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Partial parabolicity of the boundary-value problem for pseudodifferential equations in a layer. (Russian. English summary) [Zbl 1438.35473](#)

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Summary: A nonlocal boundary-value problem for evolution pseudodifferential equations in an infinite layer is considered in this paper. The notion of the partially parabolic boundary-value problem is introduced in the case where a solving function decreases exponentially with respect to a part of space variables only. This concept generalizes the concept of a parabolic boundary value problem, which was previously studied by one of the authors of this paper (A. A. Makarov). The necessary and sufficient conditions for the pseudodifferential operator symbol are obtained under which partially parabolic boundary-value problems exist. It turned out that the real part of the symbol of a pseudodifferential operator should increase unboundedly powerfully in some of the spatial variables. In this case, a specific type of boundary conditions is indicated, which depend on a pseudodifferential equation and are also pseudodifferential operators. It is shown that for solutions of partially parabolic boundary-value problems, smoothness in some of the spatial variables increases. The disturbed (excited) pseudodifferential equation with a symbol which depends on space and temporal variables is also investigated. It is found what pseudodifferential operators are possible to be disturbed in the way that the input equation of the partially parabolic boundary-value problem would remain correct in Sobolev-Slobodetsky spaces. It is also shown that although the properties of increasing the smoothness of solutions in part of the variables are similar to the property of solutions of partially hypoelliptic equations introduced by L. Hörmander, these examples show that the partial parabolic boundary value problem does not follow from partial hypoellipticity; and vice versa. An example of a partially parabolic boundary value problem for a differential equation that is not partially hypoelliptic is given.

MSC:

35S15 Boundary value problems for PDEs with pseudodifferential operators

Keywords:

boundary-value problem; pseudodifferential equations; Fourier transform; parabolicity; hypoellipticity

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