

ONE-SIDED MAXIMAL OPERATORS ON HERZ SPACES WITH VARIABLE EXPONENTS

KWOK-PUN HO

Abstract. This paper extends the boundedness of the one-sided maximal operators from the Lebesgue spaces with variable exponents to the one-sided Herz spaces with variable exponents. The main result generalizes the boundedness of the one-sided maximal operators on the classical Herz spaces.

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REFERENCES

- [1] A. ALMEIDA AND D. DRIHEM, *Maximal, potential and singular type operators on Herz spaces with variable exponents*, J. Math. Anal. Appl., **394**, (2012), 781–795.
- [2] C. BENNETT AND R. SHARPLEY, *Interpolation of Operators*, Academic Press (1988).
- [3] D. CRUZ-URIBE AND A. FIORENZA, *Variable Lebesgue Spaces*, Birkhäuser, 2013.
- [4] L. DIENING, P. HARJULEHTO, P. HÄSTÖ AND M. RUŽIČKA, *Lebesgue and Sobolev Spaces with Variable Exponents*, Springer, 2011.
- [5] D. E. EDMUNDS, V. KOKILASHVILI AND A. MESKHI, *On one-sided operators in variable exponent Lebesgue spaces*, Proc. A. Razmadze Math. Inst., **144** (2007), 126–131.
- [6] H. FEICHTINGER AND F. WEISZ, *Herz spaces and summability of Fourier transforms*, Math. Nachr., **281** (2008), 309–324.
- [7] G. FOLLAND, *Real Analysis: Modern Techniques And Their Applications*, John Wiley & Sons, New York, (1984).
- [8] G. HARDY AND J. LITTLEWOOD, *A maximal theorem with function-theoretic applications*, Acta Math., **54** (1930), 81–116.
- [9] C. HERZ, *Lipschitz spaces and Bernstein’s theorem on absolutely convergent Fourier transforms*, J. Math. Mech., **18** (1968/69), 283–323.
- [10] K.-P. HO, *Extrapolation to Herz spaces with variable exponents and applications*, Revista Mat. Complut., **33**, (2020), 437–463.
- [11] K.-P. HO, *Sublinear operators on Herz-Hardy spaces with variable exponents*, Math. Nachr., **295** (2022), 876–889.
- [12] K.-P. HO, *Bilinear operators on ball Banach function spaces*, J. Geom. Anal. **34** (2024), Article no. 337.
- [13] K.-P. HO, *Herz spaces and integral operators on Morrey spaces*, (preprint).
- [14] K.-P. HO, *Localized operators on weighted Herz spaces*, Math. Nachr. **297** (2024) 4067–4080.
- [15] L. HUANG, F. WEISZ, D. YANG AND W. YUAN, *Summability of Fourier transforms on mixed-norm Lebesgue spaces via associated Herz spaces*, Anal. Appl. (Singap.) **21** (2023), 279–328.
- [16] M. IZUKI AND Y. SAWANO, *The Haar wavelet characterization of weighted Herz spaces and greediness of the Haar wavelet basis*, J. Math. Anal. Appl. **362** (2010), 140–155.
- [17] M. IZUKI, *Boundedness of sublinear operators on Herz spaces with variable exponent and application to wavelet characterization*, Anal. Math., **36** (2010), 33–50.
- [18] M. IZUKI AND T. NOI, *Boundedness of some integral operators and commutators on generalized Herz spaces with variable exponents*,
http://sci.osaka-cu.ac.jp/math/OCAMI/preprint/2011/11_15.pdf.

- [19] M. IZUKI, T. NOI AND Y. SAWANO, *Extrapolation to two-weighted Herz spaces with three variable exponents*, Adv. Oper. Theory **9** (2024) Article No. 44.
- [20] Y. LI, D. YANG AND L. HUANG, *Real-variable theory of Hardy spaces associated with generalized Herz spaces of Rafeiro and Samko*, Lecture Notes in Mathematics, No. 2320, Springer (2022).
- [21] S. LU AND D. YANG, *Hardy-Littlewood-Sobolev theorem of fractional integration on Herz-type spaces and its applications*, Canad. J. Math., **48** (1996), 363–380.
- [22] S. LU, D. YANG AND G. HU, *Herz type spaces and their applications*, Science Press, Beijing, 2008.
- [23] S. LU, Z. FU, F. ZHAO AND S. SHI, *Hardy Operators on Euclidean Spaces and Related Topics*, World Scientific Press, Singapore (2023).
- [24] F. MARTÍN-REYES, P. ORTEGA AND A. DE LA TORRE, *Weighted inequalities for one-sided maximal functions*, Trans. Amer. Math. Soc. **319** (1990), 517–534.
- [25] F. MARTÍN-REYES, *Weights, one-sided operators, singular integrals and ergodic theorems*, Nonlinear Analysis, Function Spaces and Applications, Praha: Prometheus Publishing House, (1994), 103–137.
- [26] F. MARTÍN-REYES AND A. DE LA TORRE, *Some weighted inequalities for general one-sided maximal operators*, Studia Math. **122** (1997), 1–14.
- [27] A. NEKVINDA, *Hardy-Littlewood maximal operator on $L^{p(x)}(\mathbb{R}^n)$* , Math. Inequal. Appl. **7** (2004), 255–265.
- [28] A. NEKVINDA, *Maximal operator on variable Lebesgue spaces for almost monotone radial exponent*, J. Math. Anal. Appl. **337** (2008), 1345–1365.
- [29] A. NEKVINDA, *A note on one-sided maximal operator in $L^{p(\cdot)}(\mathbb{R})$* , Math. Inequal. Appl. **13** (2010), 887–897.
- [30] M. A. RAGUSA, *Homogeneous Herz spaces and regularity results*, Nonlinear Anal. **71** (2009), 1909–1914.
- [31] M. A. RAGUSA, *Parabolic Herz spaces and their applications*, Appl. Math. Lett. **25** (2012), 1270–1273.
- [32] Y. SAWANO, *Theory of Besov Spaces*, Developments in Mathematics, vol. 56, Berlin, Springer.
- [33] Y. SAWANO, K.-P. HO, D. YANG AND S. YANG, *Hardy spaces for ball quasi-Banach function spaces*, Dissertationes Math. (Rozprawy Mat.) **525** (2017), 1–102.
- [34] E. SAWYER, *Weighted inequalities for the one-sided Hardy-Littlewood maximal functions*, Trans. Amer. Math. Soc. **297** (1986), 53–61.
- [35] Y. ZHAO, D. YANG AND Y. ZHANG, *Mixed-norm Herz spaces and their applications in related Hardy spaces*, Anal. Appl. (Singap.) **21** (2023), 1131–1222.