

ANNIVERSARY OF THE SCIENTIST ЮБИЛЕЙ УЧЕНОГО



Valentin Dymnikov, Academician member of the Russian Academy of Sciences, is 85 years old

Valentin Dymnikov, Academician of the Russian Academy of Sciences, Doctor of Physical and Mathematical Sciences, Professor, turned 85 on November 26, 2023. Valentin Dymnikov is an outstanding figure of Russian science, a specialist in the field of mathematical models and numerical methods in the field of problems of geophysical hydro-aerohydrodynamics, ocean-atmosphere interaction. He is responsible for the fundamental development of global models of atmospheric processes, climate and the creation of a scientific basis for studying the predictability of its changes.

V.P. Dymnikov was born in the village of Yurino, Mari ASSR. In 1955, with a silver medal, he graduated from the 11th men's secondary school in Yoshkar-Ola, and in 1961 — the Moscow Engineering Physics Institute. He is a student of Academician G.I. Marchuk, the last President of the USSR Academy of Sciences, founder of the Institute of Computational Mathematics of the Russian Academy of Sciences.

V.P. Dymnikov headed the Institute of Computational Mathematics of the Russian Academy of Sciences (now Marchuk institute of numerical mathematics of the Russian Academy of Sciences) in the period from 2000 to 2010. Under his leadership, a galaxy of young promising doctors and candidates of sciences has been educated. V.P. Dymnikov is the author of more than 200 scientific papers, including 15 monographs and textbooks.

He is a member of the editorial boards of a number of authoritative journals: "Izvestia RAS. Physics of the Atmosphere and Ocean", "Reports of the Academy of Sciences", "Russian Journal of Numerical Analysis and Mathematical Modelling", "Ecological Bulletin of the Scientific Centers of the Black Sea Economic Cooperation", member of the publishing council "Synergetics".

V.P. Dymnikov is a member of a number of international scientific committees and commissions, in particular, the International Commission on Dynamic Meteorology, the Steering Scientific Committee of the international TOGA program (Tropical Ocean and Global Atmosphere), the steering scientific committee of the World Climate Program. Member of the American Meteorological Society. In 2004, he was elected a member of the European Academy of Sciences. V.P. Dymnikov was awarded the Order of Honor, is a Laureate of the State Prize of the Russian Federation. Awarded the A.A. Prize. Friedman RAS for a series of works on the theory of large-scale atmospheric processes and climate theory.

The editorial staff of "Computational Mathematics and Information Technologies", colleagues of Valentin Dymnikov cordially congratulate the dear and deeply respected hero of the day on his 85th birthday, wish him good health, new ideas and creative achievements in the field of computational mathematics, solving problems of climate and geophysical hydro-aerohydrodynamics, great human happiness!

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*Brief information about the main scientific achievements
of Academician of the Russian Academy of Sciences V.P. Dymnikov*

The academician obtained fundamental scientific results in a number of areas of modern geophysics and mathematical modelling. In the field of transfer of humidity fields in the atmosphere, he investigated the microphysical processes of adaptation of humidity and cloud fields, formulated a new equation for the transfer of these fields, and also proposed methods for solving it, solved the problem of parametrization of torn clouds, proposed a method for parametrization of wet convection, etc.

Under the leadership of V.P. Dymnikov, a fully automated weather forecasting system for a limited area was developed and put into operational practice. The works carried out under his leadership together with a specially created laboratory at the Hydrometeorological Center of Russia were accepted in 2007 for implementation into the operational practice of Roshydromet.

In the field of the theory of hydrodynamic stability, he solved the problem of the development of baroclinic instability in the atmosphere in the presence of condensation, and investigated the problem of approximation by spectrum. The problem of symmetry of Lyapunov exponents for regular systems with Rayleigh friction, the problem of instability of zonal-asymmetric atmospheric flows, etc. is studied.

V.P. Dymnikov proposed and justified a dynamic-stochastic equation to describe the low-frequency variability of atmospheric circulation and investigated the relationship of the singular vectors of the dynamic operator with the eigenvectors of the covariance matrix, investigated the most correlated distributions of ocean surface temperature and atmospheric circulation characteristics.

In the field of numerical methods for solving differential equations, a method for constructing absolutely stable difference schemes for atmospheric hydrothermodynamics equations is proposed, which has an exact analogue of the quadratic law of conservation of energy based on the symmetrization of the original system of equations. A method for constructing difference schemes with a given set of integral conservation laws based on the use of conjugate equations is proposed.

Under the leadership of V.P. Dymnikov, original global models of the general circulation of the atmosphere, zonal-averaged models of the general circulation of the atmosphere and the ocean were developed, and a number of important results on modelling the modern climate and its changes were obtained.

A new direction in climate theory has been formed — the mathematical theory of climate, the basis of which is the study of the structure of the attractors of climate change models, their stability and sensitivity to changes in parameters. The structure of the attractors of atmospheric models is investigated, the dissipation-fluctuation relations are applied to construct the operator of the response of models to small external influences, which makes it possible to investigate the sensitivity of a real climate system.

The applicability of conjugate equations of nonlinear hydrodynamic systems for the construction of known integral conservation laws is investigated and proved, new conservation laws are obtained. A method for constructing optimal excitation of large-scale components of atmospheric circulation is proposed, a problem of potential predictability of the first kind is formulated and a method for solving it is proposed based on the reduction of a dynamic system to a dynamic-stochastic one.

Under the leadership of V.P. Dymnikov, a global mathematical model of the world-class climate has been developed at the INM RAS, which makes it possible to assess future climate changes based on joint interactive models of the general circulation of the atmosphere, ocean, cryosphere and land. As part of the project to create a model of the Earth system, original models of the upper atmosphere and ionosphere have been developed. In order to introduce the developed models into operational practice, V.P. Dymnikov organized an ionosphere modeling laboratory at the E.K. Fedorov Institute of Applied Geophysics.

V.P. Dymnikov is the head of the leading scientific school “Mathematical Modelling of Climate”, supported by a grant from the President of Russia. On the initiative of Academician V.P. Dymnikov and under his scientific guidance, since 2001, a school of young scientists “Computing and information technologies in environmental science” has been regularly held in various cities of Western Siberia. He has trained 8 doctors and 12 candidates of sciences. The scientist is the head of the seminar “Mathematical modelling of geophysical processes”, co-head of the seminar “Global changes in the natural environment and climate”.