–246.
115. Bjorkquist D.C. (1990): Particle image velocimetry analysis system, Proc. *59th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
116. Efron U., Grinberg J., Braatz P.O., Little M.J., Reif P.G., Schwartz R.N. (1985): The silicon liquid-crystal light valve, *J. Appl. Phys.*, **57**, pp. 1356–1368.
117. Gabor A.M., Landreth B., Moddel G. (1993): Integrating mode for an optically addressed spatial light modulator, *Appl. Optics*, **37**, pp. 3064–3067.
118. Grant I., Liu A. (1989): Method for the efficient incoherent analysis of particle image velocimetry images, *Appl. Optics*, **28**, pp. 1745–1748 ($\star$).
119. Humphreys W.M. (1989): A histogram-based technique for rapid vector extraction from PIV photographs, Proc. *4th Intl. Conf. on Laser Anemometry, Advances and Applications, Cleveland, Ohio (USA).*
120. Lee J., Farrell P.V. (1992): Particle image velocimetry measurements of IC engine valve flows, Proc. *69th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
121. Morck T., Andersen P.E., Westergaard C.H. (1992): Processing speed of photorefractive optical correlators in PIV-processing, Proc. *69th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
122. Pickering C.J.D., Halliwell N.A. (1984): Speckle photography in fluid flows: signal recovery with two-step processing, *Appl. Optics*, **23**, pp. 1128–1129 ($\star$).
123. Pickering C.J.D., Halliwell N.A. (1984): Laser speckle photography and particle image velocimetry: photographic film noise, *Appl. Optics*, **23**, pp. 2961–2969.
124. Willert, C. (1996): The fully digital evaluation of photographic PIV recordings, *Appl. Sci. Res.*, **56**, pp. 79–102.

Digital PIV Processing

125. Agüi J.C, Jiménez J. (1987): On the performance of particle tracking, *J Fluid Mech.*, **185**, pp. 447–468 ($\star$).
126. Astarita T., Cardone G. (2005): Analysis of interpolation schemes for image deformation methods in PIV, *Exp. Fluids*, **38**, pp. 233–243.

127. Cenedese A., Querzoli G. (1995): PIV for Lagrangian scale evaluation in a convective boundary layer, in *Flow Visualisation, vol. VI,* (eds. Tanida Y, Miyshiro H.), Springer Verlag, Berlin, pp. 863–867.
128. Chen J., Katz J. (2005): Elimination of peak-locking error in PIV analysis using the correlation mapping method, *Exp. Fluids*, **16**, pp. 1605–1618.
129. Cowen E.A., Monismith S.G. (1997): A hybrid digital particle tracking velocimetry technique, *Exp. Fluids*, **22**, pp. 199–211.
130. Di Florio D., Di Felice F., Romano G.P. (2002): Windowing, reshaping and re-orientation interrogation windows in particle image velocimetry for the investigation of shear flows, *Meas. Sci. Tech.*, **13**, pp. 953–962.
131. Fincham A.M., Delerce G. (2000): Advanced optimization of correlation imaging velocimetry algorithms, *Exp. Fluids*, **29**, pp. S013–S022.
132. Frigo M., Johnson S.G. (1998): FFTW: An adaptive software architecture for the FFT, *Proc. IEEE Intl. Conf. Acoustics Speech and Signal Processing*, **3**, pp. 1381–1384.
133. Frigo M., Johnson S.G. (2005): The design and implementation of FFTW3, *Proc. IEEE*, **93**(2), pp. 216–231.
134. Grant I., Pan X. (1995): An investigation of the performance of multi layer neural networks applied to the analysis of PIV images, *Exp. Fluids*, **19**, pp. 159–166.
135. Gui L., Merzkirch W., Shu J. Z. (1997): Evaluation of Low Image Density PIV Recordings with the MQD Method and Application to the Flow in a Liquid Bridge, *J. Flow Vis. and Image Proc.*, **4**(4), pp. 333–343.
136. Gui L., Wereley S.T. (2002): A correlation-based continuous window-shift technique to reduce the peak-locking effect in digital PIV image evaluation, *Exp. Fluids*, **32**, pp. 506–517.
137. Gui L., Wereley S.T., Kim Y.H. (2003): Advances and application of the digital mask technique in particle image velocimetry experiments, *Meas. Sci. Tech.*, **14**, pp. 1820–1828.
138. Hart D.P. (1996): Sparse array image correlation, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
139. Hart D.P. (1998): The elimination of correlation errors in PIV processing, Proc. *99th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
140. Hart D.P. (2000): Super-resolution PIV by recursive local-correlation, *J. Visualization*, **3**(2), pp. 187–194.
141. Hart D.P. (2000): PIV error correction, *Exp. Fluids*, **29**, pp. 13–22.
142. Huang H.T., Fiedler H.F., Wang J.J. (1993): Limitation and improvement of PIV, part II. Particle image distortion, a novel technique, *Exp. Fluids*, **15**, pp. 263–273.
143. Jambunathan K, Ju X.Y., Dobbins B.N., Ashcroft-Frost S. (1995): An improved cross correlation technique for particle image velocimetry, *Meas. Sci. Tech.*, **6**, pp. 507–514.
144. Lecordier B. (1997): Etude de l'interaction de la propagation d'une flamme premelangée avec le champ aerodynamique, par association de la tomographie laser et de la vélocimétrie par images de particules, Ph.D. thesis, Université de Rouen (France).

145. Lecordier B., Lecordier J.C., Trinité M. (1999): Iterative sub-pixel algorithm for the cross-correlation PIV measurements, Proc. *3rd International workshop on particle image velocimetry (PIV'99), Santa Barbara, California (USA).*
146. Lecordier B., Trinité M. (2004): Advanced PIV algorithms with image distortion for velocity measurements in turbulent flows, in *Stanislas M., Westerweel J., Kompenhans J. (eds) Particle Image Velocimetry: recent improvements. Proceedings of the EUROPIV 2 workshop, Zaragoza, Spain, March/April 2003*, Springer, Berlin, Heidelberg, New York, pp. 115–142.
147. Lourenço L.M. Gogineeni S.P., Lasalle R.T. (1994): On-line particle image velocimeter: an integrated approach, *Appl. Optics*, **33**, pp. 2465–2470.
148. Nobach H., Honkanen M. (2005): Two-dimensional Gaussian regression for sub-pixel displacement estimation in particle image velocimetry or particle position estimation in particle tracking velocimetry, *Exp. Fluids*, **38**, pp. 511–515.
149. Nogueira J., Lecuona A., Rodriguez P.A. (1999): Local field correction PIV: On the increase of accuracy in digital PIV systems, *Exp. Fluids*, **27**, pp. 107–116.
150. Nogueira J., Lecuona A., Rodriguez P.A. (2001a): Identification of a new source of peak locking, analysis and its removal in conventional and super-resolution PIV techniques, *Exp. Fluids*, **30**, pp. 309–316.
151. Nogueira J., Lecuona A., Rodriguez P.A. (2001b): Local field correction PIV, implemented by means of simple algorithms and multigrid versions, *Meas. Sci. Tech.*, **12**, pp. 1911–1921.
152. Prasad A.K., Adrian R.J., Landreth C.C., Offutt P.W. (1992): Effect of resolution on the speed and accuracy of particle image velocimetry interrogation, *Exp. Fluids*, **13**, pp. 105–116.
153. Roesgen T. (2003): Optimal subpixel interpolation in particle image velocimetry, *Exp. Fluids*, **35**, pp. 252–256.
154. Rohaly J., Frigerio F., Hart D.P. (2002): Reverse hierarchical PIV processing, *Meas. Sci. Tech.*, **13**, pp. 984–996.
155. Ronneberger O., Raffel M., Kompenhans J. (1998): Advanced evaluation algorithms for standard and dual plane particle image velocimetry, Proc. *9th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).* 13–16 July.
156. Roth G., Katz J. (2001): Five techniques for increasing speed and accuracy of PIV interrogation, *Meas. Sci. Tech.*, **12**, pp. 238–245.
157. Scarano F., Riethmuller M.L. (1999): Iterative multigrid approach in PIV image processing with discrete window offset, *Exp. Fluids*, **26**, pp. 513–523.
158. Scarano F., Riethmuller M.L. (2000): Advances in iterative multigrid PIV image processing, *Exp. Fluids*, **29**, pp. S051–S060.
159. Scarano F. (2002): Iterative image deformation methods in PIV, *Meas. Sci. Tech.*, **13**, pp. R1–R19.
160. Scarano F. (2003): Theory of non-isotropic spatial resolution in PIV, *Exp. Fluids*, **35**, pp. 268–277.

161. Shavit U., Lowe R.J., Steinbuck J.V. (2007): Intensity Capping: a simple method to improve cross-correlation PIV results, *Exp. Fluids*, **42**, pp. 225–240.
162. Siu Y.W., Taylor A.M.K.P., Whitelaw J.H. (1994): Lagrangian tracking of particles in regions of flow recirculation, Proc. *First International Conference on Flow Interaction, Hong Kong.* 330–333.
163. Thévenaz P., Blu T., Unser M. (2000): Interpolation Revisited, *IEEE Trans. Medical Imaging*, **19**, pp. 739–758.
164. Thomas M., Misra S., Kambhamettu C., Kirby J.T. (2005): A robust motion estimation algorithm for PIV, *Meas. Sci. Tech.*, **16**, pp. 865–877.
165. Unser M. (1999): Splines: a perfect fit for signal and image processing, *IEEE Sign. Proces. Mag.*, **16**, pp. 22–38.
166. Unser M., Aldroubi A., Eden M. (1993a): B-spline signal processing: part I – theory, *IEEE T. Sign. Proces.*, **41**, pp. 821–832.
167. Unser M., Aldroubi A., Eden M. (1993b): B-spline signal processing: part II – efficient design and applications, *IEEE T. Sign. Proces.*, **41**, pp. 834–848.
168. Vogt A., Raffel M., Kompenhans J. (1992): Comparison of optical and digital evaluation of photographic PIV recordings, Proc. *69th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
169. Wereley S.T., Meinhart C.D. (2001): Second-order accurate particle image velocimetry, *Exp. Fluids*, **31**, pp. 258–268.
170. Wernet M.P. (2001): New insights into particle image velocimetry data using fuzzy-logic-based correlation/particle tracking processing, *Exp. Fluids*, **30**, pp. 434–447.
171. Wernet P. (2005): Symmetric phase-only filtering: a new paradigm for DPIV data processing, *Meas. Sci. Tech.*, **16**, pp. 601–618.
172. Westerweel J., Dabiri D., Gharib M. (1997): The effect of a discrete window offset on the accuracy of cross-correlation analysis of PIV recordings, *Exp. Fluids*, **23**, pp. 20–28.
173. Westerweel J., Geelhoed P.F., Lindken R. (2004): Single-pixel resolution ensemble correlation for micro-PIV applications image velocimetry, *Exp. Fluids*, **37**, pp. 375–384.
174. Willert C.E., Gharib M. (1991): Digital particle image velocimetry, *Exp. Fluids*, **10**, pp. 181–193 ($\star$).
175. Yaroslavsky L.P. (1996): Signal sinc-interpolation: a fast computer algorithm, *Bioimaging*, **4**, pp. 225–231.

Super-resolution PIV

176. Bastiaans R.J.M., van der Plas G.A.J., Keift R.N. (2002): The performance of a new PTV algorithm applied in super-resolution PIV, *Exp. Fluids*, **32**, pp. 346–356.
177. Cowen E.A., Monismith S.G. (1997): A hybrid digital particle image velocimetry technique, *Exp. Fluids*, **22**, pp. 199–211.
178. Dracos Th. (1996): Particle tracking velocimetry (PTV) – basic concepts, in *Three-Dimensional Velocity and Vorticity Measuring and*

Image Analysis Techniques ed. Th. Dracos, Kluwer Academic Publishers, Dordrecht (the Netherlands), pp. 155–160.
179. Keane R.D., Adrian R.J., Zhang Y (1995): Super-resolution particle image velocimetry, *Meas. Sci. Tech.*, **6**, pp. 754–768.
180. Maas H.G., Grün A., Papantoniou D. (1993): Particle tracking in threedimensional turbulent flows - Part I: Photogrammetric determination of particle coordinates, *Exp. Fluids*, **15**, pp. 133–146.
181. Ohmi K., Hang Yu L. (2000): Particle tracking velocimetry with new algorithms, *Meas. Sci. Tech.*, **11**, pp. 603–616.
182. Scarano F. (2004): A super-resolution particle image velocimetry interrogation approach by means of velocity second derivatives correlation, *Meas. Sci. Tech.*, **15**, pp. 475–486.
183. Stitou A., Riethmuller M.L. (2001): Extension of PIV to super resolution using PTV, *Meas. Sci. Tech.*, **12**, pp. 1398–1403.
184. Takehara K., Adrian R.J., Etoh G.T., Christensen K.T. (2000): A Kalman tracker for super-resolution PIV, *Exp. Fluids*, **29**, pp. S034–S041.
185. Gharib M., Willert C.E. (1990): Particle tracing – revisited, in *Lecture Notes in Engineering: Advances in Fluid Mechanics Measurements **45**,* ed. M. Gad-el-Hak, Springer-Verlag, New York, pp. 109–126.

Optical flow

186. Barron J.L., Fleet D.J., Beauchemin S.S. (1994): Performance of optical flow techniques, *International Journal of Computer Vision*, **12**, pp. 43–77.
187. Horn B.K.P., Schunck B.G. (1981): Determining Optical Flow, *Artificial Intelligence*, **17**, pp. 185–203.
188. Quenot G.M. Pakleza J., Kowalewsky T.A. (1998): Particle image velocimetry with optical flow, *Exp. Fluids*, **25**, pp. 177–189.
189. Ruhnau P., Kohlberger T., Schnörr C., Nobach H. (2005): Variational optical flow estimation for particle image velocimetry, *Exp. Fluids*, **38**, pp. 21–32.
190. Ruhnau P., Schnörr C. (2007): Optical Stokes flow estimation: an imaging-based control approach, *Exp. Fluids*, **42**, pp. 61–78.
191. Tokumaru P.T., Dimotakis P.E. (1995): Image Correlation Velocimetry, *Exp. Fluids*, **19**, pp. 1–15.

Three-Component PIV

192. Abdel-Aziz Y.I., Karara H.M. (1971): Direct linear transformation from comparator coordinates into object space coordinates in close-range photogrammetry, Proc. *Symposium on Close-Range Photogrammetry. Falls Church, VA (U.S.A.), American Society of Photogrammetry, pp. 1–18.*
193. Arroyo M.P., Greated C.A. (1991): Stereoscopic particle image velocimetry, *Meas. Sci. Tech.*, **2**, pp. 1181–1186.
194. Coudert S., Schon J.P. (2001): Back projection algorithm with misalignment corrections for 2D-3C stereoscopic PIV, *Meas. Sci. Tech.*, **12**, pp. 1371–1381.

195. Ehrenfried K. (2002): Processing calibration grid images using the Hough transformation, *Meas. Sci. Tech.*, **13**, pp. 975–983.
196. Faugeras O., Toscani, G. (1987): Camera calibration for 3D computer vision, Proc. *International Workshop on Industrial Applications of Machine Vision and Machine Intelligence, Silken, Japan,* pp. 240–247.
197. Fournel L., Lavest J.M., Coudert S., Collange F. (2004): Self-calibration of PIV video cameras in Scheimpflug condition, in *Stanislas M., Westerweel J., Kompenhans J. (eds) Particle Image Velocimetry: recent improvements. Proceedings of the EUROPIV 2 workshop, Zaragoza, Spain, March/April 2003*, Springer, Berlin Heidelberg New York, pp. 391–405.
198. Gaydon M., Raffel M., Willert C., Rosengarten M., Kompenhans J. (1997): Hybrid stereoscopic particle image velocimetry, *Exp. Fluids*, **23**, pp. 331–334.
199. Gauthier V., Riethmuller M.L. (1988): Application of PIDV to complex flows: Measurement of the third component, *von Karman Institute for Fluid Dynamics, Lecture Series* 1988-06, Particle Image Displacement Velocimetry, Rhode-St-Genèse (Belgium).
200. Kähler C.J (2000): Multiplane stereo PIV – recording and evaluation methods, Proc. *EUROMECH 411: Application of PIV to turbulence measurements University of Rouen (France).*
201. Kähler C.J., Adrian R.J., Willert C.E. (1998): Turbulent boundary layer investigations with conventional and stereoscopic particle image velocimetry, Proc. *99th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
202. Kent J.C., Eaton A.R. (1982): Stereo photography of neutral density He-filled bubbles for 3-D fluid motion studies in an engine cylinder, *Appl. Optics*, **21**, pp. 904–912.
203. Klein F. (1968): *Elementarmathematik vom höheren Standpunkt aus, Zweiter Band: Geometrie*, Springer Verlag, Berlin.
204. Prasad A.K., Adrian R.J. (1993): Stereoscopic particle image velocimetry applied to liquid flows, *Exp. Fluids*, **15**, pp. 49–60.
205. Prasad A.K., Jensen K. (1995): Scheimpflug stereocamera for particle image velocimetry to liquid flows, *Appl. Optics*, **34**, pp. 7092–7099.
206. Prasad A.K. (2000): Stereo particle image velocimetry, *Exp. Fluids*, **29**, pp. 103–116.
207. Raffel M., Gharib M., Ronneberger O., Kompenhans J. (1995): Feasibility study of three-dimensional PIV by correlating images of particles within parallel light sheet planes, *Exp. Fluids*, **19**, pp. 69–77.
208. Raffel M., Westerweel J., Willert C., Gharib M., Kompenhans J. (1996): Analytical and experimental investigations of dual-plane particle image velocimetry, *Optical Engineering*, **35**, pp. 2067–2074.
209. Ronneberger O. (1998): Measurement of all three velocity components with particle image velocimetry using a single camera and two parallel light sheets, Diploma thesis / DLR Research Report 98-40, Göttingen, Germany (Text in German).
210. Royer H., Stanislas M. (1996): Stereoscopic and holographic approaches to get the third velocity component in PIV, *von Karman*

Institute for Fluid Dynamics, Lecture Series 1996–03, Particle Image Velocimetry, Rhode-St-Genèse (Belgium).
211. Scheimpflug T. (1904): Improved Method and Apparatus for the Systematic Alteration or Distortion of Plane Pictures and Images by Means of Lenses and Mirrors for Photography and for other purposes, British Patent No. 1196.
212. Soloff S., Adrian R.J., Liu Z.C. (1997): Distortion compensation for generalized stereoscopic particle image velocimetry, *Meas. Sci. Tech.*, **8**, pp. 1441–1454.
213. Dadi M., Stanislas M., Rodriguez O., Dyment A. (1991): A study by holographic velocimetry of the behaviour of free particles in a flow, *Exp. Fluids*, **10**, pp. 285–294.
214. Tsai R.Y. (1987): A versatile camera calibration technique for high-accuracy 3D machine vision metrology using off-the-shelf TV cameras and lenses, *IEEE J. Robot. Autom.*, **RA-3**, pp. 323–344.
215. van Doorne C.W.H. (2004): Stereoscopic PIV on transition in pipe flow, Ph.D. thesis, Delft University of Technology, the Netherlands.
216. van Doorne C.W.H., Westerweel J. (2007): Measurement of laminar, transitional and turbulent pipe flow using stereoscopic-PIV, *Exp. Fluids*, **42**, pp. 259–279.
217. van Oord J. (1997): The design of a stereoscopic DPIV-system, Report MEAH-161 Delft University of Technology, Delft (the Netherlands).
218. Westerweel J., Nieuwstadt F.T.M. (1991): Performance tests on 3-dimensional velocity measurements with a two-camera digital particle-image velocimeter, in *Laser Anemometry Advances and Applications, Vol. 1* (ed. Dybbs A. and Ghorashi B.), ASME, New York, pp. 349–355.
219. Wieneke B. (2005): Stereo-PIV using self-calibration on particle images, *Exp. Fluids*, **39**, pp. 267–280.
220. Willert C. (1997): Stereoscopic particle image velocimetry for application in wind tunnel flows, *Meas. Sci. Tech.*, **8**, pp. 1465–1479.
221. Willert C. (2006): Assessment of camera models for use in planar velocimetry calibration, *Exp. Fluids*, **41**, pp. 135–143.
222. Zhang Z. (2000): A flexible new technique for camera calibration, *IEEE Trans. Pattern Analysis and Machine Intelligence*, **22**, pp. 1330–1334.

Volumetric particle imaging methods

223. Barnhart D.H. (2001): *Whole-field holographic measurements of three-dimensional displacement in solid and fluid mechanics* Ph.D. Dissertation, PhD Thesis Loughborough University, UK.
224. Barnhart D.H., Adrian R.J., Papen G.C. (1994): Phase-conjugate holographic system for high-resolution particle image velocimetry, *Appl. Optics*, **33**, pp. 7159–7170.
225. Brücker C. (1996): 3-D PIV via spatial correlation in a color-coded light sheet, *Exp. Fluids*, **21**, pp. 312–314.
226. Brücker C. (1996): 3-D scanning particle image velocimetry: technique and application to a spherical cap wake flow, *Appl. Sci. Res.*, **56**, pp. 157–179.

227. Choi W.C., Guenzennec Y.G., Jung I.S. (1996): Rapid evaluation of variable valve lift strategies using 3-d in-cylinder flow measurements, Proc. *SAE Paper 960951.*
228. Coupland J.M., Halliwell N.A. (1992): Particle image velocimetry: three-dimensional fluid velocity measurements using holographic recording and optical correlation, *Appl. Optics*, **31**, pp. 1005–1007.
229. Dracos Th. (1996): Particle tracking in three-dimensional space, in *Three-Dimensional Velocity and Vorticity Measuring and Image Analysis Techniques* ed. Th. Dracos, Kluwer Academic Publishers, Dordrecht (the Netherlands), pp. 209–227.
230. Elsinga G.E., Scarano F., Wieneke B., van Oudheusden B.W. (2006): Tomographic particle image velocimetry, *Exp. Fluids*, **41**, pp. 933–947.
231. Guezennec Y.G., Brodkey R.S., Trigui N., Kent J.C. (1994): Algorithms for fully automated three-dimensional particle tracking velocimetry, *Exp. Fluids*, **17**, pp. 209–219.
232. Herman G.T., Lent A. (1976): Iterative reconstruction algorithms, *Compt Biol Med*, **6**, pp. 273–294.
233. Herrmann S.F., Hinsch K.D. (2004): Light-in-flight holographic particle image velocimetry for wind-tunnel applications, *Meas. Sci. Tech.*, **15**, pp. 613–621.
234. Humble R.A., Scarano F., van Oudheusden B.W. (2007): Instantaneous 3D flow organization of a shock wave/turbulent boundary layer interaction using Tomo-PIV, Proc. *37th AIAA Fluid Dynamics Conference and Exhibit. Miami (USA).*
235. Konrath R., Schröder W., Limberg W. (2002): Holographic particle-image velocimetry applied to the flow within the cylinder of a four-valve IC engine, *Exp. Fluids*, **33**, pp. 781–793.
236. Malek M., Allano D., Coetmellec S., Özkul C., Lebrun D. (2004): Digital in-line holography for three-dimensional-two-components particle tracking velocimetry, *Meas. Sci. Tech.*, **15**, pp. 699–705.
237. Meng H., Pan G., Pu Y., Woodward S. H. (2004): Holographic particle image velocimetry: from film to digital recording, *Meas. Sci. Tech.*, **15**, pp. 673–685.
238. Michaelis D., Poelma C., Scarano F., Westerweel J., Wieneke B. (2006): A 3D-time resolved cylinder wake survey by tomographic PIV, Proc. *12th Int. Symposium on Flow Visualization, ISFV12, Göttingen, Germany.*
239. Pereira F., Stüer H., Graff E.C., Gharib M. (2006): Two-frame 3D particle tracking, *Meas. Sci. Tech.*, **17**, pp. 1680–1692.
240. Pu Y., Meng H. (2000): An advanced off-axis holographic particle image velocimetry (HPIV) system, *Exp. Fluids*, **29**, pp. 184–197.
241. Scarano F., Elsinga G.E., Bocci E., van Oudheusden B.W. (2006): Three-dimensional turbulent cylinder wake structure investigation with Tomo-PIV, Proc. *139th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
242. Schröder A., Kompenhans J. (2004): Investigation of a turbulent spot using multi-plane stereo particle image velocimetry, *Exp. Fluids*, **36**, pp. 82–90.

243. Schröder A., Geisler R., Elsinga G.E., Scarano F., Dierksheide U. (2006): Investigation of a turbulent spot using time-resolved tomographic PIV, Proc. *139th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
244. Svizher A., Cohen J. (2006): Holographic particle image velocimetry system for measurements of hairpin vortices in air channel flow, *Exp. Fluids*, **40**, pp. 708–722.
245. Virant M. (1996): Anwendung des dreidimensionalen "Particle-Tracking-Velocimetry" auf die Untersuchung von Dispersionsvorgängen in Kanalströmungen, Ph.D. thesis, Institut für Hydromechanik und Wasserwirtschaft, ETH Zürich (Switzerland).
246. Virant M., Dracos Th. (1996): Establishment of a videogrammetic PTV system, in *Three-Dimensional Velocity and Vorticity Measuring and Image Analysis Techniques* ed. Th. Dracos, Kluwer Academic Publishers, Dordrecht (the Netherlands), pp. 229–254.
247. Watanabe Y., Hideshima Y., Shigematsu T., Takehara K. (2006): Application of three-dimensional hybrid stereoscopic particle image velocimetry to breaking waves, *Meas. Sci. Tech.*, **17**, pp. 1456–1469.
248. Zhang J., Tao B., Katz J. (1997): Turbulent flow measurement in a square duct with hybrid holographic PIV, *Exp. Fluids*, **23**, pp. 373–381.

Post-Processing of PIV Data

249. Abrahamson S., Lonnes S. (1995): Uncertainty in calculating vorticity from 2D velocity fields using circulation and least-squares approaches, *Exp. Fluids*, **20**, pp. 10–20.
250. Carasone F., Cenedese A., Querzoli G. (1995): Recognition of partially overlapped particle images using the Kohonen neural network, *Exp. Fluids*, **19**, pp. 225–232.
251. Etebari A., Vlachos P.P. (2005): Improvements on the accuracy of derivative estimation from DPIV velocity measurements, *Exp. Fluids*, **39**, pp. 1040–1050.
252. Foucaut J.M., Stanislas M. (2002): Some considerations on the accuracy and frequency response of some derivative filters applied to particle image velocimetry vector fields, *Meas. Sci. Tech.*, **13**, pp. 1058–1071.
253. Fouras A., Soria J. (1998): Accuracy of out-of-plane vorticity measurements derived from in-plane velocity field data, *Exp. Fluids*, **25**, pp. 409–430.
254. Fujisawa N., Tanahashi S., Srinivas K. (2005): Evaluation of pressure field and fluid forces on a circular cylinder with and without rotational oscillation using velocity data from PIV measurement, *Meas. Sci. Tech.*, **16**, pp. 989–996.
255. Gurka R., Liberzon A., Hefetz D., Rubinstein D., Shavit U. (1999): Computation of Pressure distribution using PIV velocity data, Proc. *3rd Intl. Workshop on PIV, 16–18 Sept., Santa Barbara (USA),* pp 671-676.

256. Imaichi K., Ohmi K. (1983): Numerical processing of flow-visualization pictures – measurement of two-dimensional vortex flow, *J Fluid Mech.*, **129**, pp. 283–311.
257. Kurtulus D.F., Scarano F., David L. (2007): Unsteady aerodynamic forces estimation on a square cylinder by TR-PIV, *Exp. Fluids*, **42**, pp. 185–196.
258. Landreth C.C., Adrian R.J. (1988): Measurement and refinement of velocity data using high image density analysis in particle image velocimetry, Proc. *4 9th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
259. Lecuona A., Nogueira J.I., Rodriguez P.A. (1997): Flowfield vorticity calculation using PIV data, Proc. *2nd Intl. Workshop on PIV, 8–11 July, Fukui (Japan).*
260. Liu X., Katz J. (2006): Instantaneous pressure and material acceleration measurements using a four-exposure PIV system, *Exp. Fluids*, **41**, pp. 227-240.
261. Lourenço L., Krothapalli A. (1995): On the accuracy of velocity and vorticity measurements with PIV, *Exp. Fluids*, **18**, pp. 421–428.
262. Lourenço L.M. (1996): Particle image velocimetry: post-processing techniques, *von Karman Institute for Fluid Dynamics, Lecture Series* 1996-03, Particle Image Velocimetry, Rhode-St-Genèse (Belgium).
263. Noca F., Shiels D., Jeon D. (1999): A comparison of methods for evaluating time-dependent fluid dynamic forces on bodies, using only velocity fields and their derivatives, *J Fluids Struct*, **13**, pp. 551-578.
264. Nogueira J., Lecuona A., Rodriguez P.A. (1999): Data validation, false vectors correction and derived magnitudes calculation on PIV data, *Meas. Sci. Tech.*, **8**, pp. 1493–1501.
265. Raffel M., Kompenhans J. (1996): Post-processing: data validation, *von Karman Institute for Fluid Dynamics, Lecture Series* 1996-03, Particle Image Velocimetry, Rhode-St-Genèse (Belgium).
266. Raffel M., Leitl B., Kompenhans J. (1993): Data validation for particle image velocimetry, in *Laser Techniques and Applications in Fluid Mechanics,* R.J. Adrian et al., Springer-Verlag, pp. 210–226.
267. Schröder A. (1996): Untersuchung der Struktur des laminaren Zylindernachlaufs mit Hilfe der Particle Image Velocimetry, Diplomarbeit, Universität Göttingen (Germany).
268. Shinneeb A.M., Bugg J.D., Balachandar R. (2004): Variable threshold outlier identification in PIV data, *Meas. Sci. Tech.*, **15**, pp. 1722–1732.
269. Unal M.F., Lin J.C., Rockwell D. (1997): Force prediction by PIV imaging, a momentum based approach, *J Fluids Struct*, **11**, pp. 965-971.
270. van Oudheusden R.W., Scarano F., Casimiri E.W.F. (2006): Non-intrusive load characterization of an airfoil using PIV, *Exp. Fluids*, **40**, pp. 988-992.
271. van Oudheusden R.W., Scarano F., Roosenboom E.W.M., Casimiri E.W.F., Souverein L.J. (2007): Evaluation of integral forces and pressure fields from planar velocimetry data for incompressible and compressible flow, accepted for publication *Exp. Fluids*, online first, DOI 10.1007/s00348-007-0261-y.

272. Vollmers H. (2001): Detection of vortices and quantitative evaluation of their main parameters from experimental velocity data, *Meas. Sci. Tech.*, **12**, pp. 1199-1207.
273. Wernet M.P., Pline A.D. (1991): Particle image velocimetry for the surface tension driven convection experiment using a particle displacement tracking technique, Proc. *4th Intl. Conf. on Laser Anemometry, Advances and Applications, Cleveland, Ohio (USA).*
274. Westerweel J. (1994): Efficient detection of spurious vectors in particle image velocimetry data, *Exp. Fluids*, **16**, pp. 236–247.
275. Westerweel J., Scarano F. (2005): Universal outlier detection for PIV data, *Exp. Fluids*, **39**, pp. 1096–1100.
276. Wiegel M., Fischer M. (1995): Proper orthogonal decomposition applied to PIV data for the oblique transition in a Blasius boundary layer, Proc. SPIE 2546 *Intl. Symp. on Optical Science, Engineering and Instrumentation, 9–14 July, San Diego (USA),* pp. 87–97.

Micro-PIV

277. Bayt R.L., Breuer K.S. (2001): Fabrication and testing of micron-sized cold-gas thrusters in micropropulsion of small spacecraft, *Advances in Aeronautics and Astronautics, Eds. Micci M. & Ketsdever A., AIAA Press., Washington, D.C. (USA)*, **187**, pp. 381–398.
278. Beskok A., Karniadakis G.E., Trimmer W. (1996): Rarefaction and compressibility, *Journal of Fluids Engineering*, **118**, pp. 448–456.
279. Bourdon C.J., Olsen M.G., Gorby, A.D. (2004): Validation of an analytical solution for depth of correlation in microscopic particle image velocimetry, *Meas. Sci. Tech.*, **15**, pp. 318–327.
280. Chen Z., Milner T.E., Dave D., Nelson J.S. (1997): Optical Doppler tomographic imaging of fluid flow velocity in highly scattering media, *Optics Letters*, **22**, pp. 64–66.
281. Cummings E.B. (2001): An image processing and optimal nonlinear filtering technique for PIV of microflows, *Exp. Fluids*, **29** [Suppl.], pp. 42–50.
282. Einstein A. (1905): On the movement of small particles suspended in a stationary liquid demanded by the molecular-kinetic theory of heat, in *Theory of Brownian Movement*, Dover, New York, pp. 1–18.
283. Kähler C.J., Scholz U., Ortmann J. (2006): Wall-shear stress and near-wall turbulence measurements up to single pixel resolution by means of long-distance micro-PIV, *Exp. Fluids*, **41**, pp. 327–341.
284. Kähler C.J., Scholz U. (2006): Transonic jet analysis using long-distance micro-PIV, Proc. *12th Int. Symp. on Flow Visualization - ISFV 12, Göttingen, Germany, 10–14 Sept.*.
285. Kim Y.H., Wereley S.T., Chun C.H. (2004): Phase-resolved flow field produced by a vibrating cantilever plate between two endplates, *Phys. Fluids*, **16**, pp. 145–162.
286. Koutsiaris A.G., Mathioulakis D.S., Tsangaris, S. (1999): Microscope PIV for velocity-field measurement of particle suspensions flowing inside glass capillaries, *Meas. Sci. Tech.*, **10**, pp. 1037–1046.
287. Lanzillotto A.M., et al. (1995): Applications of X-ray micro-imaging, visualization and motion analysis techniques to fluidic microsystems,

Proc. Technical Digest of the IEEE Solid State Sensor and Actuator Workshop, *3–6 June, Hilton Head Island, SC,* pp. 123–126.
288. Meinhart C.D., Wereley S.T., Santiago J.G. (2000): Micron-resolution velocimetry techniques, in *Laser Techniques Applied to Fluid Mechanics, R. J. Adrian et al. (eds.)*, Springer-Verlag, New York, pp. 57–70.
289. Meinhart C.D., Wereley S.T. (2003): Theory of diffraction-limited resolution in micro particle image velocimetry, *Meas. Sci. Tech.*, **14**, pp. 1047–1053.
290. Meinhart C.D., Hart D., Wereley S.T. (2005): Optimum particle size and correlation strategy for sub-micron spatial resolution, Proc. *Joint International PIVNET II / ERCOFTAC Workshop on Micro PIV and Applications in Microsystems, 7–8 April, Delft (the Netherlands).*
291. Meinhart C. D., Zhang H. (2000): The flow structure inside a microfabricated inkjet printer head, *J. Microelectromechanical Systems*, **9**, pp. 67–75.
292. Minsky M. (1988): Memoir on Inventing the Confocal Scanning Microscope, *Journal of Scanning Microscopies*, **10**, pp. 128–138.
293. Northrup M.A., et al. (1995): A MEMS-based DNA analysis system, Proc. *Proceedings of Transducers '95, 8th International Conference on Solid-State Sensors and Actuators, 16–19 June, Stockholm (Sweden),* pp. 764–767.
294. Olsen M. G., Adrian R. J. (2000): Out-of-focus effects on particle image visibility and correlation in particle image velocimetry, *Exp. Fluids*, **29**, pp. 166–174.
295. Olsen M.G., Adrian R.J. (2000): Brownian motion and correlation in particle image velocimetry, *Optics and Laser Tech.*, **32**, pp. 621–627.
296. Probstein R.F. (2003): *Physicochemical Hydrodynamics: An Introduction*, Wiley, New York.
297. Santiago J.G., Wereley S.T., Meinhart C.D., Beebe D.J., Adrian, R.J. (1998): A particle image velocimetry system for microfluidics, *Exp. Fluids*, **25**, pp. 316–319.
298. Van Kampen N.G. (2007): *Stochastic Processes in Physics and Chemistry*, North-Holland Publishing Co., Amsterdam.
299. Wereley S.T., Gui L., Meinhart, C.D. (2002): Advanced algorithms for microscale particle image velocimetry, *AIAA J.*, **40**, pp. 1047–1055.
300. Wereley S.T., Meinhart C.D. (2005): Micron-resolution particle image velocimetry, in *Microscale Diagnostic Techniques, ed. K.S. Breuer*, Springer-Verlag, New York, pp. 51–112.

Examples of Application

Liquid flows

301. Böhm C., Wulf P., Egbers C., Rath H.J. (1997): LDV- and PIV-measurements on the dynamics in spherical Couette flow, Proc. *Int. Conf. on Laser Anemometry-Advances and Appl., 8–11 May, Karlsruhe (Germany).*
302. Garg V.K. (1992): Natural convection between concentric spheres, *Int. J. Heat Mass Transfer*, **35**, pp. 1938–1945.

303. Mack L.R., Hardee H.C. (1968): Natural convection between concentric spheres at low Rayleigh numbers, *Int. J. Heat Mass Transfer*, **11**, pp. 387–396.
304. Weigand A., Gharib M. (1994): On the decay of a turbulent vortex ring, *Phys. Fluids*, **6**, pp. 3806–3808.
305. Willert C.E. (1992): The interaction of modulated vortex pairs with a free surface, Ph.D. thesis, Department of Applied Mechanics and Engineering Sciences, University of California, San Diego (USA).
306. Willert C., Gharib M. (1997): The interaction of spatially modulated vortex pairs with free surfaces, *J Fluid Mech.*, **345**, pp. 227–250.

Transonic Flows

307. Dolling D.S. (2001): Fifty years of shock wave/boundary layer interaction research: what next?, *AIAA J.*, **39**(8), pp. 1517–1531.
308. Elsinga G.E., van Oudheusden B.W., Scarano F. (2005): Evaluation of aero-optical distortion effects in PIV, *Exp. Fluids*, **39**, pp. 246–256.
309. Kähler C.J. (1997): Ortsaufgelöste Geschwindigkeitsmessungen in einer turbulenten Grenzschicht, *Deutsche Forschungsanstalt für Luft- und Raumfahrt, Research Report* DLR-FB 97–32.
310. Raffel M., Höfer H., Kost F., Willert C., Kompenhans J. (1996): Experimental aspects of PIV measurements of transonic flow fields at a trailing edge model of a turbine blade, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
311. Samimy M., Lele S.K. (1991): Motion of particles with inertia in a compressible free shear layer, *Phys. Fluids A*, **3**, pp. 1915–1923.
312. Scarano F., van Oudheusden, B.W. (2003): Planar velocity measurements of a two-dimensional compressible wake flow, *Exp. Fluids*, **34**, pp. 430–441.
313. Schrijer F.F.J., Scarano F., van Oudheusden B.W. (2006): Application of PIV in a Mach 7 double-ramp flow, *Exp. Fluids*, **41**, pp. 353–363.
314. Urban W.D., Mungal M.G. (1997): Planar velocity measurements in compressible mixing layers, Proc. *35th Aerospace Sciences Meeting, Reno, Nevada (USA), AIAA Paper 97-0757.*

Large-Scale Rayleigh-Bénard Convection

315. Bosbach J., Kühn M., Wagner C., Raffel M., Resagk C., du Puits R., Thess A. (2006): Large-scale particle Image velocimetry of natural and mixed convection, Proc. *139th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
316. Bosbach J., Penneçot J., Wagner C., Raffel M., Lerche T., Repp S. (2006): Experimental and numerical simulations of turbulent ventilation in aircraft cabins, *Energy*, **31**, pp. 694–705.
317. Lin C.H., Horstman R.H., Ahlers M.F., Sedgwick L.M., Dunn K.H., Topmiller J.L., Benett J.S., Wirogo S. (2005): Numerical simulation of airflow and airborne pathogen transport in aircraft cabins - Part II: Numerical simulation of airborne pathogen transport, *ASHRAE Transactions*, **111**, pp. 764–768.

318. Niemela J.J., Skrbek L., Sreenivasan K.R., Donelly R.J. (2000): Turbulent convection at very high Rayleigh numbers, *Nature*, **404**, pp. 837–840.
319. Okuno Y., Fukuda T., Miwata Y., Kobayashi T. (1993): Development of three-dimensional air flow measuring method using soap bubbles, *JSAE Review*, **14**, pp. 50–55.
320. Sun Y., Zhang Y., Wang A., Topmiller J.L., Benett J.S. (2005): Experimental Characterization of Airflows in Aircraft Cabins, Part I: Experimental System and Measurement Procedure, *ASHRAE Transactions*, **111**, pp. 45–52.
321. Tilgner A., Belmonte A., Libchaber A. (1993): Temperature and velocity profiles of turbulent convection in water, *Phys. Rev. E*, **47**, pp. 2253–2256.
322. Qiu X.L., Tong P. (2001): Large-scale velocity structures in turbulent thermal convection, *Phys. Rev. E, 2001*, **64**, pp. 036304.1–13.

Analysis of PIV image sequences

323. Hain R., Kähler C.J. (2007): Fundamentals of multiframe particle image velocimetry (PIV), *Exp. Fluids*, **42**, pp. 575–587.
324. Kähler C.J. (2004): Dynamic evaluation of time resolved PIV image sequences, Proc. *International Workshop on Dynamic PIV, University of Tokyo (Japan)*.
325. Marxen O., Rist U., Wagner S. (2004): The effect of spanwise-modulated disturbances on transition in a 2-D separated boundary layer, *AIAA*, **42**, pp. 937–944.

Velocity and pressure maps above a delta wing in transonic flow

326. Hummel D. (2005): The Second International Vortex Flow Experiment (VFE-2) - Objectives and First Results, Proc. *2nd International Symposium on Integrating CFD and Experiments in Aerodynamics, Cranfield University, Shrivenham, UK, 5-6 September*.
327. Konrath R., Klein C., Schröder A., Kompenhans J. (2006): Combined application of Pressure Sensitive Paint and Particle Image Velecimetry to the flow above a delta wing, Proc. *12th International Symposium on Flow Visualization, Göttingen, Germany, 10-14 September, ISBN 0.9533991-8-4, ISFV12-67.2*.

Coherent Structure Detection in a Backward-Facing Step Flow

328. Chacin J.M., Cantwell B.J. (2000): Dynamics of a low Reynolds number turbulent boundary layer, *J Fluid Mech.*, **404**, pp. 87–115.
329. Farge M. (1992): Wavelet transforms and their applications to turbulence, *Ann. Rev. Fluid Mech.*, **24**, pp. 395–457.
330. Hunt J., Wray A., Moin P. (1988): Eddies, stream and convergence zone in turbulent flows, Stanford Center for Turbulence Research, Technical Report CTR-S88, p. 193.
331. Hussain A.K.M.F. (1986): Large-scale organized motions in jets and shear layers, in *A. Krothapalli and C.S. Smith, editors, Recent advances in aerodynamics*, Springer, pp. 1–30.

332. Jeong J., Hussain F. (1995): On the identification of a vortex, *J Fluid Mech.*, **285**, pp. 69–94.
333. Le H., Moin P. (1994): Direct numerical simulation of turbulent flow over a backward-facing step, Report TF, vol. 58. Thermosciences Division, Department of Mechanical Engineering, Stanford University.
334. Le H., Moin P., Kim J. (1997): Direct numerical simulation of turbulent flow over a backward-facing step, *J Fluid Mech.*, **330**, pp. 349–374.
335. Robinson S.K. (1991): Coherent motions in the turbulent boundary layer, *Ann. Rev. Fluid Mech.*, **23**, pp. 601–639.
336. Robinson S.K., Kline S.J., Spalart P.R. (1989): A review of quasi-coherent structures in a numerically simulated turbulent boundary layer, NASA Technical Memorandum, vol. 102191.
337. Scarano F. (2000): Particle image velocimetry development and application - Investigation of coherent structures in turbulent shear flows, Ph.D. thesis, Universitá Degli Napoli "Federico II" & von Karman Institute for Fluid Dynamics.
338. Schram C. (2002): Application of wavelet transform in vortical flows, *von Karman Institute for Fluid Dynamics, Lecture Series* 2002-04, Rhode-St-Genèse (Belgium).
339. Schram C. (2003): Aeroacoustics of subsonic jets: prediction of the sound produced by vortex pairing based on particle image velocimetry, Ph.D. thesis, Technische Universiteit Eindhoven (the Netherlands).
340. Schram C., Rambaud P., Riethmuller L.M. (2004): Wavelet based coherent structure eduction from a backward facing step flow investigated using particle image velocimetry, *Exp. Fluids*, **36**, pp. 233–245.

Vortex pairing study in an air jet for aeroacoustic prediction

341. Bridges J.E. (1990): Application of coherent structure and vortex sound theories to jet noise, Ph.D. thesis, University of Houston, Texas (USA).
342. Bridges J.E., Hussain A.K.M.F. (1992): Direct evaluation of aeroacoustic theory in a jet, *J Fluid Mech.*, **240**, pp. 469–501.
343. Kambe T., Minota T. (1981): Sound radiation from vortex systems, *Journal of Sound and Vibration*, **74**, pp. 61–72.
344. Lecuona A., Ruiz-Rivas U., Nogueira J. (2002): Simulation of particle trajectories in a vortex-induced flow: application to seed-dependent flow measurement techniques, *Meas. Sci. Tech.*, **13**, pp. 1020–1028.
345. Schram C., Hirschberg A. (2003): Application of vortex sound theory to vortex-pairing noise: sensitivity to errors in flow data, *Journal of Sound and Vibration*, **266**, pp. 1079–1098.
346. Schram C., Riethmuller M.L. (2001): Evolution of vortex rings characteristics during pairing in an acoustically excited air jet using stroboscopic particle image velocimetry, Proc. *4th International Symposium on Particle Image Velocimetry, Göttingen (Germany), 17–19 September.*
347. Schram C., Taubitz S., Anthoine J., Hirschberg A. (2005): Theoretical/empirical prediction and measurement of the sound produced

by vortex pairing in a low mach number jet, *Journal of Sound and Vibration*, **281(1-2)**, pp. 171–187.

Helicopter Aerodynamics

348. Boutier A., Lefevre J.B., Micheli F. (1996): Analysis of helicopter blade vortex structure by laser velocimetry, *Exp. Fluids*, **21**, pp. 33–42.
349. Heineck J.T., Yamauchi G.H., Woodcock A.J., Lourenco L. (2000): Application of three-component PIV to a hovering rotor wake, Proc. *56th Annual Forum of the American Helicopter Society, Virginia Beach (USA)*.
350. Kato H., Watanabe S., Kondo N., Saito S. (2003): Application of stereoscopic PIV to helicopter rotor blade tip vortices, Proc. *20th Congress on Instrumentation in Aerospace Simulation Facilities, Göttingen (Germany)*.
351. Martin P.B., Pugliese J.G., Leishman J.G., Anderson S.L. (2000): Stereo PIV measurements in the wake of a hovering rotor, Proc. *56th Annual Forum of the American Helicopter Society, Virginia Beach (USA)*.
352. McAlister K.W. (2004): Rotor wake development during the first revolution, *Journal of the American Helicopter Society*, **49**, pp. 371–390.
353. Murashige A., Kobiki N., Tsuchihashi A., Inagaki K., Nakamura H., Tsujiutchi T.,Hasegawa Y., Yamamoto Y., Yamakawa E. (2000): Second ATIC aeroacoustic model rotor test at DNW, Proc. *26th European Rotorcraft Forum, The Hague (the Netherlands)*.
354. Murashige A., Kobiki N., Tsuchihashi A., Nakamura H., Inagaki K., Yamakawa E. (1998): ATIC aeroacoustic model rotor test at DNW, Proc. *24th European Rotorcraft Forum, Marseille (France)*.
355. Raffel M., Seelhorst U., Willert C., Vollmers H., Bütefisch K.A., Kompenhans J. (1996): Measurement of vortical structures on a helicopter rotor model in a wind tunnel by LDV and PIV, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal)*.
356. Raffel M., Seelhorst U., Willert C. (1998): Vortical flow structures at a helicopter rotor model measured by LDV and PIV, *The Aeronautical Journal of the Royal Aeronautical Society*, **102**, pp. 221–227.
357. Richard H., Raffel M. (2002): Full-scale and model tests, Proc. *58th Annual Forum of the American Helicopter Society, Montreal (Canada)*.
358. Richard H., van der Wall B.G. (2006): Detailed investigation of rotor blade tip vortex in hover condition by 2C and 3C-PIV, Proc. *32nd European Rotorcraft Forum, Maastricht (the Netherlands)*.
359. Splettstößer W.R., van der Wall B.G., Junker B., Schultz K.J., Beaumier P., Delrieux Y., Leconte P., Crozier P. (1999): The ERATO programme: Wind tunnel results and proof of design for an aeroacoustically optimized rotor, Proc. *25th European Rotorcraft Forum, Rome (Italy)*.
360. van der Wall B.G., Junker B., Yu Y.H., Burley C.L., Brooks T.F., Tung C., Raffel M.,Richard H., Wagner W., Mercker E., Pengel K.,

Holthusen H., Beaumier P., Delrieux Y. (2002): The HART II test in the LLF of the DNW - a major step towards rotor wake understanding, Proc. *28th European Rotorcraft Forum, Bristol (England)*.

361. van der Wall B.G., Richard H. (2005): Analysis methodology for 3C PIV data, Proc. *31st European Rotorcraft Forum, Florence (Italy)*.
362. Vatistas G.H., Kozel V., Mih W.C. (1991): A simpler model for concentrated vortices, *Exp. Fluids*, **11**, pp. 73–76.
363. Yamauchi G.K., Burley C.L., Mercker E., Pengel K., Janakiram R. (1999): Flow measurements of an isolated model tilt rotor, Proc. *55th Annual Forum of the American Helicopter Society, Montreal (Canada)*.
364. Yu Y.H. (2002): The HART II test - rotor wakes and aeroacoustics with higher-harmonic pitch control (HHC) inputs - the joint German/French/Dutch/US project, Proc. *58th Annual Forum of the American Helicopter Society, Montreal (Canada)*.

Stereo PIV applied to a transonic turbine

365. Göttlich E., Neumayer F., Woisetschläger J., Sanz W., Heitmeir F. (2004): Investigation of stator-rotor interaction in a transonic turbine stage using Laser Doppler Velocimetry and pneumatic probes, *ASME J. Turbomach.*, **126**, pp. 297–305.
366. Göttlich E., Woisetschläger J., Pieringer P., Hampel B., Heitmeir F. (2005): Investigation of vortex shedding and wake-wake interaction in a transonic turbine stage using laser Doppler velocimetry and particle image velocimetry, Proc. *ASME Turbo Expo 2005*.
367. Lang H., Mørck T., Woisetschläger J. (2002): Stereoscopic particle image velocimetry in a transonic turbine stage, *Exp. Fluids*, **32**, pp. 700–709.
368. Woisetschläger J., Lang H., Hampel B., Göttlich E., Heitmeir F. (2003): Influence of blade passing on the stator wake in a transonic turbine stage investigated by particle image velocimetry and laser vibrometry, *Proc. Instn. Mech. Engrs.: J. Power and Energy*, **217 A**, pp. 385–391.
369. Woisetschläger J., Mayrhofer N., Hampel B., Lang H., Sanz W. (2003): Laser-optical investigation of turbine wake flow, *Exp. Fluids*, **34**, pp. 371–378.

PIV applied to a transonic centrifugal compressor

370. Förster W, Karpinski G, Krain H, Röhle I., Schodl R. (2002): 3-Component Doppler laser-two-focus velocimetry applied to a transonic centrifugal compressor, in *Adrian et al. (eds.) "Laser Techniques for Fluid Mechanics", Selected Papers from the 10th Intern. Symp., 10–13 July 2000, Lisbon (Portugal)*, Springer Verlag, Berlin, Heidelberg, New York, pp. 55–74.
371. Wernet M.P. (2000): Development of digital particle imaging velocimetry for use in turbomachinery, *Exp. Fluids*, **28**, pp. 97–115.
372. Wernet M.P. (2000): A flow field investigation in the diffuser of a high-speed centrifugal compressor using digital particle imaging velocimetry, *Meas. Sci. Tech.*, **11**, pp. 1007-1022.

373. Voges M., Beversdorff M., Willert C., Krain H. (2007): Application of Particle Image Velocimetry to a Transonic Centrifugal Compressor, accepted for publication *Exp. Fluids, DOI 10.1007/s00348-007-0279-1.*

PIV in reacting flows

374. Anderson D.J., Greated C.A., Jones J.D.C., Nimmo G., Wiseall S. (1996): Fibre optic PIV studies in an industrial combustor, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
375. Honoré D., Maurel S., Quinqueneau (2001): Particle image velocimetry in a semi-industrial 1 MW boiler, Proc. *4th Intl. Symp. on Particle Image Velocimetry, 17–19 Sept., Göttingen (Germany).*
376. Lecordier B., Mouqallid M., Trinité M. (1994): Simultaneous 2D measurements of flame front propagation by high speed tomography and velocity field by cross correlation, Proc. *79th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
377. Willert C., Jarius M. (2002): Planar flow field measurements in atmospheric and pressurized combustion chambers, *Exp. Fluids*, **33**, pp. 931–939.
378. Willert C., Hassa C., Stockhausen G., Jarius M., Voges M., Klinner J. (2006): Combined PIV and DGV applied to a pressurized gas turbine combustion facility, *Meas. Sci. Tech.*, **7**, pp. 1670–1679.

A High-Speed PIV Study of Trailing-Edge Noise Sources

379. Herr M., Dobrzynski W. (2004): Experimental investigations in low noise trailing edge design, Proc. *10th AIAA/CEAS Aeroacoustics Conference, Manchester (England), 2004.*
380. Howe M.S. (1978): A review of the theory of trailing edge noise, *J. of Sound and Vibr.*, **61**, pp. 437–465.
381. Möhring W. (1979): *Modelling low mach number noise*, E.A. Müller, Ed., Springer Verlag, Berlin.
382. Powell A. (1964): Theory of vortex sound, *Journal of the Acoustical Society of America*, **36**, pp. 177–195.
383. Schroeder A., Herr M., Lauke T., Dierksheide U. (2004): A study on trailing edge noise sources using high-speed particle image velocimetry, Proc. *129th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*

Volume PIV

384. Robinson S.K. (1989): A review of vortex structures and associated coherent motions in turbulent boundary layers., Proc. *2nd IUTAM Symp. Struct. Turbul. and Drag Reduct., Zürich (Switzerland).*

Multiplane Stereo PIV

385. Braud C., Heitz D., Braud P., Arroyo G., Delville J. (2004): Analysis of the wake-mixing-layer interaction using multiple plane PIV and 3d classical POD, *Exp. Fluids*, **37**, pp. 95–104.

386. Carlier J., Stanislas M. (2005): Experimental study of eddy structures in a turbulent boundary layer, *J Fluid Mech.*, **535**, pp. 143–188.
387. Hu H., Saga T. Kobayashi T., Taniguchi N., Yasuki M. (2001): Dual-plane stereoscopic particle image velocimetry: system set-up and its application on a lobed jet mixing flow, *Exp. Fluids*, **31**, pp. 277–293.
388. Jakobsen M.L., Dewhirst T.P., Greated C.A. (1997): Particle image velocimetry for predictions of acceleration force within fluid flows, *Meas. Sci. Tech.*, **8**, pp. 1502–1516.
389. Kähler C.J. (2004): Investigation of the spatio-temporal flow structure in the buffer region of a turbulent boundary layer by means of multiplane stereo PIV, *Exp. Fluids*, **36**, pp. 114–130.
390. Kähler C.J (2004): The significance of coherent flow structures for the turbulent mixing in wall-bounded flows, Ph.D. thesis, Georg-August-University zu Göttingen (Germany). http://webdoc.sub.gwdg.de/diss/2004/kaehler/kaehler.pdf, also: research report, DLR-FB-2004-24.
391. Kähler C.J. (2004): The significance of turbulent eddies for the mixing in boundary layers, Proc. *IUTAM Symposium "One Hundred Years of Boundary Layer Research", Göttingen (Germany).*
392. Kähler C.J., Kompenhans J. (1999): Multiple plane stereo PIV – technical realization and fluid-mechanical significance, Proc. *3rd International Workshop on PIV, Santa Barbara (USA).*
393. Kähler C.J. Kompenhans J. (2000): Fundamentals of multiple plane stereo PIV, *Exp. Fluids*, **29**, pp. S70–S77.
394. Kähler C.J., Stanislas M., Dewhirst T.P., Carlier J. (2001): Investigation of the spatio-temporal flow structure in the log-law region of a turbulent boundary layer by means of multi-plane stereo particle image velocimetry, in *Developments in Laser Techniques and Applications to Fluid Mechanics, R.J. Adrian et.al, editors*, Springer-Verlag, Berlin Heidelberg, pp. 39–53.
395. Mullin J.A., Dahm W.J.A. (2004): Direct experimental measurements of velocity gradient fields in turbulent flows via high-resolution frequency-based dual-plane stereo PIV (DSPIV), Proc. *129th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*
396. Mullin J.A., Dahm W.J.A. (2005): Dual-plane stereo particle image velocimetry (DSPIV) for measuring velocity gradient fields at intermediate and small scales of turbulent flows, *Exp. Fluids*, **38**, pp. 185–196.

Micro-PIV

397. Auroux P.A., Iossifidis D., Reyes D.R., Manz A. (2002): Micro total analysis systems. 2. Analytical standard operations and applications, *Journal of Analytical Chemistry*, **74**, pp. 2637–2652.
398. Delnoij E., Westerweel J., Deen N. G., Kuipers J. A. M., van Swaaij W. P. M. (1999): Ensemble correlation PIV applied to bubble plumes rising in a bubble column, *Chemical Engineering Science*, **54**, pp. 5159–5171.
399. Devasenathipathy S., Santiago J.G., Wereley S.T., Meinhart C.D., Takehara K. (2003): Particle imaging techniques for microfabricated fluidic systems, *Exp. Fluids*, **34**, pp. 504–514.

400. Gomez R. et al. (2001): Microfluidic biochip for impedance spectroscopy of biological species, *Biomedical Microdevices*, **3**, pp. 201–209.
401. Hong J.W., Quake S.R. (2003): Integrated nanoliter systems, *Journal of Nature Biotechnology*, **21**, pp. 1179–1183.
402. Lindken R., Westerweel J., Wieneke B. (2006): Stereoscopic micro particle image velocimetry, *Exp. Fluids*, **41**, pp. 161–171.
403. Kinoshita H., Oshima M., Kaneda S., Fujii T., Saga T., Kobayashi T. (2003): Application of micro PIV to measurement of flow in various designs of microchip, Proc. *7th International Symposium on Fluid Control, Measurement and Visualization, Sorrento (Italy)*.
404. Kinoshita H., Oshima M., Kaneda S., Fujii T. (2003): Confocal micro-PIV measurement of internal flow in a moving droplet, Proc. *μTAS Symposium, Boston, Massachusetts (USA)*.
405. McDonald J. C., Duffy D. C., Anderson J. R., Chiu D. T., Wu H. Schueller O. J. A., Whitesides G. M. (2000): Fabrication of microfluidic systems in poly(dimethylsiloxane), *Journal of Electrophoresis*, **21**, pp. 27–40.
406. Meinhart C.D., Wereley S.T., Santiago J. G. (1999): PIV measurements of a microchannel flow, *Exp. Fluids*, **27**, pp. 414–419.
407. Meinhart C.D., Wereley S.T., Santiago J. G. (2000): A PIV algorithm for estimating time-averaged velocity fields, *Journal of Fluids Engineering*, **122**, pp. 285–289.
408. Meinhart C.D., Wereley S.T., Gray M.H.B. (2000): Volume illumination for two-dimensional particle image velocimetry, *Meas. Sci. Tech.*, **11**, pp. 809–814.
409. Reyes D.R., Iossifidis D., Auroux P.A., Manz A. (2002): Micro total analysis systems. 1. Introduction, theory, and technology, *Journal of Analytical Chemistry*, **74**, pp. 2623–2636.
410. Santiago J.G., Wereley S.T., Meinhart C.D., Beebe D.J., Adrian R.J. (1998): A particle image velocimetry system for microfluidics, *Exp. Fluids*, **25**, pp. 316–319.
411. Sato Y., Hishida K., Maeda M. (2002): Quantitative measurement and control of electrokinetically driven flow in microspace, Proc. *μTAS Symposium, Nara New Public Hall, Nara (Japan)*.
412. Sato Y., Inaba S., Hishida K., Maeda M. (2003): Spatially averaged time-resolved particle-tracking velocimetry in microspace considering Brownian motion of submicron fluorescent particles, *Exp. Fluids*, **35**, pp. 167–177.
413. Tanaami T., Otsuki S., Tomosada N., Kosugi Y., Shimizu M., Ishida H. (2002): High-speed 1-frame/ms scanning confocal microscope with a microlens and Nipkow disks, *Appl. Optics*, **41**, pp. 4704–4708.
414. Webb R.H. (1996): Confocal optical microscopy, *Reports on Progress in Physics*, **59**, pp. 427–471.
415. Wereley S.T., Gui L., Meinhart C.D. (2001): Flow Measurement Techniques for the Microfrontier, Proc. *AIAA,* Aerospace Sciences Meeting and Exhibit*, 39th, Reno, NV (USA), Jan. 8-11, AIAA Paper 2001-0243*.

Nano-PIV

416. Axelrod D., Burghardt T.P., Thompson N.L. (1984): Total internal reflection fluorescence, *Annual Reviews of Biophysics and Bioengineering*, **13**, pp. 247–268.
417. Hunter R.J. (1981): *Zeta Potential in Colloid Science*, Academic Press, London.
418. Liang D.F., Jiang C.B., Li Y.L. (2002): A combination correlation-based interrogation and tracking algorithm for digital PIV evaluation, *Exp. Fluids*, **33**, pp. 684–695.
419. Sadr R., Li H., Yoda M. (2005): Impact of hindered Brownian diffusion on the accuracy of particle-image velocimetry using evanescent-wave illumination, *Exp. Fluids*, **38**, pp. 90–98.
420. Sadr R., Yoda M., Zheng Z., Conlisk A.T. (2004): An experimental study of electro-osmotic flow in rectangular microchannels, *J Fluid Mech.*, **506**, pp. 357–367.
421. Sadr R., Yoda M., Gnanaprakasm P., Conlisk A.T. (2006): Velocity measurement inside the diffuse electric double layer in electro-osmotic flow, *Applied Physics Letters*, **89**, pp. 044103/1–3.
422. Zettner C.M., Yoda M. (2003): Particle velocity field measurements in a near-wall flow using evanescent wave illumination, *Exp. Fluids*, **34**, pp. 115–121.

Micro-PIV in Life Science

423. Diez L., Zima B.E., Kowalczyk W., Delgado A. (2007): Investigation of multiphase flow in sequencing batch reactor (SBR) by means of hybrid methods, *Chem. Eng. Sci.*, **62**, pp. 1803–1813.
424. Eisenmann, H., Letsiou, I., Feuchtinger, A., Beisker, W., Mannweiler, E., Hutzler, P., Arnz, P. (2001): Interception of small particles by flocculent structures, sessile ciliates, and the basic layer of a wastewater biofilm, *Appl. Env. Microbiology*, **67**, pp. 4286–4292.
425. Fried, J., Mayr, G., Berger, H., Traunspurger, W., Psenner, R., Lemmer, H. (2000): Monitoring protozoa and metazoa biofilm communities for assessing wastewater quality impact and reactor scale-up effects, *Water Sci. Technol.*, **41**(4), pp. 309–316.
426. Hartmann C., Özmutlu Ö., Petermeier H., Fried J., Delgado A. (2007): Analysis of the flow field induced by the sessile peritrichous ciliate Opercularia asymmetrica, *J. Biomech.*, **40**, pp. 137–148.
427. Krishnamachari V.V., Denz C. (2003): Real-time phase measurement with a photorefractive novelty filter microscope, *J. Optics A: Pure and Applied Optics*, **5**, pp. 239–243.
428. Petermeier H., Kowalczyk W., Delgado A., Denz C., Holtmann F. (2007): Detection of microorganismic flows by linear and nonlinear optical methods and automatic correction of erroneous images artefacts and moving boundaries in image generating methods by a neuronumerical hybrid implementing the Taylor hypothesis as a priori knowledge, accepted for publication *Exp. in Fluids*.
429. Petermeier H., Delgado A., Kondratieva P., Westermann R., Holtmann F., Krishnamachari V., Denz C. (2006): Hybrid Approach

Between Experiment and Evaluation for Artefact Detection and Flow Field Reconstruction - a Novel Approach Exemplified on Microorganismic Induced Fluid Flows, Proc. *12th International Symposium on Flow Visualization (ISFV 2006), Gttingen (Germany).*

430. Schiwietz T., Westermann R (2004): GPU-PIV, Proc. *Proceedings of the 9th International Fall Workshop Vision, Modeling and Visualization 2004, Stanford, California (USA).*

Micro-scale PIV Wind-Tunnel Investigations

431. Berton E., Favier D., Nsi Mba M., Maresca C., Allain C. (2001): Embedded LDV measurements methods applied to unsteady flows investigation, *Exp. Fluids*, **30**, pp. 102–110.
432. Lindken, R., Di Silvestro, F., Westerweel, J., Nieuwstadt, F. (2002): Turbulence measurements with μPIV in large-scale pipe flow, Proc. *119th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal).*

Related Techniques

433. Asundi A., Chiang F.P. (1982): Theory and application of the white light speckle method to strain analysis, *Opt. Eng.*, **21(4)**, pp. 570–580.
434. Asundi A., North H. (1998): White-light speckle method - Current trends, *Optics and Lasers in Engineering*, **29**, pp. 159–169.
435. Bagai A., Leishman J.G. (1993): Flow visualization of compressible vortex structures using density gradient techniques, *Exp. Fluids*, **15**, pp. 431–442.
436. Burch J.M., Tokarski J.M.J. (1968): Production of multiple beam fringes from photographic scatterers, *Opt. Acta*, **15(2)**, pp. 101–111.
437. Chen D.J., Chiang F.P., Tan Y.S., Don H.S (1993): Digital speckle-displacement measurement using a complex spectrum method, *Appl. Optics*, **32**, pp. 1839–1849.
438. Dalziel S.B., Hughes G.O., Sutherland B.R. (2000): Whole-field density measurements by synthetic schlieren, *Exp. Fluids*, **28**, pp. 322–335.
439. Debrus S., Francon M., Grover C.P., May M., Robin M.L. (1972): Ground glass differential interferometer, *Appl. Optics*, **11**, pp. 853–857.
440. Doric S. (1990): Ray tracing through gradient-index media: recent improvements, *Appl. Optics*, **29**, pp. 4026–4029.
441. van der Draai R.K., van Schinkel R.P.M., Lelesca A. (1999): A new approach to measuring model deflection, Proc. *18th International Congress on Instrumentation in Aerospace Simulation Facilities (ICIASF), 14–17 June, Toulouse (France).*
442. Forno C. (1975): White-light speckle photography for measuring deformation, strain, and shape, *Opt. Laser Technol.*, **7(5)**, pp. 217–221.
443. Goldhahn E., Seume J. (2006): Background oriented schlieren technique – sensitivity, accuracy, resolution and application to three-dimensional density fields, submitted to *Exp. Fluids.*
444. Jin H., Bruck H.A. (2005): Theoretical development for pointwise digital image correlation, *Optical Engineering*, **44**, pp. 067003.

445. Kaufmann, G.H. (1984): Double pulsed white-light speckle photography, *Appl. Opt.*, **23(2)**, pp. 194–196.
446. Kenneth P.Z., Goodson E. (2001): Subpixel displacement and deformation gradient measurement using digital image speckle correlation (DISC), *Optical Engineering*, **40**, pp. 1613–1620.
447. Kindler K., Goldhahn E., Leopold F., Raffel M. (2006): Recent developments in background oriented schlieren methods for rotor blade tip vortex measurements, submitted to *Experiments in Fluids*, online first, DOI 10.1007/s00348-007-0328-9.
448. Klinge F., Raffel M., Hecklau M., Kompenhans J., Gömann U. (2006): Measurement of the position of rotor blade vortices generated by a helicopter in free flight by means of stereoscopic Background Oriented Schlieren Method (BOS), Proc. *139th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal)*.
449. Köpf U. (1972): Application of speckling for measuring the deflection of laser light by phase objects, *Opt. Commun.*, **5**, pp. 347–350.
450. Lecompte D, Smits A., Bossuyt S., Sol H., Vantomme J., Van Hemelrijck D., Habraken A.M. (2006): Quality assessment of speckle patterns for digital image correlation, *Optics and Lasers in Engineering*, **44**, pp. 1132–1145.
451. Mandella M., Bershader D. (1987): Quantitative study of the compressible vortex: Generation, structure and interaction with airfoils, AIAA Paper 87-328.
452. Meier G.E.A. (1999): Hintergrund Schlierenmeßverfahren, Deutsche Patentanmeldung (German patent pending), DE 199 42 856 A1.
453. Pan B., Xie H., Xu B., Dai F. (2006): Performance of sub-pixel registration algorithms in digital image correlation, *Meas. Sci. Tech.*, **17**, pp. 1615–1621.
454. Raffel M., Tung C., Richard H., Yu Y., Meier G.E.A. (2000): Background oriented stereoscopic schlieren for full-scale helicopter vortex characterization, Proc. *9th Int. Symp. on Flow Visualization, Edinburgh (Scotland)*.
455. Raffel M., Richard H., Meier G.E.A. (2000): The applicability of background oriented optical tomography, *Exp. Fluids*, **28**, pp. 477–481.
456. Richard H., Raffel M., Rein M., Kompenhans J. and Meier G.E.A. (2000): Demonstration of the applicability of a background oriented schlieren (BOS) method, Proc. *109th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal)*.
457. Roux S., Hild F., Berthaud Y. (2002): Correlation image velocimetry: a spectral approach, *Appl. Optics*, **41**, pp. 108–115.
458. Schreier H.W., Braasch J.R., Sutton M.A. (2000): Systematic errors in digital image correlation caused by intensity interpolation, *Optical Engineering*, **39**, pp. 2915–2921.
459. Settles G.S. (1999): Schlieren and shadowgraph imaging in the great outdoors, Proc. *PSFVIP-2 Schlieren and Shadowgraph Techniques; Visualizing Phenomena in Transparent Media, Honolulu (USA)*.
460. Shaopeng M., Guanchang J. (2003): Digital speckle correlation improved by genetic algorithm, *Acta Mechanica Solida Sinica*, **16**, pp. 367–373.

461. Sharma A., Kumar D.V., Ghatak A.K. (1982): Tracing rays through graded-index media: a new method, *Appl. Optics*, **21**, pp. 984–987.
462. Tay C.J., Quan C., Huang Y.H., Fu Y. (2005): Digital image correlation for whole field out-of-plane displacement measurement using a single camera, *Optical Engineering*, **251**, pp. 23–36.
463. Vikram, C.S., Vedam, K. (1983): Complete 3-d deformation analysis in the white light speckle method, *Appl. Opt.*, **22(2)**, pp. 213–214.
464. Viktin D., Merzkirch W. (1998): Speckle-photographic measurements of unsteady flow processes using a highspeed CCD camera, Proc. *8th Int. Symp. on Flow Visualization, Sorrento (Italy)*.
465. Wernekinck U., Merzkirch W. (1987): Speckle photography of spatially extended refractive-index fields, *Appl. Optics*, **26**, pp. 31–32.
466. Weinstein L.M. (2000): Large field schlieren visualization-from wind tunnels to flight, *J. Visualization*, **2**, pp. 3–4.

Other optical velocimetry techniques

467. Dahm W.J.A., Su L.K., Southerland K.B. (1992): A Scalar Imaging Velocimetry Technique for Fully Resolved Four-Dimensional Vector Velocity Field Measurements in Turbulent Flows, *Physics of Fluids A (Fluid Dynamics)*, **4**(10), pp. 2191–2206.
468. Elliot G.S., Beutner T.J. (1999): Molecular filter based planar Doppler velocimetry, *Prog. Aero. Sci.*, **35**, pp. 799–845.
469. Koochesfahani M.M., et al. (1997): Molecular Tagging Diagnostics for the Study of Kinematics and Mixing in Liquid Phase Flows, in *Developments in Laser Techniques in Fluid Mechanics, R. J. Adrian et al. (eds.)*, Springer-Verlag, New York, pp. 125–134.
470. Meyers J.F., Komine H. (1991): Doppler global velocimetry – a new way to look at velocity, Proc. *ASME Fourth International Conference on Laser Anemometry, Cleveland (USA)*.
471. Röhle I. (1997): Three-dimensional Doppler global velocimetry in the flow of a fuel spray nozzle and in the wake region of a car, *Flow Measurement and Instrumentation*, **7**, pp. 287–294.
472. Wernet P. (2004): Planar particle imaging Doppler velocimetry: a hybrid PIV/DGV technique for 3-component velocity measurements, *Meas. Sci. Tech.*, **15**, pp. 2001–2028.

Further Reading

473. Höcker R., Kompenhans J. (1989): Some technical improvements of particle image velocimetry with regard to its application in wind tunnels, Proc. *Intl. Congr. on Instrumentation in Aerospace Facilities (ICIASF'89), Göttingen (Germany)*.
474. Kompenhans J., Raffel M., Willert C. (1996): PIV applied to aerodynamic investigations in wind tunnels, *von Karman Institute for Fluid Dynamics, Lecture Series* 1996-03, Particle Image Velocimetry, Rhode-St-Genèse (Belgium).
475. Lai W.T. (1996): Particle Image Velocimetry: A new approach in experimental fluid research, in *Th. Dracos (ed.), Three-Dimensional*

Velocity and Vorticity Measuring and Image Analysis Techniques, Kluwer Academic Publishers, Dordrecht (the Netherlands), pp. 61–92.

476. Pierce W.F., Delisi D.P. (1995): Effects of interrogation window size on the measurement of vortical flows with digital particle image velocimetry, in *J. Crowder (ed.), Flow Visualization VII*, Begell House, New York, pp. 728–732.
477. Raffel M., Kompenhans J. (1994): Error analysis for PIV recording utilizing image shifting, Proc. *79th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal)*.
478. Raffel M., Kompenhans J., Stasicki B., Bretthauer B., Meier G.E.A. (1994): Velocity measurement of compressible air flows utilizing a high-speed video camera, *Exp. Fluids*, **18**, pp. 204–206.
479. Kompenhans J., Reichmuth J. (1987): 2-D flow field measurments in wind tunnels by means of particle image velocimetry, Proc. *6th Intl. Congr. on Appl. of Lasers and Electro-Optics, 8–12 Nov., San Diego (USA)*.
480. Kompenhans J., Höcker R. (1988): Application of particle image velocimetry to high speed flows, *von Karman Institute for Fluid Dynamics, Lecture Series* 1988-06, Particle Image Displacement Velocimetry pp. 67–84 (⋆), Rhode-St-Genèse (Belgium).
481. Kompenhans J., Raffel M., Vogt A., Fischer M. (1993): Aerodynamic investigations in low- and high-speed wind tunnels by means of particle image velocimetry, Proc. *15th Intl. Congr. on Instrumentation in Aerospace Simulation Facilities (ICIASF), 20–23 Sept., St. Louis (France)*.
482. Kompenhans J., Raffel M. (1994): The importance of image shifting to the applicability of the PIV technique for aerodynamic investigations, Proc. *79th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal)*.
483. Kompenhans J., Raffel M., Wernert P., Schäfer H.J. (1994): Instantaneous flow field measurements on pitching airfoils by means of particle image velocimetry, Proc. *Optical Methods and Data Processing in Heat and Fluid Flow, 14–15 April, London,* pp. 117–121.
484. Kompenhans J., Raffel M., Willert C. (1996): PIV applied to aerodynamic investigations in wind tunnels, *von Karman Institute for Fluid Dynamics, Lecture Series* 1996–03, Particle Image Velocimetry, Rhode-St-Genèse (Belgium).
485. Liu Z.C., Landreth C.C., Adrian R.J., Hanratty T.J. (1991): High resolution measurement of turbulent structure in a channel with particle image velocimetry, *Exp. Fluids*, **10**, pp. 301–312 (⋆).
486. Liu Z.C., Adrian R.J., Hanratty T.J. (1996): A study of streaky structures in a turbulent channel flow with particle image velocimetry, Proc. *89th Intl. Symp. on Laser Techniques to Fluid Mechanics, Lisbon (Portugal)*.
487. Meinhart C.D. (1994): Investigation of turbulent boundary-layer structure using particle-image velocimetry, Ph.D. thesis, Department of Theoretical and Applied Mechanics, University of Illinois, Urbana, Illinois (USA).

488. Raffel M. (1993): PIV-Messungen instationärer Geschwindigkeitsfelder an einem schwingenden Rotorprofil, Ph.D. thesis, Universität Hannover (Germany), DLR-FB 93-50.
489. Roesgen T., Totaro R. (1995): Two-dimensional on-line particle imaging velocimetry, *Exp. Fluids*, **19**, pp. 188–193.
490. Somerscales E.F.C. (1980): Fluid velocity measurement by particle tracking, in *Flow, its Measurement and Control in Science and Industry, Vol. I,* ed. R.E. Wendt, Instrum. Soc. Amer., pp. 795–808.