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Journal of MARINE RESEARCH

A Tribute to Vladimir Kamenkovich

Volume 69, Numbers 2–3, March–May 2011

Sears Foundation for Marine Research *Yale University*

Vladimir Kamenkovich

Journal of Marine Research, 69, iii–xix, 2011

Journal of
MARINE RESEARCH

Volume 69, Numbers 2-3

Vladimir Kamenkovich – Scientist and Teacher

by V. O. Ivchenko[1] and G. M. Reznik[2]

This special collection of articles is dedicated to Vladimir Kamenkovich, on the occasion of his 80th birthday. We take this opportunity to celebrate his extraordinary career in science and education. Through his pioneering work, Vladimir Kamenkovich has made important contributions to the development of modern physical oceanography, being, in the words of Peter Rhines, "a great force in ocean dynamics," and he has inspired many scientists worldwide. It is fair to say that the field of ocean dynamics would have been very different if Vladimir had chosen a different career path.

Vladimir was born December 22, 1931, in Moscow, in a family of an architect. His father wanted him to become an architect too, but young Vladimir decided to follow his passion and instead chose mathematics and physics. After graduation with a top honor ("Gold Medal") from his high school, Vladimir entered the most prestigious of Soviet universities of that time – the Moscow State University.

Owing to the intensity and depth of the curriculum at the Department of Mechanics and Mathematics, where giants such as Andrey Kolmogorov were teaching, Vladimir received the best training in math and physics that a young person could get. Vladimir excelled at all his studies and graduated with the top honor ("Red Diploma") in 1954. His next step was unorthodox. Instead of following a more traditional career in mathematics, Vladimir joined the recently formed Department of the Dynamics of Marine Currents at the P. P. Shirshov Institute of Oceanology and began his career in physical oceanography, which was still a very young field at that time.

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Vladimir while at Moscow State University.

The Department was headed by a prominent Russian authority in oceanic physics, Vladimir Shtockman, who became the supervisor of Vladimir's Ph.D. In the work on his thesis, Vladimir demonstrated his talent for applying rigorous mathematics to complex physical problems – he worked out a novel method of solving for large-scale currents in multiple-connected domains (Kamenkovich, 1961). This method continues to be used to this day, as this challenging problem is particularly relevant to calculating the total transport of the Antarctic Circumpolar Current (ACC). The dynamics of the ACC is widely known for its complexity and importance in the Earth's climate. Finding the most elegant and transparent model that captures the essential physics is the hallmark of Vladimir's research. His more recent contribution to studies of the ACC dynamics includes the formulation of a simple and elegant equivalent barotropic model of the ACC in the mid-nineties (Krupitsky *et al.*, 1996). In spite of its simplicity, this model demonstrates a reasonable agreement with observations, often surpassing more comprehensive models.

One of the most significant of Vladimir's scientific contributions is found in the dynamics of oceanic boundary currents and their role in the large-scale oceanic circulation. He was among the first scientists to study the dynamics of western boundary currents, focusing on the importance of bottom topography, stratification and nonstationarity (Kamenkovich and Reznik, 1972a,b). In a series of studies during 1963–1968, Vladimir developed a theory of inertial-viscous boundary layers in rotating fluids, which, along with the classic works by Charney (1955) and Morgan (1956), offered an explanation of a number of important effects observed in reality such as detachment of the western boundary currents from the coast, their nonsteadiness downstream from the detachment point, nonexistence of a decelerated inertial boundary layer, and others (Il'in and Kamenkovich, 1964; Kamenkovich, 1966).

These results formed the basis of Vladimir's next major accomplishment in his scientific career. In 1968, he successfully defended his dissertation, *On the Problems of Nonlinear Theory of Stationary Oceanic Currents*, for the prestigious title of Doctor of Science – the Soviet Union's highest academic degree that can be achieved by an examination.

Throughout his career, Vladimir continued to explore the dynamics of the large-scale ocean circulation, combining a deep understanding of a particular physical problem in the real ocean with the use of elegant idealized models and rigorous mathematics. In one of his major contributions to the field, he examined the joint effect of nonlinearity and turbulent viscosity on basin-scale circulation in a closed basin, using an idealized numerical model of a barotropic ocean. These studies lead to, among other things, the examination of stationary states, their stability, formation of oceanic gyres, and regime transitions from small to large Reynolds numbers (Kamenkovich *et al.*, 1995; Sheremet *et al*., 1995, 1997).

Starting in the seventies, the oceanographic community began to absorb a novel idea of the importance of mesoscale eddies in ocean dynamics. One of the best examples of a successful international cooperation, the POLYMODE Program, was started in 1973 as a bilateral US-USSR project to study mesoscale dynamics in the ocean and improve the understanding of the role of eddy processes on scales of 50 to 500 kilometers. Vladimir took a very active part in these activities and strongly contributed to the eventual success of the POLYMODE program. At approximately the same time, Vladimir made important progress in the field of oceanic and atmospheric physics by examining linear oscillations in a rotating spherical layer. He systematically described dispersion relations and spatial structure of practically all types of oceanic waves and demonstrated that a frequently used traditional approximation can be applied to all types of oscillations, besides the inertial ones (Kamenkovich, 1967; Kamenkovich and Odulo, 1972; Kamenkovich and Kulakov, 1977). Building on his expertise in the dynamics of linear and nonlinear Rossby waves, Vladimir later guided the development of an effective numerical model for regional hydrodynamic forecasts in oceanic domains (Kamenkovich *et al*., 1982b,c,d; 1983; 1986).

Of special interest is his work on the Agulhas eddies, which demonstrated that the intense baroclinic Agulhas eddies are able to "jump" over high oceanic ridges and to penetrate into the South Atlantic (Kamenkovich *et al.*, 1996). His interest in the rapidly developing field of mesoscale dynamics culminated in the publication of a well-received book, *Synoptic Eddies in the Ocean*, (Kamenkovich *et al*., 1982a) which is now in its second edition (1987).

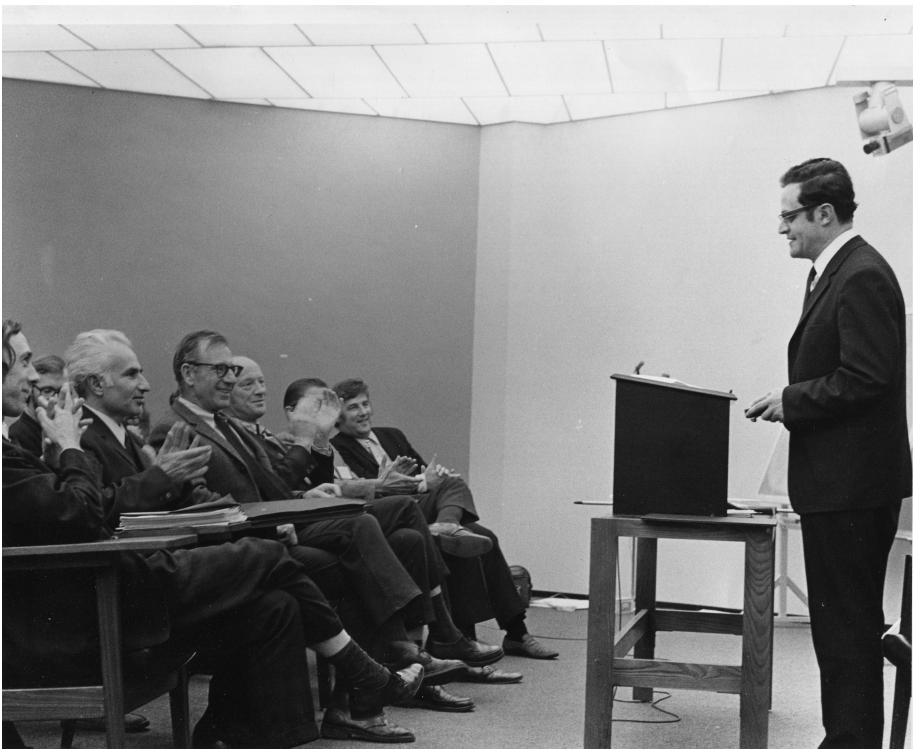
Vladimir's exceptional work in the field of Geophysical Fluid Dynamics earned him a solid international reputation. In 1972, he joined such classics in dynamical oceanography as Henry Stommel, Walter Munk and Kirk Bryan in receiving the prestigious Sverdrup Gold medal for "his extension of the Sverdrup transport equation to a general theory of ocean circulation, including the effects of islands and coastal boundaries, linear and nonlinear."

Most recently, Vladimir became interested in the dynamics of the Indonesian Seas and Indonesian Throughflow (ITF) (Gordon and Kamenkovich, 2010; Burnett *et al*., 2000a,b;

Vladimir receiving the Sverdrup Gold Medal from Walter Munk.

2003; Kamenkovich *et al*., 2003, 2009). The ITF is an important part of the Global Ocean Conveyer Belt and plays a significant role in maintaining a stable global climate (Gordon, 1986). With his colleagues, Vladimir analyzed the role of the pressure contrast between the western Pacific and the eastern Indian Ocean in the dynamics of ITF. The quantification of this role together with the demonstrated importance of other factors, including transports through particular ports, bottom form stress and local wind, is another example of his most recent contributions to the field.

Vladimir is a passionate and brilliant teacher, with a remarkable ability to offer clear explanations about complicated concepts. His courses are always carefully thought out and organized. Vladimir's devotion to teaching at the Moscow Institute of Physics and Technology (MIPT) helped to steer the careers of many young scientists. One of us (GR) chose oceanography after being inspired by Vladimir's course on Geophysical Fluid Dynamics at MIPT. With time, this lecture course for MIPT students transformed into his highly popular textbook, *Fundamentals of Ocean Dynamics* (Kamenkovich, 1973), which has been translated into several languages. This book, along with such fundamental textbooks as *Geophysical Fluid Dynamics* by J. Pedlosky (Pedlosky, 1979), and *Atmosphere-Ocean Dynamics*



Vladimir delivers the Sverdrup Gold Medal Award lecture.

by A. Gill (Gill, 1982), constitute cornerstones of modern oceanography. Vladimir's mentoring skills are legendary. In Russia and the Soviet Union, he brought up 12 Candidates of Sciences (equivalent to the Ph.D.). Many of them formed the core of the Geophysical Fluid Dynamics Laboratory (P.P. Shirshov Institute of Oceanology), which Vladimir headed from 1974 to 1994. His continued energy and passion as an educator and mentor are exemplary. At the University of Southern Mississippi alone, where he has been a faculty member since 1997, Vladimir developed a total of five new courses. In the USA, a total of six students defended their Ph.D. dissertations under advisement and co-advisement by Vladimir.

Despite his busy professional life, Vladimir has always been able to devote time to his family and friends. Chess, history, and literature have always been among his passions. Vladimir is a tennis player, who often prevails over his fellow oceanographers on the tennis court (as well as in scientific discussions).

On this very special occasion, we, together with all the participants of this volume and the entire oceanography community, wish Vladimir all the best - good health and continued strong scientific activity (which shows no signs of declining). This special collection of articles for the *Journal of Marine Research* is a dedication to Vladimir's remarkable career.

Vladimir at Lamont Doherty Earth Observatory, Columbia University.

Acknowledgments. We appreciate valuable comments on this article from B. Filyushkin, A. Gordon, I. Kamenkovich, M. Koshlyakov, P. Rhines and N. Bagryantsev. We thank all of the authors and referees who have contributed to this volume.

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Biographical Notes

Vladimir Kamenkovich

Date of Birth:	22 December 1931
Place of Birth:	Moscow, USSR
Education:	
1954:	Diploma: Department of Mechanics and Mathematics, Moscow State University, Moscow, Russia.
1961:	Ph.D.: Institute of Oceanology of the USSR, Academy of Sciences, Moscow, Russia.

Professional Experience:

Permanent

1996–present:	Department of Marine Science, College of Science and Technology, The University of Southern Mississippi. Professor (since 1999).
1957–1990:	P. P. Shirshov Institute of Oceanology, Russian (till 1992 the
1992–1994:	USSR) Academy of Sciences, Moscow, Russia (till 1992 the USSR). Head of Laboratory, Senior Scientist, Junior Scientist.
1966–1990:	(Part-time) Moscow Institute of Physics and Technology, Moscow,
1993–1994:	Russia (till 1992 the USSR). Professor, Associate Professor, Assistant Professor.

Visiting

1991–1992:	Lamont-Doherty Earth (till 1991 Geological) Observatory of
1994–1996:	Columbia University, (NY, NY). Visiting Senior Research Scientist.
1990–1991:	Massachusetts Institute of Technology (Cambridge, MA). Visiting Professor.
1985	Institut fuer Meereskunde, Hamburg Universitaet (Federal
May–August:	Republic Germany). Guest Professor.

Honors:

1972:	Sverdrup Gold Medal, American Meteorological Society.

Editorial Boards:

2004–2006:	Journal of Atmospheric & Ocean Science, Taylor & Francis *Member of Editorial Board*
1977 to present:	Dynamics of Atmospheres and Oceans, Elsevier *Member of Editorial Board*
1990–2002:	Journal of Marine Systems, Elsevier *Member of Editorial Board*
1988–1992:	Okeanologiya (Oceanology), Russian Academy of Sciences *Deputy of the Editor-in-Chief*
1972–1988:	Okeanologiya (Oceanology), Russian Academy of Sciences *Scientific Secretary*
1992–1998:	Okeanologiya (Oceanology), Russian Academy of Sciences *Member of Editorial Board*

Editing:

1978:	Physics of the Ocean; Vol. I, Hydrophysics of the Ocean, 455 pp. Vol II, Hydrodynamics of the Ocean, 455 pp. (Fizika okeana; tom 1, Gidrofizika okeana; tom. 2, Gidrodinamika okeana) (with A. S. Monin). Moscow, Nauka (in Russian).
1984:	Russian translation of "Geophysical Fluid Dynamics," by J. Pedlosky, Springer Verlag, 1982, Vol. I, 400 pp. Vol. 2, 406 pp. (with A. S. Monin). Moscow, Mir.
1986:	The POLYMODE Atlas (jointly with A. S. Monin, A. D. Voorhis). Woods Hole Oceanographic Institution Contribution No 6077, 375 pp. Woods Hole (with microfiche appendices).
2010:	Guest Editor of the special issue titled "Modeling and Observing the Indonesian Throughflow" of 'Dynamics of Atmospheres and Oceans' (jointly with A. Gordon, LDEO, Columbia University).

International Research Programs:

1988–1992	WOCE (World Ocean Circulation Experiment). Member of the Scientific Steering Group.
1988–1994	WOCE (World Ocean Circulation Experiment). Member of the Russian National Committee.
1974–1980	USSR-USA POLYMODE Program. Member of the Joint Organizing Committee; Co-chairman of the Theoretical Subgroup.

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