

# Evangelos Siminos

## *curriculum vitae*

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### EDUCATION

- 2009 **PhD in Physics**, Georgia Institute of Technology, Atlanta, GA, USA  
adviser: Prof. P. Cvitanović
- 2005 **MS in Physics**, Georgia Institute of Technology, Atlanta, GA, USA
- 2003 **BS in Physics**, University of Thessaloniki, Thessaloniki, Greece
- FALL 2001 **Exchange Student**, Max Planck Institut für Plasmaphysik, Greifswald, Germany

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### EMPLOYMENT

- 2011 – NOW **Guest Scientist (postdoc)**, Max Planck Institute for the Physics of Complex Systems  
Dresden, Germany
- 2009 – 2011 **Postdoctoral Fellow**, Commissariat à l'Énergie Atomique (CEA), DAM, DIF  
Arpajon (Paris area), France
- 2008 – 2009 **Research Assistant**, Center for Nonlinear Science, School of Physics, Georgia Tech  
Atlanta, GA, USA  
support: NSF grant DMS-0807574 & G. Robinson Fund
- 2003 – 2008 **Teaching Assistant**, School of Physics, Georgia Tech

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### RESEARCH EXPERIENCE

- 2011 – NOW **Max Planck Inst. for the Physics of Complex Systems**, Germany  
*Ultra-intense laser pulse propagation in solid density targets*
- ADVISER Prof. S. Skupin
- AREA Relativistic optics
- TOOLS Maxwell-Vlasov (Particle-in-Cell) codes, relativistic cold fluid-plasma theory
- MAIN RESULTS Connection of phase-space topology of a simple dynamical system to self-induced transparency  
threshold for relativistic intensity pulses interacting with overdense plasmas
- IN PROGRESS Time-dependent separatrices for electron motion
- 2009 – 2011 **Dép. Physique Théorique et Appliquée**, CEA, DAM, DIF, France
- PROJECT I *Kinetic Description of Stimulated Raman Scattering*
- ADVISER D. Bénisti
- AREA Basic plasma physics, inertial confinement fusion, nonlinear dynamics
- TOOLS Plasma kinetic theory, Galerkin projection methods, spectral deformation, sparse eigenproblems,  
Vlasov codes

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| MAIN RESULTS   | A fast converging semi-analytic method for the computation of stability of nonlinear Vlasov-Poisson waves. Application to vortex fusion instabilities of electrostatic plasma waves.   |
| IN PROGRESS    | Application to the modeling and control of stimulated Raman scattering   |
| PROJECT II     | <i>Relativistic Solitary Waves in Plasmas</i>  |
| WITH           | G. Sánchez-Arriaga, E. Lefebvre  |
| AREA           | Relativistic intensity laser-plasma interaction  |
| TOOLS          | Plasma-fluid models, Hamiltonian dynamical systems, spectral methods   |
| MAIN RESULTS   | Identification and classification of new families of solitary waves  |
| 2004 – 2009    | <b>Center for Nonlinear Science</b> , School of Physics, Georgia Tech, USA   |
| PHD THESIS     | <i>Recurrent Spatio-temporal Structures in Presence of Continuous Symmetries</i>   |
| ADVISER        | Prof. P. Cvitanović  |
| AREA           | Spatially extended systems, chaos and turbulence   |
| TOOLS          | Dynamical systems theory, symmetry reduction, state-space visualization, numerical integration of stiff partial differential equations, periodic orbit searches  |
| MAIN RESULTS   | Efficient continuous symmetry reduction methods for systems with a high-dimensional state space. Geometric description of symmetry reduced Kuramoto-Sivashinsky and complex Lorenz attractors in terms of the unstable manifolds of traveling waves. |
| 2002 – 2003    | <b>Department of Physics</b> , University of Thessaloniki, Greece  |
| DIPLOMA THESIS | <i>Lattice-gas modeling of anomalous diffusion</i>   |
| ADVISER        | Prof. L. Vlahos  |
| DESCRIPTION    | Numerical study of anomalous diffusion of passive tracers in a turbulent environment modeled by a lattice-gas cellular automaton   |
| FALL 2001      | <b>Max Planck Institut für Plasmaphysik</b> , Greifswald, Germany  |
| PROJECT        | <i>Asymptotic study of toroidal and helical MHD equilibria of magnetic confinement devices</i>   |
| ADVISER        | Prof. J. Nührenberg  |
| DESCRIPTION    | Perturbative study of the effect of magnetic field geometry in steady-state confinement properties of tokamaks and stellarators  |

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## Teaching Experience

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| FALL 2008   | <b>Symmetry in dynamical systems</b> , School of Physics, Georgia Tech, USA<br>Series of three lectures for the advanced graduate course <i>Nonlinear Dynamics</i> (PHYS 7224) |
| 2003–2008   | <b>Teaching Assistant</b> , School of Physics, Georgia Tech, USA   |
| COURSES     | Undergraduate Physics I & II, Physics Laboratory I & II, Classical Mechanics I & II, Electromagnetism, Special Relativity, Quantum Mechanics I                                 |
| DUTIES      | Lab sessions, recitation sessions, office hours, preparation and grading of homework & exams   |
| 1999–2000   | <b>Teaching Assistant</b> , Department of Physics, University of Thessaloniki, Greece  |
| FALL 1999   | Lab assistant for Introductory Computer Lab  |
| SPRING 2000 | Grader for course Calculus II  |

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## FELLOWSHIPS

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| 2007 | Gerondelis Foundation Graduate Student Fellowship, USA |
| 2001 | Erasmus Fellowship, European Union                     |

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## COMPUTER SKILLS

programming C/C++, Fortran, Python  
markup  $\text{\LaTeX}$ , HTML

libraries PETSc, matplotlib, channelflow  
other Mathematica, Matlab

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## OTHER ACTIVITIES

2008 Organized informal seminar for Center for Nonlinear Science, Georgia Tech.  
FALL 2008 Advised student Dominic Kohler in his project “Armbruster-Guckenheimer-Holmes flow” for graduate level course “Nonlinear Dynamics”

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## SEMINAR TALKS

March 2011 ETH Zurich, Department of Materials  
*Stability of nonlinear waves in collisionless plasmas*  
May 2011 Max Planck Inst. for the Physics of Complex Systems, Dresden  
*Stability of nonlinear waves in collisionless plasmas*

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## RECENT AND FORTHCOMING CONFERENCES

Sept. 2012 Dynamics Days Europe, Gothenbourg, Sweden  
talk **E. Siminos** and P. Cvitanović, *Continuous symmetry reduction in high-dimensional flows with the method of slices*  
July 2012 EPS Conference on Plasma Physics, Stockholm, Sweden  
poster **E. Siminos**, M. Grech, S. Skupin, T. Schlegel, and V. T. Tikhonchuk, *Electron heating effect on self-induced-transparency threshold in ultra-intense laser pulse interaction with overdense plasmas*  
June 2011 EPS Conference on Plasma Physics, Strasbourg, France  
poster **E. Siminos**, D. Bénisti and L. Gremillet, *A spectral method for the stability of BGK modes and application to vortex-fusion instabilities*  
May 2011 Chaos, Complexity and Transport, Marseilles, France  
talk **E. Siminos**, D. Bénisti and L. Gremillet, *A spectral method for the stability of nonlinear Vlasov-Poisson equilibria*  
Nov. 2010 Annual Meeting of the APS Division of Plasma Physics, Chicago, IL, USA  
talk **E. Siminos**, D. Bénisti and L. Gremillet, *Stability of nonlinear Vlasov-Poisson equilibria through spectral deformation and Fourier-Hermite expansion*  
Sept. 2010 International Workshop on Laser-Matter Interaction, Porquerolles, France  
poster **E. Siminos**, D. Bénisti and L. Gremillet, *Stability of nonlinear Vlasov-Poisson equilibria through Fourier-Hermite expansion*  
June 2009 Modern Challenges in Nonlinear Plasma Physics, Sani, Halkidiki, Greece  
poster **E. Siminos**, P. Cvitanović and R. L. Davidchack, *State-space geometry of a continuous symmetry reduced Kuramoto-Sivashinsky flow*  
May 2009 SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, USA  
talk **E. Siminos**, P. Cvitanović and R. L. Davidchack, *State-space geometry of a Kuramoto-Sivashinsky flow in terms of relative periodic orbits*  
in Minisymposium: *Dynamical systems and turbulence: unstable periodic orbits*

Jan. 2009 Dynamics Days, San Diego, CA, USA  
poster **E. Siminos** and P. Cvitanović, *Continuous symmetry reduction for high dimensional flows*

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## PUBLICATIONS

### In preparation

**E. Siminos**, M. Grech, S. Skupin, T. Schlegel, and V.T. Tikhonchuk, *When does an ultra-intense laser pulse propagate in a plasma?*, in preparation (2012)

### Submitted

P. Cvitanović, D. Borrero-Echeverry, K. M. Carroll, B. Robbins, **E. Siminos** and L. Zhang, *Cartography of high-dimensional flows: A visual guide to sections and slices*, submitted to Chaos (2012)

### Journal Articles

- [DOI] [PDF] [8] G. Sánchez-Arriaga, **E. Siminos** and E. Lefebvre, *Relativistic solitary waves with phase modulation embedded in long laser pulses in plasmas*, Phys. Plasmas **18** 082304 (2011)
- [DOI] [PDF] [7] **E. Siminos**, D. Bénisti and L. Gremillet, *Stability of nonlinear Vlasov-Poisson equilibria through spectral deformation and Fourier-Hermite expansion*, Phys. Rev. E **83** 056402 (2011)
- [DOI] [PDF] [6] G. Sánchez-Arriaga, **E. Siminos** and E. Lefebvre, *Relativistic solitary waves modulating long laser pulses in plasmas*, Plasma Phys. Contr. Fusion **53**, 045011 (2011)
- [DOI] [PDF] [5] D. Bénisti, O. Morice, L. Gremillet, **E. Siminos** and D. J. Strozzi, *Self-organization and threshold of stimulated Raman scattering*, Phys. Rev. Lett. **105**, 015001 (2010)
- [DOI] [PDF] [4] D. Bénisti, O. Morice, L. Gremillet, **E. Siminos** and D. J. Strozzi, *Nonlinear group velocity of an electron plasma wave*, Phys. Plasmas **17**, 082301 (2010)
- [DOI] [PDF] [3] D. Bénisti, O. Morice, L. Gremillet, **E. Siminos** and D. J. Strozzi, *Nonlinear kinetic description of Raman growth using an envelope code, and comparisons with Vlasov simulations*, Phys. Plasmas **17**, 102311 (2010)
- [DOI] [PDF] [2] **E. Siminos** and P. Cvitanović, *Continuous symmetry reduction and return maps for high-dimensional flows*, Physica D **240**, 187–198 (2011)
- [DOI] [PDF] [1] P. Cvitanović, R. L. Davidchack and **E. Siminos**, *On the state space geometry of the Kuramoto-Sivashinsky flow in a periodic domain*, SIAM J. Appl. Dyn. Syst. **9**, 1 (2010)

### Thesis

- [HTML][PDF] **E. Siminos**, Recurrent spatio-temporal structures in presence of continuous symmetries, PhD Thesis, School of Physics, Georgia Institute of Technology, Atlanta, GA, USA, May 2009