CURRICULUM VITA

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Formal Education:

Ph.D.	Physics, University of Michigan, 1976
M.S.	Physics/Mathematics, University of Michigan, 1971
B.S.	Physics, University of Minnesota, 1967 (cum laude)

Research Interests:

Nonlinear science, especially nonlinear dynamics – ranging from integrable to chaotic behavior, from solitons to turbulence – in Hamiltonian systems for nonlinear optics and fluid dynamics. In nonlinear optics I am studying dynamics of laser-cavity optics and telecommunication pulses in fibers.[1] In fluid dynamics I am applying averaging, asymptotics and geometrical methods from nonlinear dynamics, in deriving and analyzing models for computing high resolution global ocean circulation, including the effects of subgrid scales and turbulence on the Lagrangian mean motions. Recent work applies the Euler-Poincaré theory to derive and analyze Lagrangian turbulence closures for large eddy simulation. These are the Lagrangian-averaged Navier-Stokes-alpha (LANS$-\alpha$) models of turbulence – an active area of my current study.

[1]UNITED STATES PATENT # 6,157,762 patents the idea of using nonlinear amplifying loop mirrors (NALMs) to stabilize, shape and regenerate optical pulses in fibers at high bit rates. The idea treats the pulse propagation and re-amplication process as an iterated mapping. See I. Gabitov, D. D. Holm, B. Luce and A. Mattheus, *Optics Lett.* **20** (1995) 2490-2492.

Summary of Experience:

Thirty-three years experience with Los Alamos National Laboratory (LANL) performing R & D coordination in issues of national and international scientific interest in applied nonlinear dynamics research, theoretical physics and experimental design. 1984 National Award of Excellence for Significant Contribution to the Nuclear Weapons Program. Theoretical Design Team participant in 1991 Joint Verification Experiment for US/Soviet Threshhold Testban Treaty. Founding Nonlinear Science Editor for Physics Letters A. Founding member and past Director of the LANL Center for Nonlinear Studies (CNLS), member and past co-leader of the Mathematical Modeling and Analysis Group (T-7) at LANL. Now Los Alamos National Laboratory Fellow and Chaired Professor in Mathematics, Imperial College of Science, Technology and Medicine (London, UK). Primary supervisor of twenty one postdoctoral fellows. Organizer of more than twenty scientific conferences and workshops.

Employment History:

2003–present: Chaired Professor in Mathematics, Imperial College London
1988–present: Laboratory Fellow, Mathematical Modeling and Analysis Group, Los Alamos National Laboratory
1985–1988: Deputy Group Leader, Mathematical Modeling and Analysis Group, Los Alamos National Laboratory
1983–1985: Staff Member, Mathematical Modeling and Analysis Group, Los Alamos National Laboratory
1982–1983: Acting Director, Center for Nonlinear Studies, Los Alamos National Laboratory
1972–1983: Staff Member, Theoretical Design Group, Los Alamos National Laboratory

Fellowships and Honors:

August 2003, Plenary Speaker, International Meeting in Direct and Large Eddy Simulations, Münich, Germany

April 2003, Royal Society of London Wolfson Fellowship for Research Merit, Five Year Research Award

Jan 2003, Plenary Speaker, Dynamics Days, held at Scottsdale, AZ

2002 Visiting Fellow, Warwick University, Canterbury, UK, July-August 2002

March 2001, Plenary Speaker, Fred Howes Memorial Workshop, held at

MSRI, UC Berkeley

2000 Visiting Fellow, Isaac Newton Institute for Mathematical Sciences, Cambridge University, Cambridge, UK, October-December 2000

2000 Lecturer, MASIE Summer School, Course on "Hamiltonian Fluid Mechanics," Peyresq, France, September 3 - 16

1998 Lecturer, DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS, TECHNICAL UNIVERSITY OF DENMARK, Ph.D.-course / Advanced school, Variational Methods in Applied Mechanics, Lyngby, January 12 - 21

1997 Senior Assessment Panel, National Science Foundation, Division of Mathematical Sciences, International Assessment of the US Mathematical Sciences, January-July, 1997, http://www.nsf.gov/pubs/1998/nsf9895/

1997 UC Visiting Scholar, UCSC Mathematics Department, Santa Cruz, CA, January-May, 1997

1997 Los Alamos National Laboratory Achievement Award

1996 Scientific Advisory Board, Isaac Newton Institute for Mathematical Sciences, research programme in THE MATHEMATICS OF ATMOSPHERE AND OCEAN DYNAMICS, Cambridge University, Cambridge, UK

1996 Plenary Speaker, SIAM Annual Meeting, Kansas City, MO

1995 Participant, Isaac Newton Institute for Mathematical Sciences, research programme in LOW DIMENSIONAL BEHAVIOR OF PDEs, Cambridge University, Cambridge, UK

1991 Theoretical Design Team Participant, Joint Verification Experiment for US/Soviet Threshhold Testban Treaty

1988–present, Laboratory Fellow, Los Alamos National Laboratory

1986–1994 Founding Editor, *Physics Letters A*, Nonlinear Science Section

1984 National Award of Excellence for Significant Contribution to the Nuclear Weapons Program

1984 Los Alamos National Laboratory, Distinguished Performance Award

1981–present, Executive Committee for Los Alamos Center for Nonlinear Studies

1967–1971 Danforth Fellow, University of Michigan

Major Conferences Organized:

Co-Organizer, CNLS Workshop, "Turbulence," held August 2004, at Bishops Lodge Resort, Santa Fe, NM.

Co-Organizer, CNLS Workshop, "Statistical Hydrodynamics," held March 2002, at Santa Fe, NM.

Co-Organizer, NSF Workshop, "Frontiers of Mathematics in Geosciences" held March 5-7, 2001, at IMA, U Minnesota.[2]

Co-organizer, CNLS/ONR 1998 Conference, "Singularities in Nonlinear Physics, Mathematics and Engineering," held January 4-6, 1998, in Santa Fe, NM.

1997 Co-chair, SIAM Workshop on Bioremediation and Porous/Fracture Flow, held Summer 1997 at Los Alamos, NM.

Co-chair, CNLS 1995 Conference on Nonlinear Phenomena in Ocean Dynamics

Co-chair, NEEDS '94 Conference on Nonlinear Evolution Equations and Dynamical Systems

Co-chair, CNLS 1993 Conference on Forces of Nature

Co-chair, CNLS 1988 Conference on Advances in Fluid Turbulence

Co-chair, University of California 1986 Summer School in Nonlinear Science

Co-chair, AMS-SIAM 1984 Summer Seminar on Systems of Nonlinear PDEs, held at College of Santa Fe

[2]For details about this program, including description, schedule, titles and abstracts, online copies of presentations, and participant lists, see:
http://www.ima.umn.edu/multimedia/winter/frontier.html

Chair, CNLS 1983 Conference on Fronts, Interfaces and Patterns

Co-chair, Joint Los Alamos/Limeil Conference on Hydrodynamics and Instabilities, June 28-July 2,1982

Books Authored:

Crossover-Time in Quantum Boson and Spin Systems with G.P. Berman and E.N. Bulgakov, Lecture Notes in Physics, Vol. **m21**, Springer-Verlag ISBN 3-540-58011-5 (1994).

Hamiltonian Structure and Lyapunov Stability for Ideal Continuum Dynamics with J.E. Marsden and T.S. Ratiu, University of Montreal Press, ISBN 2-7606-0771-2 (1987).

Books and Journal Volumes Edited:

Advisor, *Series in Applied Mathematical Sciences*, Springer-Verlag, New York

Nonlinear Phenomena in Ocean Dynamics, with R. C. Malone, L. G. Margolin and R. Smith, *Physica D*, **98** (1996) 229 – 600.

Nonlinear Evolution Equations & Dynamical Systems, NEEDS '94, International Workshop Proceedings, with A. R. Bishop and V. G. Makhankov, World Scientific, Singapore (1995).

Proceedings of the Conference on Numerical Methods in High Temperature Physics, with R.E. Alcouffe and P.J. O'Rourke, LA-11342-C, Los Alamos National Laboratory (1988).

Advances in Fluid Turbulence, with G. Doolen, R. Ecke, and V. Steinberg, *Physica D*, **37** (1989) 1 – 564.

Nonlinear Systems of Partial Differential Equations in Applied Mathematics, with J.M. Hyman and B. Nicolaenko, Lectures in Applied Mathematics, Volume 23–Parts 1 and 2, AMS, Providence (1986).

Proceedings of the Joint Los Alamos/Limeil Conference on Hydrodynamics and Instabilities, June 28-July 2,1982, Los Alamos National Laboratory LAUR (1983).

SCIENTIFIC JOURNAL EDITORSHIP:

Physics Letters A, Nonlinear Science section, March 1986 – February 1994
(Founding Editor)

SIAM Journal of Applied Dynamical Systems
Associate Editor, March 2001 – present
http://epubs.siam.org/sam-bin/dbq/toclist/SIADS

Dynamics of PDE
Associate Editor, October 2004 – present
http://www.intlpress.com/PDE

UNITED STATES PATENT # 6,157,762:
Nonlinear pulse reshaping for fiber transmission systems.

Granted December 5, 2000.

USP# 6,157,762 patents the idea of using nonlinear amplifying loop mirrors (NALMs) to stabilize, shape and regenerate optical pulses in fibers at high bit rates. The idea treats the pulse propagation and re-amplication process as an **iterated mapping**. See I. Gabitov, D. D. Holm, B. Luce and A. Mattheus, *Optics Lett.* **20** (1995) 2490-2492.

Our invention is the use of certain nonlinear optical devices (NALMs) to reshape and recover optical pulses which have suffered distortions during propagation in an optical fiber due to chromatic dispersion, energy losses, and other effects. Our device, which we name a Nonlinear Pulse Reshaping Device (NPRD), is specifically designed to minimize the differences between the amplitude and phase of input and output pulses. This causes the reshaping or recovery of optical pulses which have suffered distortion during propagation in an optical fiber that restores them into a form which is very similiar in terms of amplitude and phase profiles to the pulses initially launched into the fiber.

To show that such a device can be built and is practical to operate, we wrote the scientific article entitled "Recovery of solitons with nonlinear amplifying loop mirrors," published in 1995 by Ildar Gabitov, Darryl Holm, Benjamin Luce, and Arnold Mattheus. This article is a theoretical analysis of the use of Nonlinear Amplifying Loop Mirrors (NALM's) to recover optical pulses.

Refereed Publications in the Last 25 Years

8 Papers Submitted and Still Under Review in 2005.

"Hasimoto Transformation and Vortex Soliton Motion
Driven by Fluid Helicity."
With S. N. Stechmann.
Submitted to *J Nonlin Sci.*
http://arxiv.org/abs/nlin.SI/0409040

"Elliptic instability in the Lagrangian averaged
Euler-Boussinesq alpha equations
With B. R. Fabijonas,
Submitted to *Phys. Fluids* September 4, 2004.
http://arxiv.org/abs/nlin.CD/0410006

"On the Clark$-\alpha$ model of turbulence:
its global regularity and long–time dynamics."
With C. Cao and E. S. Titi.
Submitted to *J. of Turbulence.*
http://arxiv.org/abs/nlin.CD/0412007

"Reduced singular solutions of EPDiff equations on manifolds with symmetry."
With J. Munn and S. N. Stechmann,
Submitted to *Nonlinearity* August 10, 2004. Ref: NON/185557/PAP/7610
http://arxiv.org/abs/nlin.PS/0402044

"Interaction Dynamics of Singular Wave Fronts."
With M. F. Staley.
Submitted to *SIAM J. Appl. Dyn. Syst.* June 4, 2004.

"Commutator-errors in large-eddy simulation."
With B. J. Geurts.
In revision for *Phys. Fluids*

"The effect of the Coriolis force on secondary instabilities of a circular columnar vortex."
With B. R. Fabijonas,
Submitted to *Phys. Fluids* – In revision for elliptical case.

5 Papers to appear.

"Peakons."
Submitted to *Encyclopedia of Mathematical Physics*, March 2004. To appear.

"Baroclinic and shear instabilities of the two-layer quasigeostrophic alpha model."
With B. A. Wingate.
J. Phys. Ocean., to appear.

"On a Leray-α Model of Turbulence."
With A. Cheskidov, E. J. Olson and E. S. Titi.
Proc. Roy. Soc. London A: Mathematical, Physical & Engineering Sciences, to appear (03PA0266).

"Helicity Dynamics of Vortex Filaments."
With S. N. Stechmann.
To appear in *ICTAM Proceedings*, Warsaw August 2004.

"Resonant Interactions in Rotating Homogeneous Three-dimensional Turbulence."
With Q. Chen, S. Chen and G. L. Eyink.
To appear in *Phys. Fluids*
http://arxiv.org/abs/nlin.CD/0404055

Published 2005.

"A class of equations with peakon and pulson solutions (with an Appendix by Harry Braden and John Byatt-Smith)."
With A. N. W. Hone.
J. of Nonlin. Math. Phys. **12**, Supplement 1 (2005), 1-15.
(Special refereed issue in honor of Francesco Calogero's 70th Birthday.)
http://arxiv.org/abs/nlin.SI/0412029

"The LANS$-\alpha$ Model for Computing Turbulence:

Origins, Results, and Open Problems."
With C. Jeffery, S. Kurien, D. Livescu, M. A. Taylor and B. A. Wingate.
Los Alamos Science **29** (2005) 152-171.

"Taylor's Hypothesis, Hamilton's Principle, and the LANS$-\alpha$ Model for Computing Turbulence."
Los Alamos Science **29** (2005) 172-180.

Published 2004.

"Momentum maps and measure valued solutions (peakons, filaments, and sheets) of the Euler-Poincare equations for the diffeomorphism group."
With J. E. Marsden.
In The Breadth of Symplectic and Poisson Geometry, (Marsden, J. E. and T. S. Ratiu, eds) Birkhäuser Boston, to appear (2004).
http://arxiv.org/abs/nlin.CD/0312048

"Soliton Dynamics in Computational Anatomy."
With J. T. Rananather, L. Younes and A. Trouvé.
NeuroImage **23**, S170-178 (2004).
http://arxiv.org/abs/nlin.SI/0411014

"Rotating Concentric Circular Peakons."
With V. Putkaradze and S. N. Stechmann.
Nonlinearity **17**, 1-24 (2004).
http://arxiv.org/abs/nlin.SI/0312012

"Craik-Criminale solutions and elliptic instability in nonlinear-reactive closure models for turbulence."
With B. R. Fabijonas,
Phys. Fluids **16** (2004) 853-866.

"Multi-frequency Craik-Criminale solutions of the Navier-Stokes equations."
With B. R. Fabijonas,
J. Fluid Mech. **506** (2004) 207-215.

"Euler-Poincaré formulation and elliptic instability for nth-gradient fluids."
With B. R. Fabijonas.
J. Phys. A: Math. Gen. **37** (2004) 7609-7623.
http://arxiv.org/abs/nlin.CD/0405051

"The CO_2 molecule as a quantum realization of the 1:1:2 resonant swing-

spring with monodromy."
With R. H. Cushman, H. R. Dullin, A. Giacobbe, M. Joyeux, P. Lynch, D. A. Sadovskiĭ and B. I. Zhilinskiĭ
Phys. Rev. Lett., **93** (2004) 024302-5.

This four page paper received a two page review in Ian Stewart, *Nature* **430** (2004) 731-732

"Traveling Wave Solutions for a Class of One-Dimensional Nonlinear Shallow Water Wave Models."
With Chongsheng Cao and Edriss S. Titi.
Journal of Dynamics and Differential Equations, **16** (2004) 167-178.

"Nonlinear Regularization for Large-Eddy Simulation."
With B. J. Geurts.
In *Direct and Large-Eddy Simulation V, Proceedings of DLES5, Münich, August 27-29, 2003*, Edited by R. Friedrich, B. J. Geurts and O. Métais. Kluwer Academic Publishers, 2004, pp 5-14.

"On asymptotically equivalent shallow water wave equations."
With H. R. Dullin and G. A. Gottwald.
Physica D **190** (2004) 1-14.

Published 2003.

"Modeling Mesoscale Turbulence in the Barotropic Double Gyre Circulation."
With Balu Nadiga.
J. Phys. Ocean. **33** 2355–2365 (2003).

"Wave Structures and Nonlinear Balances in a Family of Evolutionary PDEs."
With M. F. Staley.
SIAM J. Appl. Dyn. Syst. **2** (3) 323-380 (2003).

"Nonintegrability of a fifth-order equation with integrable two-body dynamics."
With A. N. W. Hone.
Theoretical and Mathematical Physics, **137** (1): 1457-1469 (2003).

"Boundary Effects on Exact Solutions of the Lagrangian-Averaged NavierStokes-α Equations."
With V. Poutkaradze, P. D. Weidman and B. A. Wingate.

J. Stat. Phys. **113** (2003) 841-854.

"Camassa-Holm, Korteweg-de Vries-5 and other asymptotically equivalent equations for shallow water waves."
With H. R. Dullin and G. A. Gottwald.
Fluid Dyn. Res. **33** (2003) 7395.

"Intermittency in the joint cascade of energy and helicity."
With Q. Chen, S. Chen and G. I. Eyink.
Phys. Rev Lett. **90** (2003) 214503-1-4.

"Mean effects of turbulence on elliptic instability in fluids."
With B. R. Fabijonas,
Phys. Rev. Lett. **90** (12) (2003) 1245001-1-4.

"Regularization modeling for large-eddy simulation."
With B. J. Geurts.
Phys. Fluids **15**, L13-L16 (2003).

"Nonlinear balance and exchange of stability in dynamics of solitons, peakons, ramps/cliffs and leftons in a 1+1 nonlinear evolutionary pde."
With M. F. Staley.
Phys. Lett. A **308**, 437-444 (2003).

"Integrable and nonintegrable equations with peakons."
With A. Degasperis and A. N. W. Hone,
Nonlinear Physics: Theory and Experiment (Gallipoli 2002) Vol II, ed. M. J. Ablowitz, M. Boiti, F. Pempinelli and B. Prinari (Singapore: World Scientific) pp. 37–43 (Preprint nlin.SI/0209008) (2003).

"Rasetti-Regge Dirac Bracket Formulation of Lagrangian Dynamics of Vortex Filaments," Proceedings of IMACS Conference, Athens, GA, April 9-12, 2001. *Mathematics and Computers in Simulation* **62**, 53-63 (2003).
http://xxx.lanl.gov/abs/nlin.CD/0103041

Published 2002.

"A new integrable equation with peakon solutions."
With A. Degasperis and A. N. W. Hone,
Theoret. and Math. Phys. **133**, 1463-1474 (2002).

"Euler-Poincaré dynamics of perfect complex fluids."

In *Geometry, Mechanics, and Dynamics: in honor of the 60th birthday of Jerrold E. Marsden* edited by P. Newton, P. Holmes and A. Weinstein. Springer, pp. 113-167 (2002). http://xxx.lanl.gov/abs/nlin.CD/0103041.

"Kármán–Howarth Theorem for the Lagrangian averaged Navier-Stokes alpha (LANS$-\alpha$) model."
J. Fluid Mech., **467** (2002) 205-214.

"Averaged Lagrangians and the mean dynamical effects of fluctuations in continuum mechanics,"
Physica D **170** (2002) 253–286.

"Transient vortex events in the initial value problem for turbulence."
With R. M. Kerr.
Phys. Rev. Lett. **88** (24) (2002) 244501-1-4.

"Lagrangian averages, averaged Lagrangians, and the mean effects of fluctuations in fluid dynamics."
Chaos **12** 518-530 (2002).

"Alpha-modeling strategy for LES of turbulent mixing."
With B. J. Geurts, in *Turbulent Flow Computation*, edited by D. Drikakis and B. G. Geurts, Kluwer: London, pp. 237-278 (2002).

"Leray simulation of turbulent shear layers."
With B. J. Geurts.
In *Advances in Turbulence IX: Proceedings of the Ninth European Turbulence conference.* (Ed. J. P. Castro and P. E. Hancock) CIMNE:Barcelona, pp 337-340 (2002). ArXive:nlin.CD/0202062.

"Toward an extended-geostrophic Euler–Poincaré model for mesoscale oceanographic flow."
With J. S. Allen and P. A. Newberger.
In *Large-Scale Atmosphere-Ocean Dynamics 1: Analytical Methods and Numerical Models.* Edited by J. Norbury & I. Roulstone, Cambridge University Press: Cambridge, pp. 101–125.

"The Euler–Poincaré equations in geophysical fluid dynamics,"
With J. E. Marsden and T. S. Ratiu.
In *Large-Scale Atmosphere-Ocean Dynamics 2: Geometric Methods and Models.* Edited by J. Norbury & I. Roulstone, Cambridge University Press: Cambridge (2002) pp. 251–299.

"Stepwise Precession of the resonant swinging spring."
With Peter Lynch.
SIAM J. Applied Dyn. Syst. **1** (1) 44-64 (2002).
http://xxx.lanl.gov/abs/nlin.CD/0104038.
http://epubs.siam.org/sam-bin/dbq/article/38857

"Variational principles for Lagrangian averaged fluid dynamics,"
J. Phys. A: Math. Gen. **35** (2002) 1–10.
http://xxx.lanl.gov/abs/nlin.CD/0103043.

"The three dimensional viscous Camassa-Holm equations, and their relation to the Navier-Stokes equations and turbulence theory."
With C. Foias and E. S. Titi.
J. Dyn. and Diff. Eqns. **14** (2002) 1-35.
http://xxx.lanl.gov/abs/nlin.CD/0103039.

Published 2001.

"Variational principles, geometry and topology of Lagrangian-averaged fluid dynamics."
In *An Introduction to the Geometry and Topology of Fluid Flows*, R. L. Ricca, Ed. Kluwer Academic Publishers, The Netherlands (2001) pp. 271-291.

"An integrable shallow water equation with linear and nonlinear dispersion."
With Holger R. Dullin and Georg Gottwald.
Phys. Rev. Lett., **87**, no.19, (2001) 194501-04.
http://xxx.lanl.gov/abs/nlin.CD/0104004.

"The Complex Geometry of Piecewise Solutions of Integrable Nonlinear PDE's of Shallow Water and Dym Type."
With M. S. Alber, R. Camassa, Y. N. Fedorov and J. E. Marsden.
Commun. Math. Phys. **221** (2001) 197-227.

"Introduction to HVBK dynamics."
In *Quantized Vortex Dynamics and Superfluid Turbulence.* Edited by C.F. Barenghi, R.J. Donnelly and W.F. Vinen, Lecture Notes in Physics, volume 571, Springer-Verlag, 2001, pp. 114-130.
http://xxx.lanl.gov/abs/nlin.CD/0103040.

"The Navier-Stokes-alpha model of fluid turbulence."

With C. Foias and E. S. Titi.
Physica D **152** (2001) 505-519.
http://xxx.lanl.gov/abs/nlin.CD/0103037.

"Navier-Stokes-alpha model: LES equations with nonlinear dispersion."
With J. A. Domaradzki.
In *Modern Simulation Strategies for Turbulent Flow*, B. J. Geurts, Editor. (R.T. Edwards, Inc.: Flourtown, PA, USA 2001) pp 107-122.
http://xxx.lanl.gov/abs/nlin.CD/0103036.

"Navier-Stokes-alpha model: LES equations with nonlinear dispersion."
With J. A. Domaradzki.
Special LES volume of *ERCOFTAC Bulletin*, **48** March (2001) 22-25.

"Integrable vs nonintegrable geodesic soliton behavior,"
With O. Fringer,
Physica D **150** (2001) 237-263.
http://xxx.lanl.gov/abs/solv-int/9903007.

Published 2000.

"An optimal control formulation for inviscid incompressible ideal fluid flow."
With A. M. Bloch, P. E. Crouch and J. E. Marsden.
Proc. of the 39th IEEEE Conference on Decision and Control, Sydney, Australia, December 2000. *Proc. CDC* **39** (2000) 1273-1279.
http://xxx.lanl.gov/abs/nlin.CD/0103042.

Published 1999.

"Alpha models for 3D Eulerian mean fluid circulation," *Nuovo Cimento C* **22** (1999) 857-866.

"On Billiard Solutions of Nonlinear PDE's," with M. S. Alber, R. Camassa, Y. N. Fedorov and J. E. Marsden, *Phys. Lett. A* **264** (1999) 171-178.

"The Camassa-Holm equations and turbulence in pipes and channels," with S. Y. Chen, C. Foias, E.J. Olson, E.S. Titi and S. Wynne, *Physica D*, **133** (1999) 49-65.

"Direct numerical simulations of the Navier-Stokes alpha model," with S. Y. Chen, L. G. Margolin and R. Zhang, *Physica D*, **133** (1999) 66-83.(LA-UR-99-185), http://xxx.lanl.gov/abs/chao-dyn/9902015.

"Fluctuation effects on 3D Lagrangian mean and Eulerian mean fluid motion," *Physica D*, **133** (1999) 215-269.(LAUR # 99-182) http://xxx.lanl.gov/abs/chao-dyn/9903034.

H. Cendra, D.D. Holm, J. E. Marsden and T. S. Ratiu [1998], Lagrangian Reduction, the Euler–Poincaré Equations, and Semidirect Products. *Arnol'd Festschrift Volume II*, **186** Am. Math. Soc. Translations Series 2, (1999) 1-25, http://xxx.lanl.gov/abs/chao-dyn/9906004.

D.D. Holm, S. Kouranbaeva, J.E. Marsden, T. Ratiu and S. Shkoller [1998], A nonlinear analysis of the averaged Euler equations. *Arnol'd Festschrift Volume II*, **186** Am. Math. Soc. Translations Series 2, http://xxx.lanl.gov/abs/chao-dyn/9903036.

"A connection between the Camassa-Holm equations and turbulence in pipes and channels," with S. Chen, C. Foias, E.J. Olson, E.S. Titi and S. Wynne, *Phys. Fluids*, **11** (1999) 2343-2353, http://xxx.lanl.gov/abs/chao-dyn/9903033.

"Variational methods and nonlinear quasigeostrophic waves," with Jinqiao Duan and Kaitai Li *Phys. Fluids*, **11** (1999) 875-879.

Published 1998.

"The Camassa-Holm equations as a closure model for turbulent channel and pipe flows," with S. Chen, C. Foias, E.J. Olson, E.S. Titi and S. Wynne, *Phys. Rev. Lett.*, **81** (1998) 5338-5341, http://xxx.lanl.gov/abs/chao-dyn/9804026.

"The Euler–Poincaré equations and semidirect products with applications to continuum theories," with J. E. Marsden and T. S. Ratiu, *Adv. in Math.*, **137** (1998) 1-81, http://xxx.lanl.gov/abs/chao-dyn/9801015.

"Euler–Poincaré models of ideal fluids with nonlinear dispersion," with J. E. Marsden and T. S. Ratiu, *Phys. Rev. Lett.*, **80** (1998) 4173-4177.

"Hamilton's principle for quasigeostrophic motion," with Vladimir Zeitlin, LANL Report LA-UR-97-2205, *Phys. Fluids*, **10** (1998) 800-806, http://xxx.lanl.gov/abs/chao-dyn/9801018.

"The Maxwell-Vlasov equations in Euler-Poincaré form," with H. Cendra, M. J. W. Hoyle and J. E. Marsden, *J. Math. Phys.*, **39** (1998) 3138-3157, http://xxx.lanl.gov/abs/chao-dyn/9801016.

Published 1997.

"Long-time shallow-water equations with a varying bottom," with R. Camassa and C.D. Levermore, *J. Fluid Mech.*, **349** (1997) 173-189.

"Low-noise picosecond soliton transmission using concatenated nonlinear amplifying loop mirrors," with I. Gabitov, B. P. Luce and A. Mattheus, *J. Opt. Soc. Am. B*, **14** (1997) 1850-1855. LAUR-96-1352

"A Note on Kelvin Waves in Balance Models," with J. S. Allen and P. R. Gent, *J. Phys. Ocean.* **27** (1997) 2060-2063. LAUR-96-4475.

"Homoclinic Orbits and Chaos in a Second-Harmonic Generating Optical Cavity," with A. Aceves, G. Kovačič and I. Timofeyev *Phys. Lett. A* **233** (1997) 203-208.

"Secondary instabilities of flows with elliptic streamlines," with B. R. Fabijonas and A. Lifschitz, *Phys. Rev. Lett.* **78** (1997) 1900-1903.

Published 1996.

"Extended-geostrophic Hamiltonian models for rotating shallow water motion," with J. S. Allen, *Physica D*, **98** (1996) 229-248.

"Long-Time Effects of Bottom Topography in Shallow Water," with R. Camassa and C.D. Levermore, *Physica D*, **98** (1996) 258-286.

"Self-consistent wave-mean flow interaction dynamics and its Hamiltonian formulation for a rotating stratified incompressible fluid," with I. Gjaja. *Physica D*, **98** (1996) 343-378.

"Hamiltonian Balance Equations," *Physica D*, **98** (1996) 379-414.

"The Ideal Craik-Leibovich Equations," *Physica D*, **98** (1996) 415-441.

"Three-dimensional Stability of Elliptical Vortex Columns in External Strain Flows," with B.J. Bayly and A. Lifschitz, *Trans. Roy. Soc. London*, **354** (1996) 895-926.

"Homoclinic orbits in the Maxwell-Bloch equations with a probe," with G. Kovacic and T.A. Wettergren, *Phys. Rev. E*, **54** (1996) 243-256.

Published 1995.

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