

Andrey Ovsyannikov, Ph.D.

1 Cyclotron Road, ◊ Berkeley, CA 94720, USA

(+1) 650-704-8895 ◊ aovsyannikov@lbl.gov

Website: www.nersc.gov/about/nersc-staff/nesap-postdocs/andrey-ovsyannikov

EDUCATION

- 2010-2013 **Ph.D.** in Fluid Mechanics, Ecole Centrale de Lyon, France (with Great Distinction). Thesis title: *“Further Development of Level Set Method: Modified Equation and Its Numerical Assessment”*. Advisor: Prof. Mikhael Gorokhovski
- 2007-2009 **M.Sc.** in Applied Mathematics and Informatics, Novosibirsk State University, Russia (GPA 5.0/5.0). Thesis title: *“Numerical Investigation of Interaction of Small Flow Disturbances with a Shock Wave”*. Advisor: Dr. Alexey N. Kudryavtsev
- 2003-2007 **B.Sc.** in Applied Mathematics and Informatics, Novosibirsk State University, Russia (GPA 5.0/5.0)

RESEARCH INTERESTS

High performance computing, parallel programming, computational fluid dynamics, fluid mechanics, numerical analysis, level-set methods, multiphase flows, turbulence, parallel I/O.

TECHNICAL STRENGTHS

Programming	Fortran, C, C++, Python, shell scripting, MATLAB
Parallel programming	MPI, OpenMP
Profiling & Debugging Tools	Intel® tools (Inspector, Vtune, Advisor, SDE), CrayPat, MAP, Darshan, DDT, Totalview, gdb
Parallel I/O:	HDF5, MPI I/O, Cray DataWarp API
Visualization	VisIt, Paraview, Tecplot, Gnuplot
Other Software & Tools	COMSOL, ANSYS Fluent, MS Visual Studio, L ^A T _E X, MS Office

WORK EXPERIENCE

National Energy Research Scientific Computing Center (NERSC), Lawrence Berkeley National Laboratory July 2015 - Current
Postdoctoral fellow

- NESAP Project (NERSC Exascale Science Applications Program) : Performance optimization and porting the Berkeley Lab subsurface science code “Chombo-Crunch” (selected winner for Department of Energy’s **Exascale Computing Project**) to manycore architecture (Intel Xeon Phi “KNL” on NERSC’s “Cori” Cray XC40 system). Achieved **2x** of performance speed-up for full application code.
- Project in the framework of Burst Buffer Early User Program: Testing I/O performance of state-of-the-art NVRAM-based Cray DataWarp Burst Buffer under production requirement of Chombo-Crunch application. Development and testing of asynchronous coupled simulation/visualization workflow for processing large data sets (hundreds terabytes) on-the-fly. Running comparison test case studies between Burst Buffer and traditional parallel file system (Cray Sonexion Lustre). Achieved from **3x** to **5x** reduction of I/O time due to utilizing non-volatile memory of Burst Buffer.

Center for Turbulence Research, Stanford University

October 2013 - January 2015

Postdoctoral fellow

- Conducting large scale simulations of two-phase liquid-gas flows. Numerical study of air entrainment and bubble generation in wall-bounded turbulent flows using volume-of-fluid DNS code (project funded by Office of Naval Research, Department of Defense).
- Development of post-processing tools (coded in C++) for analysis of turbulent statistics.
- Presenting the research results on high-impact scientific conferences (APS 67th Annual Meeting, Division of Fluid Dynamics; 30th Symposium on Naval Hydrodynamics). Preparation of manuscript for journal publication.

Ecole Centrale de Lyon, LMFA, France

February 2010 - June 2013

Research assistant

- Development and verification analysis of the level-set code (Fortran 90 and C) for numerical solution of partial differential equations of two-phase flow. Application studies include: flow of 2 immiscible Newtonian liquids (Rayleigh-Taylor instability); atomization phenomenon; fuel flows in combustion chambers of diesel engines.
- Presenting the research results on high-impact international conferences (ECCOMAS2012, ICLASS2012, Stanford CTR Summer Program 2012)

Laboratory of Computational Aerodynamics, Khristianovich Institute of Theoretical and Applied Mechanics, Russia

September 2007 - December 2009

Undergraduate researcher

- Analysis of shock-capturing schemes for accurate simulation of flows with shock wave/acoustic waves interactions
- Development of in-house parallel code (Fortran 90) based on high-order WENO and compact finite-difference schemes for numerical simulation of compressible flows

PROFESSIONAL SERVICE AND ACTIVITIES

Referee of publications

Supercomputing Conference (Tutorials)

Journal of Computational Physics

International Journal for Numerical Methods in Fluids

Annual Research Briefs, Stanford University, Center for Turbulence Research

Memberships

American Physical Society

Association for Computing Machinery

HONORS AND AWARDS

- Best Paper Award. Cray User Group Meeting 2016, London, UK
- CTR Postdoctoral Fellowship, Stanford University, 2013
- Invited Participant, Center for Turbulence Research Summer Program, Stanford University, 2012
- Medal of the Ministry of Education and Science of the Russian Federation “For the best scientific student work”, 2009

- Academician Nikolai N. Yanenko Award of the Department of Mathematics and Mechanics, Novosibirsk State University, 2009
- The Schlumberger Scholarship Award for the Academic Year 2008-2009
- The Schlumberger Scholarship Award for the Academic Year 2007-2008
- Award for the best talk on XLVII International Students Scientific Conference, Novosibirsk, 2009

PEER-REVIEWED ARTICLES

1. B. Van Straalen, **A. Ovsyannikov**, D. Trebotich, D.T. Graves, “Scalable Structured Adaptive Mesh Refinement with Complex Geometry”. Submitted.
2. **A. Ovsyannikov**, M. Romanus, B. Van Straalen, G. H. Weber, D. Trebotich 2016 ”Scientific Workflows at DataWarp-Speed: Accelerated Data-Intensive Science using NERSC’s Burst Buffer”, Supercomputing Conference, PDSW-DISCS Workshop, pp. 1-6.
3. T. Barnes, B. Cook, J. Deslippe, T. Kurth, T. Koskela, M. Lobet, T. Malas, L. Oliker, **A. Ovsyannikov**, A. Sarje, J.-L. Vay, H. Vincenti, S. Williams, P. Carrier, N. Wichmann, M. Wagner, P. Kent, C. Kerr, J. Dennis 2016 “Evaluating and Optimizing the NERSC Workload on Knights Landing”. Supercomputing Conference, 7th International Workshop on Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems, pp. 43-53
4. W. Bhimji, D. Bard, M. Romanus, D. Paul, **A. Ovsyannikov**, B. Friesen, M. Bryson, J. Correa, G. K. Lockwood, V. Tsulaia, S. Byna, S. Farrell, D. Gursoy, C. Daley, V. Beckner, B. Van Straalen, N. J. Wright, K. Antypas, Prabhat, Accelerating Science with the NERSC Burst Buffer Early User Program. Cray User Group Meeting, 2016 (Best Paper Award).
5. **Ovsyannikov, A.Y.**, Kim, D., Mani, A., & Moin, P. 2014 Numerical study of turbulent two-phase Couette flow. *Annual Research Briefs*, Center for Turbulence Research, Stanford University, pp. 41-52.
6. Sabelnikov, V., **Ovsyannikov, A.Y.**, & Gorokhovski, M. 2014 Modified level set equation and its numerical assessment. *Journal of Computational Physics*, 278, pp. 1-30.
7. Khotyanovsky, D.V., Kudryavtsev, A.N., & **Ovsyannikov, A.Y.** 2014 A comparative study of accuracy of shock capturing schemes for simulation of shock/acoustic wave interactions. *International Journal of Aeroacoustics*, 13 (3) pp. 261-274.
8. Kudryavtsev, A.N., **Ovsyannikov, A.Y.** 2010 Numerical investigation of the interaction of acoustic disturbances with a shock wave. *TSAGI Science Journal*, v.41 (1), pp. 47-57.

IN PROCEEDINGS

1. Yu, T., Park, J., Moon, H., Shim, J., You, D., Kim, D., & **Ovsyannikov, A.Y.** 2014. Numerical simulation of liquid-layer breakup on a moving wall due to an impinging jet. In *Proceedings of the Summer Program*. Center for Turbulence Research, Stanford University, pp. 106-111.
2. **Ovsyannikov, A.Y.**, Kim, D., Mani, A., & Moin, P. Numerical study of bubble generation in a turbulent two-phase Couette flow. DFD14 Meeting of The American Physical Society, San-Francisco, USA, 23-25 November 2014.
3. Yu, T., Moon, H., You, D., Kim, D., & **Ovsyannikov, A.Y.** 2014. Numerical simulation of liquid-layer breakup on a moving wall due to an impinging jet. DFD14 Meeting of The American Physical Society, San-Francisco, USA, 23-25 November 2014.

4. **Ovsiyannikov, A.Y.**, Sabelnikov, V., & Gorokhovski, M. 2012 Modified level set equation and its numerical assessment. In *Proceedings of the Summer Program*. Center for Turbulence Research, Stanford University, pp. 315-324.
5. **Ovsiyannikov, A.Y.**, Gorokhovski, M., & Sabelnikov, V.A. Modified level set equation for gas-liquid interface and its numerical solution. In *Proceedings of ICLASS 2012*. Heidelberg, Germany, 2012.
6. Sabelnikov, V.A., **Ovsiyannikov, A.Y.**, & Gorokhovski, M. Modified level set equation for gas-liquid interface and its numerical solution. In *Proceedings of ECCOMAS 2012*. Vienna, Austria, 2012.
7. Kudryavtsev, A.N., Khotyanovsky, D.V., Epstein, D.B., & **Ovsiyannikov, A.Y.** Numerical simulations of interaction of shock waves with small disturbances. 18th International Shock Interaction Symposium, Rouen, France, 2008.
8. **Ovsiyannikov, A.Y.**, Kudryavtsev, A.N. Numerical investigation of interaction of shock wave with small disturbances. International Conference “Differential Equations. Function Spaces. Approximation Theory” dedicated to the 100th anniversary of the birthday of S.L. Sobolev, Novosibirsk, Russia, 2008 (in Russian).
9. **Ovsiyannikov, A.Y.**, Kudryavtsev, A.N. Numerical analysis of interaction of acoustic disturbances with shock wave. International conference “Computational experiment in aeroacoustics”, Svetlogorsk, Russia, 2008 (in Russian).
10. **Ovsiyannikov, A.Y.** Numerical investigation of interaction of shock wave with small disturbances. XLVI International Students Scientific Conference, Novosibirsk, Russia, 2008 (in Russian).
11. **Ovsiyannikov, A.Y.** On a total conservation property of finite-difference schemes for gravitational gas dynamics. XLV International Students Scientific Conference, Novosibirsk, Russia, 2007 (in Russian).

PRESENTATION/TALKS

1. Case study: Chombo-Crunch and VisIt for carbon sequestration, Supercomputing Conference, Birds of a Feather: “Burst Buffers: Early Experiences and Outlook”, November 15, 2016, Salt Lake City, UT.
2. Enabling high-performance simulation of subsurface flows with Chombo-Crunch on Intel Xeon Phi. 2016 IXPUG US Annual Meeting, September 21, 2016, Chicago, IL.
3. Science with the Burst Buffer, NERSC Data Day, August 22, 2016, Berkeley, CA.
4. Chombo-Crunch and VisIt for Carbon Sequestration and In-Transit Data Analysis Using Burst Buffers, DOE Centers of Excellence Performance Portability Meeting, April 21, 2016, Glendale, AZ.
5. Porting Chombo-Crunch to next-generation architecture. Bay Area Scientific Computing Day, December 11, 2016, Berkeley, CA.
6. Numerical simulation of turbulent two-phase flows using interface-capturing schemes. Lawrence Berkeley National Lab, February 23, 2015, Berkeley, CA.
7. Numerical simulation of flows with interfaces: modified level set equation and its numerical assessments. CTR Tea Seminar, October 25, 2013, Stanford, CA.
8. Modified level set equation for flows with interface and its numerical assessment. May 8, 2013. University of Catania, Italy.

9. Modified equation for gas-liquid interfaces and its numerical solution. December 12, 2011. Group de Recherche, Aussois, France.
10. Numerical simulation of two-phase flows based on the level-set approach. October 21, 2011. Seminar "Conservation laws and invariants" Institute of Computational Technologies, Novosibirsk, Russia.
11. Numerical simulation of two-phase flows based on the level-set approach. October 19, 2011. Seminar "Mechanics of viscous flows and turbulence" Khristianovich Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia.