INTERNATIONAL BIWEEKLY ONLINE SEMINAR ON ANALYSIS, DIFFERENTIAL EQUATIONS AND MATHEMATICAL PHYSICS

Coordinators: Prof. Alexey Karapetyants, Prof. Vladislav Kravchenko

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23 April 2026, 6 pm (UTC+3)

Parabolic problems with hysteresis: properties of solutions and the free boundaries

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We study solutions of one-space dimensional parabolic equations with a discontinuous hysteresis operator, described by a free interface boundary. The hysteresis operator is used in mathematical descriptions of various chemical, physical, biological and sociological processes such as thermocontrol, chemical reactors, ferromagnetism, self-organisation, population dynamics etc.

We show that for transversal initial data from the space $W_q^{2-2/q}$, $q > 3$, the problem is solvable in the space $W_q^{2,1}$, and the free (interface) boundaries are defined by monotone Hölder curves with exponent $1/2$. Moreover, we demonstrate that for the initial data from the space W_∞^2 the interface boundaries satisfy the Lipschitz condition.

We also discuss some outcomes concerning the non-transversal initial data.

This talk is based on results [1-3] obtained jointly with N.N. Uraltseva and S.B. Tikhomirov.

References:

[1] Apushkinskaya D.E., Uraltseva N.N. On regularity properties of solutions to the hysteresis-type problem. Interfaces Free Bound., 17:1 (2015), 93-115.

[2] Apushkinskaya D.E., Uraltseva N.N. Free boundaries in problems with hysteresis. Philos. Trans. Roy. Soc. A, 373 (2015), 20140271.

[3] Apushkinskaya D.E., Uraltseva N.N., Tikhomirov S.B. Properties of the phase boundary in the parabolic problem with hysteresis. Zap. Nauchn. Semin. POMI, 536 (2024), 26-53.

*Seminar website: https://msrn.sfedu.ru/sl. The seminar uses Microsoft Teams online platform.
Please send questions to ademp.seminar@gmail.com (Tatiana Andreeva, scientific secretary).

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