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Formulation and Analysis of Spatially-Periodic Evolution Anisotropic Navier-Stokes Equations

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We consider the evolution (time-dependent) anisotropic Navier-Stokes equations with variable space-periodic tensor viscosity coefficient in $\mathbb{R}^n$.

First, employing the Galerkin algorithm, we prove the existence of a global weak spatially-periodic solution for the Navier-Stokes system in a periodic Sobolev space, $\mathbf{u} \in L_\infty(0, T; \dot{\mathbf{H}}_{\# \sigma}^0) \cap L_2(0, T; \dot{\mathbf{H}}_{\# \sigma}^1)$. Next, we analyse the existence and properties of Serrin-type solutions in the mixed-norm Sobolev-based spaces, that is, the weak solutions such that $\mathbf{u} \in L_2(0, T; \dot{\mathbf{H}}_{\# \sigma}^{n/2})$.

The solution uniqueness and regularity results are also discussed.

[1] S.E. Mikhailov, Spatially-Periodic Solutions for Evolution Anisotropic Variable-Coefficient Navier-Stokes Equations: I. Weak Solution Existence. Mathematics, 12 (12), 1817 (2024), 1-27,
<https://doi.org/10.3390/math12121817>.

[2] S.E. Mikhailov, Spatially-Periodic Solutions for Evolution Anisotropic Variable-Coefficient Navier-Stokes Equations: II. Serrin-Type Solutions. Math. Meth. Appl. Sci., 48, 11592-11619 (2025),
<https://doi.org/10.1002/mma.10921>.

*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).

The seminar is organized by the coordinators Alexey Karapetyants and Vladislav Kravchenko within the activities of the Regional Mathematical Center of the Southern Federal University in collaboration with Institute of Mathematics, Mechanics and Computer Sciences of the Southern Federal University and the OTHA research group in Operator Theory and Harmonic Analysis.



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