

Coordinators: Prof. Alexey Karapetyants, Prof. Vladislav Kravchenko

[JOIN THE SEMINAR](#)

15 October 2026, 6 pm (UTC+3)

Interior a priori estimate for higher order elliptic systems in Orlicz spaces

Amiran Gogatishvili, Czech Academy of Sciences, Institute of Mathematics, Czechia

gogatish@math.cas.cz

We study the boundedness of singular integral operators with Calderón-Zygmund kernel and their commutators in Orlicz spaces L^Φ , with coefficients in the space of functions with Vanishing Mean Oscillation (VMO), combined with the classical approach of "freezing of the coefficients" method. Then, we establish boundedness results in L^Φ under suitable structural assumptions on the Young function Φ , namely requiring the global Δ_2 and ∇_2 conditions. The proofs rely on decomposition techniques and weak-type estimates. In conclusion, these results provide a functional-analytic foundation for a priori estimates and interior regularity of solutions to higher-order elliptic operators with discontinuous coefficients: more precisely, we consider the following linear *uniformly elliptic* systems of order $2b$, $b \geq 1$, in the sense of Douglis-Nirenberg in an open domain $\Omega \subset \mathbb{R}^n$, $n \geq 3$

$$\mathcal{L}(x, D)\mathbf{u} := \sum_{|\alpha|=2b} \mathbf{A}_\alpha(x) D^\alpha \mathbf{u}(x) = \mathbf{f}(x), \quad x \in \Omega, \quad (1)$$

with matrix $\mathbf{A}_\alpha = \{a_{jk}^\alpha(x)\}_{j,k=1}^m$ of coefficients $a_{jk}^\alpha \in VMO \cap L^\infty(\Omega)$, for all $|\alpha| = 2b$ and for each $j, k = 1, \dots, m$.

Our main result establishes interior Sobolev-Orlicz WL_Φ^{2b} estimates for strong solutions: specifically, we prove that if $\mathbf{f} \in L^\Phi(\Omega)$, any strong solution $\mathbf{u} \in WL_\Phi^{2b}$ of the system (1) satisfies

$$\|\mathbf{u}\|_{WL_\Phi^{2b}(\Omega')} \leq C(\|\mathbf{f}\|_{L^\Phi(\Omega'')} + \|\mathbf{u}\|_{L^\Phi(\Omega'')})$$

for every pair of subdomains $\Omega' \Subset \Omega'' \Subset \Omega$. The proof of this result is mainly based on the technique known for L^p spaces and Morrey spaces, with the use of an interpolation inequality in Orlicz spaces.

References:

1. Chiarenza F., Franciosi M., Frasca M., L^p -estimates for linear elliptic systems with discontinuous coefficients, *Atti Accad. Naz. Lincei, Cl. Sci. Fis. Mat. Nat., IX Ser., Rend. Lincei, Mat. Appl.* **5** (1) (1994), 27-32.
2. Geneshvili I., Gogatishvili A., Kokilashvili V., Krbeć M., Weight theory for integral transforms on spaces of homogeneous type, *Pitman Monographs and Surveys in Pure and Applied Math.* 92-Harlow: Longman (1998), xii, 410 p.

3. Gogatishvili A., Salerno P., Softova L., Interior a priori estimate for higher order elliptic systems in Orlicz spaces, submitted.
4. Kalamajska A., Pietruska-Paluba K., Gagliardo-Nirenberg inequalities in weighted Orlicz spaces, *Studia Math.* **173** (1) (2006), 49-71.
5. Kokilashvili V., Krbec M., Weighted inequalities in Lorentz and Orlicz spaces, *World Scientific Publishing Co. Pte. Ltd. Singapore etc.* (1991), xii, 233 p.

*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.



Regional Mathematical Center
<https://rmc.sfedu.ru/>



**Institute of Mathematics, Mechanics
 and Computer Sciences**
<http://www.mmcs.sfedu.ru/>



**OTHA research network in
 Operator Theory and Harmonic Analysis**
<http://msrn.sfedu.ru/>