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Orlicz-Hardy Spaces Associated with Divergence Operators on Unbounded Strongly Lipschitz Domains of $\mathbb{R}^n$

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Let Ω be either $\mathbb{R}^n$ or an unbounded strongly Lipschitz domain of $\mathbb{R}^n$, and Φ be a continuous, strictly increasing, subadditive and positive function on $(0,\infty)$ of upper type 1 and of strictly critical lower type $p_{\Phi}\in(n/(n+1),1]$. Let L be a divergence form elliptic operator on $L^2 (\Omega)$ with the Neumann boundary condition and the heat semigroup generated by L have the Gaussian property (G_{∞}). In this paper, the authors introduce the Orlicz-Hardy space $H_{\Phi,\,L}(\Omega)$ via the nontangential maximal function associated with $\{e^{-t\sqrt{L}}\}_{t\ge0}$, and establish its equivalent characterization in terms of the Lusin area function associated with $\{e^{-t\sqrt{L}}\}_{t\ge0}$. The authors also introduce the "geometrical" Orlicz-Hardy space $H_{\Phi,\,z}(\Omega)$ via the classical Orlicz-Hardy space $H_{\Phi}(\mathbb{R}^n)$, and prove that the spaces $H_{\Phi,\,L}(\Omega)$ and $H_{\Phi,\,z}(\Omega)$ coincide with equivalent norms, from which, characterizations of $H_{\Phi,\,L}(\Omega)$, including the vertical and the nontangential maximal function characterizations associated with $\{e^{-tL}\}_{t\ge0}$, and the Lusin area function characterization associated with $\{e^{-tL}\}_{t\ge0}$, are deduced. All the above results generalize the well-known results of P. Auscher and E. Russ by taking $\Phi(t)\equiv t$ for all $t\in(0,\infty)$.

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