

Commutators and Generalized Local Morrey Spaces

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Abstract

In this paper we study the behaviour of Hardy-Littlewood maximal operator and the action of commutators in generalized local Morrey spaces $LM_{\{x_0\}}^{p,\varphi}(\mathbb{R}^n)$ and generalized Morrey spaces $M^{p,\varphi}(\mathbb{R}^n)$.

1 Introduction

We study in generalized local Morrey spaces $LM_{\{x_0\}}^{p,\varphi}(\mathbb{R}^n)$ and generalized Morrey spaces $M^{p,\varphi}(\mathbb{R}^n)$ the boundedness of Hardy-Littlewood maximal operator in terms of Sharp Maximal Function and, as consequence, the boundedness of Commutators of the type

$$[a, K](f) = a(K, f) - K(a, f),$$

where K is a Calderón-Zygmund singular integral operator, f is in a Generalized Local Morrey Space $LM_{\{x_0\}}^{p,\varphi}(\mathbb{R}^n)$ and the function a belongs to the Bounded Mean Oscillation class (B.M.O.) at first defined by John-Nirenberg.

The Generalized Morrey Spaces $M^{p,\varphi}(\mathbb{R}^n)$ are obtained by replacing in the classical Morrey Space $M^{p,\lambda}(\mathbb{R}^n)$, r^λ by a function φ .

The classical Morrey spaces were introduced by Morrey [20] to study the local behavior of solutions to second order elliptic partial differential equations (see e.g. [18], [23]). For the properties and applications of classical Morrey spaces, we refer the readers to [9, 10, 15, 20]. Mizuhara [19] and Nakai [22] introduced generalized Morrey spaces. Later, Guliyev [15] defined the generalized Morrey spaces $M^{p,\varphi}(\mathbb{R}^n)$ with normalized norm.

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