

Research interests and accomplishments

Nonlinear wave theory. Asymptotic methods for differential and partial-difference equations and their applications. Theory of nonlinear wave packets and modulation instability; dynamics of solitons as classical particles; wave propagation in time-variable media and theory of group synchronism. Theory of strong solitons and kinks.

Fluid Dynamics and Oceanography. Theory and laboratory experiments on wave-turbulence interactions in a stratified fluid. A new equation for nonlinear waves in the rotating Earth ("Ostrovsky Equation"). Theory of strong internal solitons in the ocean. Deputy Head of an oceanic expedition; Dived in an autonomous apparatus up to 1620 m depth. Models of short surface wave modulation by long surface and internal waves. Theory of wind modulation by the variable sea roughness; Application to the problem of floating debris motion due to the Fukushima tsunami.

Nonlinear and Biomedical Acoustics. Nonlinear Acoustics, including wave propagation in gas bubbles, nonlinear phenomena in rock and metals. Realization of a parametric sound generator. The suggestion of a classical acoustic maser. Nonlinear theory of infrasound and magnetic sound in atmosphere and ionosphere. Modeling of acoustic radiation force action on biological tissues and microparticles. A model of oscillations in the ear's basilar membrane.

Nonlinear optics and lasers. Self-modulation and envelope solitons ("bright" and "dark" solitons) in optics (Discovery Certificate). Suggested and analyzed a spatially distributed model of a laser.

Selected publications by I. A. Ostrovsky (Out of over 350)

Books

1. K. A. Naugolnykh and L. A. Ostrovsky, *Nonlinear Wave Processes in Acoustics*, Cambridge University Press, New York, 1998, 300 p. (In Russian: Nauka, Moscow, 1990).
2. L. A. Ostrovsky and A. I. Potapov, *Modulated Waves: Theory and Applications*, Johns Hopkins Univ. Press, Baltimore-London, 1999, 370 p. (In Russian: Fizmatlit, Moscow, 2003).
3. L. A. Ostrovsky, *Asymptotic Perturbation Theory of Waves*, Imperial College Press, London, 2015, 208 p.

Lecture Notes

1. A. Ostrovsky and M. I. Rabinovich, *Nonlinear and Non-stationary waves*, Ryazan' Technol. Inst., Ruazan', USSR, 1975.
2. S. D. Vyshkind and L. A. Ostrovsky, *Electromagnetic Solitons (to the laboratory practice)*. Gorky University, Gorky, USSR, 1977.
3. V. I. Korolev, V. A. Mel'nikova, and L. A. Ostrovsky, *Oscillations in Systems with Variable Parameters*. Gorky University, 1981.
4. L. A. Ostrovsky, *Problems of Fluid Dynamics*. Gorky University, 1982.

5. L. A. Ostrovsky and A. I. Potapov, *Modulated Waves in Linear Dispersive Media*. Gorky University, 1988.

Editing books

1. L. A. Ostrovsky, Russian translation editor of: K. Lonngren. and A.Scott, editors. *Solitons in Action*, Fizmatgiz, Moscow, 1980.
2. V. A. Zverev and L. A. Ostrovsky, editors. *Nonlinear Acoustics: Theoretical and Experimental Research*. Inst. Applied Physics. Gorky, USSR, 1980.
3. A. V. Gaponov-Grekhov, S. A. Khristianovich, and L. A. Ostrovsky, editors. *Methods of Hydrophysical Research: Turbulence and Microstructure*. Inst. Applied Physics, Nizhny Novgorod, 1990.
4. L. A. Ostrovsky, editor. *English-Russian Dictionary on Geophysical Hydrodynamics*. Compiled by Yu. A. Stepanyants and N. V. Rudik. Inst. Applied Physics, Nizhny Novgorod, 1994.
5. K. A. Naugolnykh and L. A. Ostrovsky, editors. *Nonlinear Acoustics*. Amer. Inst. Phys, New York, 1994.

Selected original and review papers and book chapters since 2000

1. Perturbation theory for Rankine vortices, K. A. Gorshkov; L. A. Ostrovsky., and I. A. Soustova, *J. Fluid Mech.*, 404, 1-25 (2000).
2. Optical solitons: Perspectives and applications, M. J. Ablowitz. G. Biondini, and L. A. Ostrovsky. *Chaos*, 10(3), 471-474 (2000).
3. Perturbation theories for nonlinear waves (a review), L. A. Ostrovsky and K. A. Gorshkov. In: Christiansen P and Soerensen M. (eds.) *Nonlinear science at the dawn at the XXI century*, pp. 47–65. Elsevier, Amsterdam (2000).
4. Dynamic nonlinear elasticity in geomaterials (a review), L. A. Ostrovsky and P. A. Johnson. *Rivista Del Nuovo Cimento*, 24(7), 1-46 (2001).
5. Nonlinear dynamics of rock: hysteretic behavior, L. Ostrovsky and. P. Johnson. *Radiophysics and Quantum Electronics*, 44 (5-6) (2001).
6. Action of strong internal solitary waves on surface waves, V. V. Bakhanov and L. A. Ostrovsky. *J. Geophys.Res. Oceans*, 107 (C10) Article No: 3139 (2002).
7. Nonlinear oscillations of bubble layers, S. Karpov, A. Prosperetti, and L. Ostrovsky. *J. Acoust. Soc. Amer.*, 113, 1304-1316 (2002).
8. Collective nonlinear phenomena in ensembles of coupled acoustic monopoles, L. A. Ostrovsky, Yu. A. Kobelev, and I. A. Soustova. In *Nonlinear Acoustics at the Beginning of the 21st Century* (Proc. of ISNA-16), Ed. O. Rudenko and O. Sapozhnikov, MSU, Moscow, 2, 1051-1057 (2002).

9. On the cascade mechanism of short surface waves modulation, M. Charnotskii, K. Naugolnykh, L. Ostrovsky and A. Smirnov. *Nonlin. Proc. in Geophysics*, no. 9, 281-288 (2002).
10. Resonant acoustic Spectroscopy at low Q factors, A. V. Lebedev, L. A. Ostrovskii, A. M. Sutin, and P. Johnson, *Acoust. Physics*, 49(1), 81-87 (2003).
11. Nonlinear scattering of acoustic waves by natural and artificially generated subsurface bubble layers in the sea, L. A. Ostrovsky; A. M. Sutin; I. A. Soustova, A. Matveev, A. Potapov, and Z. Kluzek, *J. Acoust. Soc. Amer.*, 113(2), 741-749 (2003).
12. Wave processes in media with hysteretic nonlinearity, Part 1, V. E. Nazarov, A. V. Radostin, L. A. Ostrovsky, and I. A. Soustova. *Acoustical Physics*, 49(3), 344-353 (2003).
13. Wave processes in media with hysteretic nonlinearity: Part 2, V. E. Nazarov, A. V. Radostin, L. A. Ostrovsky, and I. A. Soustova. *Acoust. Physics*, 49(4), 444-448 (2003).
14. Evolution equations for strongly nonlinear internal waves, Ostrovsky, L. A. and Grue, *Phys. Fluids*, 15(10), 2934-2948 (2003).
15. Perturbation theory for kinks and its application for multisoliton interactions in hydrodynamics, K. A. Gorshkov, L. A. Ostrovsky, I. A. Soustova, V. E. and Irisov. *Phys. Rev. E*, 69(1), 016614 (2004).
16. Wave interaction in acoustic resonators with and without hysteresis, Ostrovsky, L. A. *J. Acoust. Soc. Amer.*, 116(6), 3348-3353 (2004).
17. Nonlinear acoustic spectroscopy of local defects in geomaterials, A. V. Lebedev, L. A. Ostrovskii, and A. M. Sutin. *Acoust. Physics*, 51, Suppl.1, S88-S101 (2005).
18. Lidar observation of a strongly nonlinear internal wave train in the Gulf of Alaska, J. H. Churnside and L. A. Ostrovsky. *Int. J. of Remote Sensing*, 26(1), 167-177 (2005).
19. Nonlinear acoustics in Nizhni Novgorod, L. A. Ostrovsky, S. N. Gurbatov, and I. N. Didenkulov, *Acoust. Phys.*, 51(2), 114-127 (2005).
20. Solitons in nonintegrable systems, R. H. J. Grimshaw, L. A. Ostrovsky, and D. E. Pelinovsky, *CHAOS*, 15(3) 037101 (2005).
21. Internal solitons in laboratory experiments: Comparison with theoretical models, L. A. Ostrovsky, L. A. and Stepanyants, Yu. A. *CHAOS*, 15(3), 037111 (2005).

22. Adiabatic behavior of strongly nonlinear internal waves in slope-shelf areas, V. Vlasenko, V., L. Ostrovsky, and K. Hutter. *J. Geophys. Res.*, 110, C04006 (2005).
23. Internal solitons in the ocean and their effect on underwater sound, J. R. Apel, L. A. Ostrovsky, Yu. A. Stepanyants, and J. Lynch. *J. Acoust. Soc. Amer.*, 121(2), 695-722 (2007).
24. Radiation force and shear motions in inhomogeneous media, L. Ostrovsky, A. Sutin, Yu. Il'inskii, O. Rudenko, and A. Sarvazyan. *J. Acoust. Soc. Amer.* 121(3), 1324-1331 (2007).
25. Modeling of internal waves and turbulence in the thermostratified tanks, L. A. Ostrovsky. In *Topical Aspects of Physical-Mechanical Research*. Naukova Dumka, Kiiv, Ukraine, pp.9-16 (2007).
26. The effect of a depth-dependent bubble distribution on the normal modes of internal waves: quasi-static approximation, R. H. J. Grimshaw, K. R. Khusnutdinova, and L. A. Ostrovsky. *Eur. J. Mechanics, B-Fluids*, 27(1), 24-41 (2008).
27. Ionospheric effects of ground motion: The roles of magnetic field and nonlinearity, L. A. Ostrovsky. *J. Atmospheric and Solar-Terrestrial Physics*, 70(10), 1273-1280 (2008).
28. Radiation force in nonlinear, focused beams, L. A. Ostrovsky. *J. Acoust. Soc. Amer.*, 124(3), 1404-1407 (2008).
29. What problems of nonlinear acoustics seem to be important and interesting today? L. Ostrovsky and O. Rudenko. In: *Nonlinear Acoustics: Fundamentals and Applications*. Am. Inst. of Physics. New York, pp. 9-16 (2008).
30. Historical development of acoustical parametric oscillators, M. A. Breazeale and L. A. Ostrovsky. *Ibid.*, pp. 139-142 (2008).
31. Modulation instability: The beginning, V. E. Zakharov and L. A. Ostrovsky. *Physica D – Nonlinear Phenomena*, 238(5), 540-548 (2009).
32. The problems of nonlinear acoustics which seem to be the most important and interesting today, L. A. Ostrovsky, and O. V. Rudenko. *Acoust. Phys.*, 55(6), 715-721 (2009).
33. Research on parametric arrays in Russia: Historical perspective, L. Ostrovsky. *Proc. Meetings Acoust. (POMA)*, 6, 045004 (2009).
34. Thermal footprints of whales, J. Churnside, L. Ostrovsky, and T. Veenstra. *Oceanography*, 22, 206-209 (2009).

35. Stirring and mixing of liquids using acoustic radiation force, A. Sarvazyan .and L. Ostrovsky. *J. Acoust. Soc. Am.*, 125(6) 3548-3554 (2009).
36. Structure formation in the oceanic subsurface bubble layer by an internal wave field, R. H. J Grimshaw, K. R. Khusnutdinova, L. A. Ostrovsky, and A. S. Topolnikov. *Phys. Fluids*, 22(10), 106603 (2010).
37. Dynamics of Soliton Chains: From Simple to Complex to Chaotic Motions, K. Gorshkov, L. Ostrovsky, and Yu. Stepanyants. In: *Long-range interactions, stochasticity and fractional dynamics* (Dedicated to G. M. Zaslavsky), Luo, A. and Afraimovich, V., Eds., Springer, Berlin, pp. 177-219 (2010).
38. Dynamics of strongly nonlinear kinks and solitons in a two-layer fluid, K. A. Gorshkov, L. A. Ostrovsky, and I. A. Soustova, *Stud. Appl. Math.*, 126(1), 49-73 (2011).
39. Strongly nonlinear, simple internal waves in continuously stratified shallow fluids, L. A. Ostrovsky and K. R. Helfrich. *Nonlin. Proc. Geophys.*, 18(1),91-102 (2011).
40. Study of Interaction between Intense Internal Wave Solitons in the Context of the Choi-Camassa Model, K. A. Gorshkov, L. A. Ostrovskii, I. A., Soustova, N. V. Zaitseva, and L. M. Shevts. *Izvestiya, Atm. Oceanic Phys.*, 47(3), 336-349 (2011).
41. The study of the effect of small-scale turbulence on internal gravity waves propagation in a pycnocline, O. A. Druzhinin, L. A. Ostrovsky, and S. S. Zilitinkevich. *Nonlin. Proc. Geophys.*, 20(6), 977-986 (2013).
42. A unified model of hysteresis and long-time relaxation in heterogeneous materials, A. V. Lebedev and L. A. Ostrovsky. *Acoust. Phys.*, 60(5), 555-561 (2014).
43. Concentration of microparticles and bubbles in standing waves, L. A. Ostrovsky. *J. Acoust. Soc. Amer.*, 138(6), 3607-3612 (2015).
44. Beyond the KdV: Post-explosion development, L. Ostrovsky, E. Pelinovsky, V. Shrira, and Yu. Stepanyants. *Chaos*, 25(9), 097620 (2015).
45. Dynamics of turbulence under the effect of stratification and internal waves, O. A. Druzhinin and L. A. Ostrovsky. *Nonlin. Proc. Geophys.*, 22(3), 337-348 (2015).
46. Self-synchronization in an ensemble of nonlinear oscillators, L. A. Ostrovsky, Y. V. Galperin, and E. A. Skirta. *Chaos*, 26, 063107 (2016).
47. Interaction of solitons with long waves in a rotating fluid, L. A. Ostrovsky and Yu. A. Stepanyants. *Physica D*, 333, 266-275 (2016).
48. Ionospheric effects of magneto-acoustic-gravity waves, M. Jones, L. Ostrovsky, and A. Bedard. *J. Atmospheric and Solar-Terrestrial Phys.*, 159, 7-22 (2017).

49. Dynamics and early post-tsunami evolution of floating marine debris near Fukushima Daiichi, J. Matthews, L. Ostrovsky, Y. Yoshikawa, S. Komori, and H. Tamura. *Nature Geoscience*, 10, 598-603 (2017).
50. Wind modulation by variable roughness of ocean surface, L. Ostrovsky. *Procedia IUTAM*, 26, 124-131 (2018).
51. Ultrasound-based cell sorting with microbubbles: A feasibility study. T. J. Matula, O. A. Sapozhnikov, L. A., Ostrovsky, A. A., Brayman, J., Kucewicz, B. E. MacConaghy, and D. De Raad. *J. Acoust. Soc. Amer.*, 144 (1), 41-52 (2018).
52. Non-linear ultrasonic monitoring of damage progression in disparate rocks. D. Shirole, G. Walton, L. Ostrovsky, H. Masoumi, H., and A. Hedayat. *Intern. J. of Rock Mechanics and Mining Sciences*, 11, 33-44 (2018).
53. On heating of tissues by shear waves generated by ultrasound, L. A. Ostrovsky. *J. Acoust. Soc. Amer.*, 144(5), 2962-2966 (2018).
54. Nonlinear relaxation in geomaterials: New results, L. Ostrovsky, A. Lebedev, S. Manakov, J. Riviere, P. Shokouhi, R. Guyer, M. Stuber Geesey, and P. Johnson. *Proc. of Meetings on Acoustics (POMA)*, 34, 032002 (2018).
55. Long-Time relaxation induced by dynamic forcing in geomaterials, L. Ostrovsky, A. Lebedev, J. Riviere, P. Shokouhi, C. Wu, M. A. Stuber Geesey, and P.A. Johnson. *J. Geophys. Res. Solid Earth*, 124, 5003-50013 (2019).
56. Some new aspects of the joint effect of rotation and topography on internal solitary waves, L. A. Ostrovsky and K. R. Helfrich. *J. Phys. Oceanogr.*, 49, 1639-1649 (2019).

Discovery and Invention Certificates (Russian patents)

1. L. A. Ostrovsky, The phenomenon of self-localization of modulated waves in nonlinear media. Discovery diploma no. 268, 1982, priority of 5/3/1962.
2. L. A. Ostrovsky and V. V. Papko, Parametric generator of impulses, Invent. Cert. no. 287104, priority of 6/28/1969.
3. L. A. Ostrovsky and V. V. Papko, A method of impulse generation. Cert. no. 315282, priority of 10/09/1969.
4. Yu. K. Bogatyryov, L. A. Ostrovsky, V. V. Papko et al. Multistable frequency-based element. Invent. Cert. no. 297957, priority of 10/27/1969.
5. Yu. K. Bogatyryov, L. A. Ostrovsky, V. V. Papko et al. A multistable element. Invent. Cert. no. 298051, priority of 10/27/1969.

6. L. A. Ostrovsky and L. V. Soustov, A broadband, low-noise amplifier. Invent. Cert. no. 302801, priority of 2/20/1970.
7. L. A. Ostrovsky, I. A. Papilova, and A. M. Sutin, A method of parametric amplification of acoustic waves. Invent. Cert. no. 481242, priority of 8/2/1972.
8. A. V. Okomel'kov, L. A. Ostrovsky, and A. M. Sutin, A parametric hydrophone. Invent. Cert. No. 1011029, priority of 9/18/1980.
9. S. D. Bogatyryov, L. N. Medvedev, L. A. Ostrovsky, et al., A wave generator. Invent. Cert. No. 1070438, priority of 11/29/1982.
10. S. D. Bogatyryov and L. A. Ostrovsky, A wave generator. Invent. Cert. No. 1153250, priority of 11/30/1983.
11. S. D. Bogatyryov, and L. A. Ostrovsky, A method for remote measurement of a current velocity component in upper ocean. Invent. Cert. no. 1261452, priority of 1/22/1985.