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The boundedness of a class of fractional type rough higher order commutators on vanishing generalized weighted Morrey spaces

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Abstract

Let $\Omega \in L_s(S^{n-1})$, $1 < s \leq \infty$. Ω is the function defined on $\mathbb{R}^n \setminus \{0\}$ satisfying the homogeneous of degree zero condition, that is,

$$\Omega(\lambda x) = \Omega(x) \text{ for any } \lambda > 0,\ x \in \mathbb{R}^n \setminus \{0\}$$

and the integral zero property (=the vanishing moment condition) over the unit sphere S^{n-1}, that is,

$$\int\limits_{S^{n-1}} \Omega(x') d\sigma(x') = 0,$$

where $x' = \frac{x}{|x|}$ for any $x \neq 0$.

In this talk, we consider the following higher order (= k-th order) commutator operators of rough fractional integral and maximal operators,

$$\begin{aligned} T_{\Omega,\alpha}^{A,k} f(x) &= T_{\Omega,\alpha}\left(\left(A(x) - A(\cdot)\right)^k f(\cdot) \right)(x), \qquad k = 0,1,2,\ldots, \\ &= \int\limits_{\mathbb{R}^n} \frac{\Omega(x-y)}{|x-y|^{n-\alpha}} \left(A(x) - A(y)\right)^k f(y) dy \end{aligned}$$

and

$$\begin{aligned} M_{\Omega,\alpha}^{A,k} f(x) &= M_{\Omega,\alpha}\left(\left(A(x) - A(\cdot)\right)^k f(\cdot) \right)(x), \qquad k = 0,1,2,\ldots, \\ &= \sup_{r>0} \frac{1}{r^{n-\alpha}} \int\limits_{|x-y|<r} \left|\Omega(x-y)\right| \left|A(x) - A(y)\right|^k |f(y)| \, dy. \end{aligned}$$

Inspired of [1], the aim of the present paper is to study the boundedness of the operators $T_{\Omega,\alpha}^{A,k}$ and $M_{\Omega,\alpha}^{A,k}$ generated by $T_{\Omega,\alpha}$ and $M_{\Omega,\alpha}$ with a BMO functions on vanishing generalized weighted Morrey spaces, respectively. That is, in this study we will consider this problem.

Key Words: Fractional type higher order (= k-th order) commutator operators, Rough kernel, $A\left(\frac{p}{s'}, \frac{q}{s'}\right)$ weight, Vanishing generalized weighted Morrey space.

References

[1] F. Gürbüz, On the behavior of a class of fractional type rough higher order commutators on generalized weighted Morrey spaces, J. Coupled Syst. Multiscale Dyn., 6 (2018), 191-198.