Curriculum Vitae – Robert A. Handler

MAILING ADDRESS:

George Mason University
Volgenau School of Engineering
Nguyen Engineering Building
Department of Mechanical Engineering
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Fairfax, VA 22030

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EDUCATION:

B.E. Stevens Institute of Technology, with Honor. .. 1973
M.S.E. University of Michigan ……. ….. 1974
S.M. Massachusetts Institute of Technology … …… 1976
Ph.D. University of Minnesota (Mechanics) ……. 1980

EXPERIENCE:

Professor and Director of Graduate Studies
Department of Mechanical Engineering
George Mason University, Fairfax, VA 2016-present

Research Professor
Department of Mechanical Engineering
Texas A&M University, College Station, TX 2014-2016

Professor
Department of Mechanical Engineering
Texas A&M University, College Station, TX 2010-2014

Research Mechanical Engineer (NP4[1])
Remote Sensing Division
Naval Research Laboratory, Washington, DC 2003-2010

Head, Fluid Dynamics Section
Remote Sensing Division
Naval Research Laboratory, Washington, DC 1993 - 2003

[1] This is equivalent to a grade of GS-15

Research Mechanical Engineer
Center for Advanced Space Sensing
Naval Research Laboratory, Washington, DC 1990-1993

Research Mechanical Engineer
Laboratory for Computational Physics and Fluid Dynamics
Center for Hydrodynamic Developments
Naval Research Laboratory, Washington, DC 1986-1990

Research Mechanical Engineer
Marine Technology Division
Naval Research Laboratory, Washington, DC 1981-1986

Research Mechanical Engineer
Ship Acoustics Department
David W. Taylor Research and Development Center, Carderock, MD 1980-1981

Teaching Associate
University of Minnesota 1976-1980

Research Assistant
Massachusetts Institute of Technology 1975-1976

EDITORIAL BOARDS:

International Journal of Non-Linear Mechanics (Dec. 2012 through Dec. 2015)
Frontiers in Mechanical Engineering, Guest Editor, 2017 – Present.

SELECTED HONORS:

Visiting Scholar
Center for Fluid Mechanics, Turbulence, and Computation
Brown University 9/92 - 3/93

Alan Berman Publication Award
Naval Research Laboratory, 1984,1999,2001

Whirlpool Corporate Fellowship
University of Michigan, 1973-1974

BOOKS:

Transport at the Air-Sea Interface: Measurements, Models, and Parameterizations, (C.S. Garbe, R.A. Handler, and B. Jahne (eds.)), published by Springer-Verlag, September, 2007, pp 1-315.

PEER REVIEW EXPERIENCE:

Reviewer for a wide number of professional journals including:

Journal of Fluid Mechanics, Physics of Fluids, Journal of Physical Oceanography, AIAA Journal, International Journal for Numerical Methods in Fluids, International Journal of Engineering Science

PUBLICATIONS:

I have included a comprehensive list of my publications. The list includes more then 100 journal articles, conference proceedings, and theses. According to "Google Scholar", these publications have been cited **3365** times with an h-index of **25** and a !10-index of **49** as of 10/10/2018.

RESEARCH ACHIEVEMENTS:

Robert Handler has been active in computational, theoretical, and experimental fluid mechanics throughout his 38 years of government and academic experience. He has participated in a wide range of fundamental research areas including: Development of direct and large eddy simulation methods for turbulent flows, turbulent transport physics, air-sea interfacial dynamics and transport with special emphasis on the surface thermal (infrared) signature of breaking waves and subsurface turbulence, surfactant effects on free surface flows, first principles understanding of polymer drag reduction and riblet drag reduction, atmospheric boundary layer flows, turbulence modeling, hydroacoustics, physics of coastal and estuarine flows, applications of Karhunen-Loeve expansion methods to turbulence and to geophysical flows, infrared remote sensing, and aerosol physics. Recently he has been involved in NSF funded research involving chaotic low Reynolds number flows of dilute polymer solutions.

The papers below are representative of the research I have been involved with during my career.

1. Goldstein, D., Handler, R., and Sirovich, L., "Modeling a No-Slip Flow Boundary with an External Force-Field", *Journal of Computational Physics,* **105** (2) 354-366 (1993). [**1085** citations (Google Scholar)]

We have developed an effective "virtual surface approach" for no-slip boundaries which is now widely used to simulate fully turbulent engineering and geophysical flows with complex geometries. This work was performed in collaboration with Brown University.

2. Sureshkumar, R., Beris, A. N., and Handler, R. A., "Direct Numerical Simulation of the Turbulent Channel Flow of a Polymer Solution", *Physics of Fluids,* **9** (3) 743-755 (1997). [**406** citations (Google Scholar)]

The addition of small amounts (parts per million) of long chain polymers to turbulent flows have been known since the 1950's to reduce friction drag by as much as fifty percent. This work represents the first successful direct simulation of this phenomenon and was also an important basis for a new DARPA program in friction drag reduction. This work was performed in collaboration with the University of Delaware.

3. Handler, R. A., Smith, G. B., and Leighton, R. I., "The Thermal Structure of an Air-Water Interface at Low Wind Speeds", *Tellus Series A - Dynamic Meteorology and Oceanography,* **53** (2) 233-244 (2001). [**54** citations (Google Scholar)]

We were among the first groups to use highly sensitive (0.01K) infrared detectors to explore the physics of the air-sea interface. These detectors, along with direct numerical simulations (DNS), were used in this work to study the turbulence at a sheared interface. We believe we are also pioneers in applying these sensors in basic fluid dynamics research and have dubbed this new field "Infrared Hydrodynamics".

4. Kaihatu, J. M., Handler, R. A., Marmorino, G. O., and Shay, L. K., "Empirical Orthogonal Function Analysis of Ocean Surface Currents Using Complex and Real-Vector Methods", *Journal of Atmospheric and Oceanic Technology,* **15** (4) 927-941 (1998). [**99** citations (Google Scholar)]

We have shown that a standard method of analysis used by oceanographers may not be nearly as effective as the so-called real-vector method which we applied to ocean current data. The proposed real-vector method preserves important properties of the flow such as incompressibility.

FUNDING PROFILE:

Texas A&M University

Project Title: Thermal Transport in Elastic turbulence
Status: Current
Source of Support: National Science Foundation (CBET – 1335748)
Total Award Amount: $150,392 (Oct. 1, 2013 – Sept. 30, 2017)
Location of Project: Texas A&M University

Project Title: Dynamic Simulation of a Gas-loaded Pressure Relief Valve
Status: Current
Source of Support: Daniel Measurement and Control
Total Award Amount: $63,704 (Nov. 1, 2014 – Oct. 31, 2015)
Location of Project: Texas A&M University

Naval Research Laboratory

My primary source of funding at the Naval Research Laboratory has been from the Office of Naval Research (ONR) through the Core program of the Naval Research Laboratory. In this program, I have been a principal investigator for a number of basic (6.1) research projects, with a total funding over the last decade of tenure there of approximately $5,000,000. During the course of this work, as Head of the Fluid Dynamics section in the Remote Sensing Division, I was responsible for developing the NRL Free Surface Hydrodynamics Laboratory, which is a basic research lab designed to study the physics of free surface flows such as surface turbulence, wake-free surface interactions, breaking waves, and surfactant effects. The lab is equipped with a number of state-of-the-art systems such as two high resolution infrared imagers, a four YAG laser digital particle imagery system, a 10 meter long flow basin with a computer controlled wavemaker, high speed imagers, and a Langmuir trough for accurate surface tension determination. Also at the Naval Research Laboratory, I received outside funding from ONR

directly, and also from other government agencies such as DARPA. In fact, our work on the development of DNS methods for simulating polymer drag reduction lead DARPA to create the "Drag Reduction Technologies Program" in 2001. External funding from these programs total about $300,000 in the last decade of my tenure at NRL.

George Mason University

[1]A. NSF Targeting Turbulence: *Modification of Wall-bounded Turbulence -- A Targeted Approach* ($488,010).
[2]B. W.M. Keck Foundation Proposal *Targeting Turbulence using Smart Particles* ($1,645,001).
[3]C. MDR Proposal GMU Understanding the Physics of Elastically Induced Turbulence in Micro-Fluidic Systems ($40,000).
[4]D. 4-VA Collaborative Research Grant Program Proposal *Scalable Molecular Dynamics* ($20,000).
[5]E. NRL Optical Sciences Division *Simulations of the Atmospheric Boundary Layer* ($12,000)

[1] Not selected for funding.
[2]This proposal made it to Phase-2, after have been **selected by GMU and the Keck reviewers**. It was not ultimately selected for funding.
[3] Funded.
[4] Funded.
[5] Funded.

TEACHING EXPERIENCE:

1. George Mason University

Undergraduate Courses:
ME322 (Fluid Mechanics)
ME498 (Independent Study in Mechanical Engineering)

Graduate Courses:
ME621 (Foundations of Fluid Mechanics)

2. Texas A&M University

Undergraduate Courses:
MEEN461 (Heat Transfer)
MEEN344 (Fluid Mechanics)
MEEN357 (Engineering Analysis for Engineers)
CVEN305 (Strength of Materials)
MEEN221 (Statics and Particle Dynamics)

Graduate Courses:
MEEN621 (Fluid Mechanics)

MEEN622 (Advanced Fluid Mechanics)
MEEN636 (Turbulence Theory and Applications)

3. University of Texas at Austin (Senior Lecturer)

Graduate Courses:
ASE382Q.1 (Foundations of Fluid Mechanics)

GRADUATE STUDENTS at Texas A&M:

Qi Zhang Thesis: "Direct numerical simulations of interfacial turbulence at low Froude and Weber numbers" (Ph.D, May, 2014)

Ni Zhen Thesis: "Transition to turbulence in shear-thinning fluids"
(Ph.D, May 2014)

Qi Shao Thesis: "Surface signature of flow past a sphere at moderate Reynolds numbers" (M.S. 2013)

Youfeng Zhang Thesis: "Numerical study of flow past a sphere and spheroid at low Reynolds numbers" (M.S. 2013)

Gabrielle Shan (non-thesis M.S. 2015)

Pengze Yang, Numerical study of cavitation within orifice flow, (M.S. 2016)

GRADUATE STUDENTS at George Mason Univerity:

Joshua Toepfer, enrolled in the IT/ME/Ph.D. program in the Fall 2018 term.

Publications of Robert A. Handler (1976-2016)

1. S. Suryanarayanan, S., Goldstein, D., Handler, R., Targeted disruption of targeted structures, Bulletin of the American Physical Society, 2018.

2. Fredriksson, S.T., Arneborg, L., Nilsson, H., Handler, R.A., Estimating air-water gas transfer velocity during low wind condition with and without buoyancy, EGU General Assembly Abstracts 20, 10177, 2018.

3. Handler, R.A., Judd, K.P., Analysis of infrared radiation at an air-water interface, Frontiers in Mechanical Engineering 4,5, 2018.

4. Vajipeyajula, B., Khambampati, T., Handler, R.A., Dynamics of a single buoyant plume in a FENE-P fluid,
Physics of Fluids, 29, 091701, 2017.

5. Fredriksson, S.T., Arneborg, L., Nilsson, H., Handler, R.A., Surface shear stress dependence of gas transfer velocity parametrizations *using DNS*, J. Geophysical Research: Oceans, vol. 121, pp. 7369-7389, 2016.

6. Fredriksson, S.T., Arneborg, L., Nilsson, H., Zhang, Q., Handler, R.A., An evaluation of *gas transfer velocitiy parameterizations during natural convection using DNS*, J. Geophysical Research: Oceans, vol. 121, pp. 1400-1423, 2016.

7. Fredriksson, S.T., Arneborg, L., Nilsson, H., Handler, R.A., Near-surface physics during convection affecting air-water gas transfer, IOP Conference Series:Earth and Environmental Science, vol. 35(1), 2016.

8. Judd, K.P., Savelyev, I., Zhang, Q., Handler, R.A., *The thermal signature of a submerged jet impacting normal to a free surface*, Journal of Visualization, vol. 19, pp. 1-5, 2016.

9. Scott, N., Zhang, Q., Handler, R.A, *Structural characterization of wind sheared turbulent flow using self-organized mapping*, SPIE Defense+ Security, pp. 98270X-98270X-14, 2016.

10. Fredriksson, S.T., Arneborg, L., Nilsson, H., Zhang, Q., Handler, R.A., *Direct numerical simulation of near surface turbulence – an evaluation of a method of estimating air-water gas exchange*, Ocean Sciences Meeting, 2014.

11. Zhang, Q., Handler, R.A., *Active suppression of buoyancy driven turbulence*, Int. J. of Heat and Mass Transfer, vol. 75, pp. 207-212, 2014.

12. Zhen, N., Handler, R.A., Zhang, Q., Oeth, C., *Evolution of a hairpin vortex in a shear-thinning fluid governed by a power-law fluid*, , Physics of Fluids-Letters, Vol. 25, 2013.

13. Handler, R.A., and Zhang, Q., *Direct Numerical Simulations of a Sheared Interface at Low Wind Speeds*, IEEE Selected Topics in Applied Earth Observations and Remote Sensing, Vol. 6, pp. 1086-1091, 2013.

14. Zhang, Q., Handler, R.A., Fredriksson, S.T., *Direct numerical simulation of free convection in the presence of a surfactant*, Int. J. of Heat and Mass Transfer, vol. 61, pp. 82-93, 2013.

15. Handler, R.A, Savelyev, I.B., and Lindsey, M., *Infrared imagery of streak formation in a breaking wave*, Physics of Fluids-Letters, vol. 24, issue 12, 121701, 2012.

16. Nagaosa, R., Handler, R.A., *Characteristic time scales for predicting the scalar flux at a free surface in turbulence open channel flows, AICHE Journal, vol. 58, 12, pp.3867-3877,* 2012.

17. Handler, R.A., Applications of direct numerical simulations to interfacial problems, Proceedings of the IEEE International Geoscience and Remote Sensing Symposium, Munich, Germany, 2012.

18. Nagaosa, R., Handler, R.A., *In-silico experiments on characteristic time scales at a shear-free gas-liquid interface, European Turbulence Conference (ETC13), Euromech, Warsaw Poland, Sept. 12-15, 10pgs., 2011.*

19. Handler, R.A., Smith, G.B., *Statistics of the temperature and its derivatives at the surface of a wind-driven air-water interface,* J. Geophysical Research, Vol. 116, Article number: C06021, DOI: 10.1029/2010JC006496, 2011.

20. Morris, K., Handler, R.A., Rouson, D.W.I, *Intermittency in the turbulent Ekman Layer*, Journal of Turbulence, Vol. 12, Article number: PII 934030632 DOI: 10.1080/14685248.2010.541258, pp. 1-25, 2011.

21. Judd, K.P., Handler, R.A., Smith, G.B., *Use of infrared imagery to quantify near surface thermal and hydrodynamic features on bodies of water*, Proceedings of SPIE, vol. 7661, 2010.

22. Savelyev, I.B., Handler, R.A., *Generation of the maximum breaking wave amplitude by means of a unidirectional wave focusing*, 63rd Annual Meeting of the AOS Division of Fluid Dynamics, Vol. 55, No. 16, Nov. 21-23, 2010.

23. Samanta, G., Housiadas, K.D., Beris, A.N., Handler, R.A., *Data reduction in viscoelastic turbulent channel flow based on extended Karhunen-Loeve analysis*, J. Non-Newtonian Fluid Mechanics, Vol.165, No. 19-20, pp. 1386-1399, 2010.

24. Mied, R.P., Schulz, W.J., Handler, R.A., Snow, C.M., Fusina, R.A., Porter, J.H., *Remote and local forcing of a coastal lagoon: The Virginia coast reserve*, Continental Shelf Research, Vol. 20, No. 30, 2010.

25. Samanta, G., Housiadis, K., Handler, R.A., and Beris, A.N., "Effects of viscoelasticity on the probability density functions in turbulent channel flows", *Physics of Fluids*, Vol. 21, Art. No. 115106, 2009.

26. Samanta, G., Beris, A. N., Handler, R. A. and Housiadas, K. D., "Velocity and conformation statistics based on reduced Karhunen-Loeve projection data from DNS of viscoelastic turbulent channel flow", *Journal of Non-Newtonian Fluid Mechanics,* **160** (1), 55-63, (2009).

27. Handler, R. A., Mied, R. P., Lindemann, G. J., and Evans, T. E., "Turbulent channel flows on a rotating earth", *Journal of Physical Oceanography,* **39** (4), 952-968, (2009).

28. Samanta, G., Oxberry, G. M., Beris, A. N., and Housiadas, K. D., "Time evolution K-L coherent structures based on DNS of turbulent Newtonian and viscoelastic flows", *Journal of Turbulence,* **9** (41), 1-25, (2008).

29. Judd, K. P., Smith, G. B., Handler, R. A., and Sisodia, A., "The thermal signature of a low Reynolds number submerged turbulent jet", *Physics of Fluids,* **20** (1) (2008).

30. Scott, N. V., Handler, R. A., and Smith, G. B., "Wavelet analysis of the surface temperature field at an air-water interface subject to moderate wind stress", *International Journal of Heat and Fluid Flow,* **29** (4) 1103-1112 (2008).

31. Samanta, G., Beris, A. N., Handler, R. A. et al., "Dynamic K-L analysis of the coherent structures in turbulent viscoelastic channel flows", *XVth International Congress on Rheology,* **1027** 213-215 (2008).

32. Smith, G. B., Handler, R. A., and Scott, N., "Observations of the structure of the surface temperature field at an air-water interface for stable and unstable cases", in *International Workshop on Transport at the Air Sea Interface, held in Heidelberg, GERMANY, SEP 06-08, 2006,* edited by Garbe, C. S., Handler,

R. A., and Jahne, B., HEIDELBERGER PLATZ 3, D-14197 BERLIN, GERMANY: SPRINGER-VERLAG BERLIN, 205-222 (2007).

33. Rouson, D., and Handler, R. A., "Toward a variational multi-scale large eddy simulation of atmospheric boundary layer turbulence", Chapter 1 of Environmental Sciences and Environmental Computing, (P. Zannetti, S. Elliot and D. Rouson, Editors), **3** (2007).

34. Handler, R. A., Housiadas, K. D., and Beris, A. N., "Karhunen-Loeve representations of turbulent channel flows using the method of snapshots", *International Journal for Numerical Methods in Fluids,* **52** (12) 1339-1360 (2006).

35. Smith, G., Handler, R., and Scott, N., "Observations of the surface temperature field at an air-water interface for both stable and unstable conditions", *Bulletin of the American Physical Society,* **51** (9) 199-200 (2006).

36. Housiadas, K. D., Beris, A. N., and Handler, R. A., "Viscoelastic effects on higher order statistics and on coherent structures in turbulent channel flow", *Physics of Fluids,* **17** (3) 035106 (2005).

37. Judd, K. P., Phongikaroon, S., Smith, G. B., and Handler, R. A., "Thermal Structure of Clean and Contaminated Free-Surfaces Subject to an Impinging Gas Jet", *Experiments in Fluids,* **38** (1) 99-111 (2005).

38. Phongikaroon, S., Hoffmaster, R., Judd, K. P., Smith, G. B., and Handler, R. A., "Effect of Temperature on the Surface Tension of Soluble and Insoluble Surfactants of Hydrodynamical Importance", *Journal of Chemical and Engineering Data,* **50** (5) 1602-1607 (2005).

39. Handler, R. A., Smith, G. B., and Leighton, R. I., "The Thermal Structure of an Air-Water Interface at Low Wind Speeds", *Tellus* , **56** (2) 176-176 (2004).

40. Phongikaroon, S., Judd, K. P., Smith, G. B., and Handler, R. A., "The Thermal Structure of a Wind-Driven Reynolds Ridge", *Experiments in Fluids,* **37** (2) 153-158 (2004).

41. Phongikaroon, S., Judd, K., Smith, G. B., and Handler, R. A., "High-resolution temperature and velocity measurement in a wind-wave tunnel", in *57th Annual Meeting of the Division of Fluid Dynamics, held in Seattle, Washington, 21-23 November, 2004,* **49** 154 (2004).

42. Handler, R. A., Leighton, R. I., Smith, G. B., and Nagaosa, R., "Surfactant Effects on Passive Scalar Transport in a Fully Developed Turbulent Flow", *International Journal of Heat and Mass Transfer,* **46** (12) 2219-2238 (2003).

43. Judd, J. K., Phongikaroon, S., Smith, G. B., and Handler, R. A., "Hydrodynamic response of a free surface to a transient gas jet", American Physical Society, Division of Fluid Dynamics 56th Annual Meeting, November 23-25, 2003, **48** 208 (2003).

44. Leighton, R. I., Smith, G. B., and Handler, R. A., "Direct Numerical Simulations of Free Convection Beneath an Air-Water Interface at Low Rayleigh Numbers", *Physics of Fluids,* **15** (10) 3181-3193 (2003).

45. Nagaosa, R. and Handler, R. A., "Statistical Analysis of Coherent Vortices Near a Free Surface in a Fully Developed Turbulence", *Physics of Fluids,* **15** (2) 375-394 (2003).

46. Phongikaroon, S., Judd, K., Smith, G. B., and Handler, R. A., "Surfactant Effects on Mass Transfer at

Free Surfaces in a Fully Developed Turbulent Flow", in *Annual AICHE Conference 2003, 20 November 2003,* AICHE, **365d** 3 (2003).

47. Judd, K. P., Phongikaroon, S., Smith, G. B., and Handler, R. A., "The Surface Thermal Structure of an Unsteady Reynolds Ridge and Associated Instabilities", in *Proceedings of American Physical Society, Division of Fluid Dynamics, 24 November 2002,* APS, 173 (2002).

48. Mied, R. P., Handler, R. A., and Donato, T. F., "Regions of Estuarine Convergence at High Rossby Number: A Solution in Estuaries with Elliptical Cross Sections", *Journal of Geophysical Research - Oceans,* **107** (C11) Art. No. 3206 (2002).

49. Phongikaroon, S., Judd, K. P., Smith, G. B., and Handler, R. A., "The Dynamics of a Wind-Driven Reynolds Ridge", in *Proceedings of the American Physical Society, Division of Fluid Dynamics, 24 November 2002,* APS, 101 (2002).

50. Webber, G. A., Handler, R. A., and Sirovich, L., "Energy Dynamics in a Turbulent Channel Flow Using the Karhunen-Loeve Approach", *International Journal for Numerical Methods in Fluids,* **40** (11) 1381-1400 (2002).

51. Dimitropoulos, C. D., Sureshkumar, R., Beris, A. N., and Handler, R. A., "Budgets of Reynolds Stress, Kinetic Energy and Streamwise Enstrophy in Viscoelastic Turbulent Channel Flow", *Physics of Fluids,* **13** (4) 1016-1027 (2001).

52. Handler, R. A., Mied, R. P., Evans, T. E., and Donato, T. F., "Convergence Fronts in Tidally Forced Rotating Estuaries", *Journal of Geophysical Research - Oceans,* **106** (C11) 27145-27162 (2001).

53. Handler, R. A., Smith, G. B., and Leighton, R. I., "The Thermal Structure of an Air-Water Interface at Low Wind Speeds", *Tellus Series A - Dynamic Meteorology and Oceanography,* **53** (2) 233-244 (2001).

54. Smith, G. B., Volino, R. J., Handler, R. A., and Leighton, R. I., "The Thermal Signature of a Vortex Pair Impacting a Free Surface", *Journal of Fluid Mechanics,* **444** 49-78 (2001).

55. Mied, R. P., Handler, R. A., and Evans, T. E., "Longitudinal Convergence Fronts in Homogeneous Rotating Channels", *Journal of Geophysical Research-Oceans,* **105** (C4) 8647-8658 (2000).

56. Handler, R. A., Saylor, J. R., Leighton, R. I., and Rovelstad, A. L., "Transport of a Passive Scalar at a Shear-Free Boundary in Fully Developed Turbulent Open Channel Flow", *Physics of Fluids,* **11** (9) 2607-2625 (1999).

57. Marmorino, G. O., Shay, L. K., Haus, B. K., Handler, R. A., Graber, H. C., and Horne, M. P., "An EOF Analysis of Hf Doppler Radar Current Measurements of the Cchesapeake Bay Buoyant Outflow", *Continental Shelf Research,* **19** (2) 271-288 (1999).

58. Mied, R. P., Handler, R. A., and Evans, T., "Flow through bathymetric channels at the mouths of estuaries" , in *Proceedings of the 22nd General Assembly of the International Union of Geodesy and Geophysics.,* International Union of Geodesy and Geophysics, (1999)

59. Saylor, J. R. and Handler, R. A., "Capillary Wave Gas Exchange in the Presence of Surfactants", *Experiments in Fluids,* **27** (4) 332-338 (1999).

60. Smith, G. B., Handler, R. A., and Leighton, R. I., "Analysis of the thermal structure of an air-water

interface subjected to shear.", in *Fluid Dynamics Meeting (abstract #AE.03), held in New Orleans, LA, November 21-23, 1999,* **44(8)** (1999)

61. Handler, R. A., Leighton, R. I., and Smith, G. B., "Simulation of a sheared air-water interface with heat transfer", in *Proceedings of the American Physical Society Conference 1998, held in Philadelphia, PA, 22-24 November 1998,* American Physical Society, (1998)

62. Handler, R., Smith, G., and Leighton, R., "Vortex interactions with a thermal boundary layer at a surfactant contaminated free surface", in *Proceedings of the 1998 ASME Fluids Engineering Division Summer Meeting, held in Washington, DC, 21-25 June 1998,* American Society of Mechanical Engineers (ASME), 1-9 (1998)

63. Kaihatu, J. M., Handler, R. A., Marmorino, G. O., and Shay, L. K., "Empirical Orthogonal Function Analysis of Ocean Surface Currents Using Complex and Real-Vector Methods", *Journal of Atmospheric and Oceanic Technology,* **15** (4) 927-941 (1998).

64. Saylor, J. R. and Handler, R. A., "Gas Transport Across an Air-Water Interface Populated with Capillary Waves", *Physics of Fluids,* **9** (9) 2529-2541 (1997).

65. Sureshkumar, R., Beris, A. N., and Handler, R. A., "Direct Numerical Simulation of the Turbulent Channel Flow of a Polymer Solution", *Physics of Fluids,* **9** (3) 743-755 (1997).

66. Webber, G. A., Handler, R. A., and Sirovich, L., "Karhunen-Loeve Decomposition of Minimal Channel Flow", *Physics of Fluids,* **9** (4) 1054-1066 (1997).

67. Webber, G. A., Handler, R. A., and Sirovich, L., "The Karhunen-Loeve Decomposition of Minimal Channel Flow (Vol 9, Pg 1054, 1997)", *Physics of Fluids,* **9** (8) 2461-2461 (1997).

68. Chen, Z., Swearingen, J. D., and Handler, R. A., "Vortex ring interaction with an inclined wall", *American Society of Mechanical Engineers, Fluids Engineering Division FED,* **238** 57-60 (1996).

69. Sureshkumar, R., Beris, A. N., and Handler, R. A., "Numerical simulation of three-dimensional and time-dependent viscoelastic flows with applications to turbulent drag reduction", *XIIth International Congress on Rheology,* 411-412, (1996).

70. Goldstein, D., Handler, R., and Sirovich, L., "Direct Numerical-Simulation of Turbulent-Flow Over a Modeled Riblet Covered Surface", *Journal of Fluid Mechanics,* **302** 333-376 (1995).

71. Swearingen, J. D., Crouch, J. D., and Handler, R. A., "Dynamics and Stability of a Vortex Ring Impacting a Solid Boundary", *Journal of Fluid Mechanics,* **297** 1-28 (1995).

72. Katz, R. A., Keith, W. L., Galib, T. A., and Handler, R. A., "Application of Non-traditional Processing Methods to Transitional and Turbulent Boundary Layer (TBL) Flow Noise", in *International Conference on Theoretical and Computational Acoustics - Volume 1, held in Mystic, CT, 05-09 JUL, 1993,* edited by Ffowcs Williams, J. E., Lee, D., and Pierce, A. D., Singapore; New Jersey: World Scientific, **1** 467-498 (1994)

73. Rovelstad, A. L., Handler, R. A., and Bernard, P. S., "The Effect of Interpolation Errors on the Lagrangian Analysis of Simulated Turbulent Channel Flow", *Journal of Computational Physics,* **110** (1) 190-195 (1994).

74. Rovelstad, A. L., Handler, R. A., Bernard, P. S., and Thomas, J. M., "Large eddy simulation of channel flow using a vorticity transport transport model", 74th Fluid dynamics symposium on 'Application of direct and large eddy simulation to transition and turbulence', AGARD-GP-551, Chapter 15, (1994).

75. Handler, R. A., "Wall bounded turbulence and low-order dynamical systems", *Current Topics in the Physics of Fluids*, Edited by Alexander, J. C. and Menon, J., **1** 475-483 (1994).

76. Bernard, P. S., Thomas, J. M., and Handler, R. A., "Vortex Dynamics and the Production of Reynolds Stress", *Journal of Fluid Mechanics,* **253** 385-419 (1993).

77. Ball, K. S., Handler, R. A., and Sirovich, L., "Dynamics of coherent structures in wall bounded turbulence", International topical conference on research trends in chaotic dynamics and transport in fluids and plasmas , February 17-20, 1991 La Jolla, CA , Edited by Prigogine, I., 149-170 (1993).

78. Goldstein, D., Handler, R., and Sirovich, L., "Modeling a No-Slip Flow Boundary with an External Force-Field", *Journal of Computational Physics,* **105** (2) 354-366 (1993).

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