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Estimates for multilinear operators on anisotropic function spaces and their applications.

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Summary: Let $A$ be an anisotropic dilation on $\mathbb{R}^n$ and $L$ a general multilinear operator formed by anisotropic Calderón-Zygmund operators. We obtain the boundedness of $L$ from weighted Lebesgue spaces to the unweighted anisotropic Hardy space. Moreover, for the anisotropic BMO space $\text{BMO}_A(\mathbb{R}^n)$ and the weighted anisotropic BMO space $\text{BMO}_A^w(\mathbb{R}^n)$, we obtain an inclusion relationship: $\text{BMO}_A^w(\mathbb{R}^n) \subset \text{BMO}_A(\mathbb{R}^n)$. As an application, for the commutator $[T, b]$ of the anisotropic Calderón-Zygmund operator $T$ and $b$ in $\text{BMO}_A^w(\mathbb{R}^n)$, we obtain $||[T, b](f)||_{L^p(\mathbb{R}^n)} \leq C||b||_{\text{BMO}_A^w(\mathbb{R}^n)}||f||_{L^p(\mathbb{R}^n)}$. All these results are still new even in the classical isotropic setting.

MSC:
42B20 Singular and oscillatory integrals (Calderón-Zygmund, etc.)
42B35 Function spaces arising in harmonic analysis

Keywords:
anisotropy; Muckenhoupt weight; Hardy space; multilinear operator; Calderón-Zygmund operator; commutator

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