

BOUNDEDNESS OF THE MARCINKIEWICZ INTEGRAL ON GRAND VARIABLE HERZ SPACES

HAMMAD NAFIS, HUMBERTO RAFEIRO* AND MUHAMMAD ASAD ZAIGHUM

Abstract. We prove the boundedness of the Marcinkiewicz integral on grand variable Herz spaces.

Mathematics subject classification (2020): 46E30.

Keywords and phrases: Herz spaces, Grand spaces, variable exponent spaces, Marcinkiewicz integral.

REFERENCES

- [1] A. ALMEIDA AND D. DRIHEM, *Maximal, potential and singular type operators on Herz spaces with variable exponents*, J. Math. Anal. Appl., **394** (2): 781–795, 2012.
- [2] D. CRUZ-URIBE, A. FIORENZA, *Variable Lebesgue Space*, Foundations and Harmonic Analysis, Birkhäuser, 2013.
- [3] D. CRUZ-URIBE, A. FIORENZA, J. MARTELL AND C. PÉREZ, *The boundedness of classical operators on variable L^p spaces*, Ann. Acad. Sci. Fenn., **31** (1): 239–264, 2006.
- [4] L. DIENING, P. HARJULEHTO, HÄSTÖ, AND M. RUZICKA, *Lebesgue and Sobolev Spaces with variable exponents*, Springer-Verlag, Lecture Notes in Mathematics, vol. 2017, Berlin, 2011.
- [5] H. G. FEICHTINGER AND F. WEISZ, *Herz spaces and summability of Fourier transforms*, Math. Nachr., **281** (3): 309–324, 2008.
- [6] A. FIORENZA, B. GUPTA AND P. JAIN, *The maximal theorem for weighted grand Lebesgue spaces*, Studia Math., **188**, no. 2, 123–133, 2008.
- [7] L. GRAFAKOS, X. LI, AND D. YANG, *Bilinear operators on Herz-type Hardy spaces*, Trans. Amer. Math. Soc., **350** (3): 1249–1275, 1998.
- [8] L. GRECO, T. IWANIEC AND C. SBORDONE, *Inverting the p -harmonic operator*, Manuscripta Math., **92**, no. 2, 249–258, 1997.
- [9] E. HERNANDEZ AND D. YANG, *Interpolation of Herz spaces and application*, Math. Nachr., **205** (1): 69283–87, 1999.
- [10] C. HERZ, *Lipschitz spaces and Bernstein's theorem on absolutely convergent Fourier transform*, J. Math. Mech., **18**: 283–323, 1968/69.
- [11] T. IWANIEC AND C. SBORDONE, *On the integrability of the Jacobian under minimal hypotheses*, Arch. Ration. Mech. Anal., **119**, no. 2, 129–143, 1992.
- [12] M. IZUKI, *Boundedness of vector-valued sublinear operators on Herz-Morrey spaces with variable exponent*, Math. Sci. Res. J., **13** (10): 243–253, 2009.
- [13] M. IZUKI, *Boundedness of sublinear operators on Herz spaces with variable exponent and application to wavelet characterization*, Analysis Mathematica, **13** (36): 33–50, 2010.
- [14] R. JOHNSON, *Temperature, Riesz potential and the Lipschitz spaces of Herz*, Proc. London Math. Soc., **27** (2): 290–316, 1973.
- [15] R. JOHNSON, *Lipschitz spaces, Littlewood-Paley spaces and convoluteurs*, Proc. London Math. Soc., **29** (1): 127–141, 1974.
- [16] V. KOKILASHVILI, *Boundedness criteria for singular integrals in weighted grand Lebesgue spaces*, J. Math. Sci. (N. Y.), **170**, no. 1, 20–33, 2010.
- [17] V. KOKILASHVILI AND A. MESKHI, *A note on the boundedness of the Hilbert transform in weighted grand Lebesgue spaces*, Georgian Math. J., **16**, no. 3, 547–551, 2009.

- [18] V. KOKILASHVILI AND A. MESKHI, *Trace inequalities for fractional integrals in grand Lebesgue spaces*, Studia Math., **210**, no. 2, 159–176, 2012.
- [19] V. KOKILASHVILI AND A. MESKHI, *Potentials with product kernels in grand Lebesgue spaces: One-weight criteria*, Lith. Math. J., **23**, no. 1, 27–39, 2013.
- [20] V. KOKILASHVILI AND A. MESKHI, H. RAFEIRO, S. SAMKO, *Integral Operators in Non-Standard Function Spaces, Vol. 1*, Oper. Theory Adv. Appl. 248, Birkhäuser, Cham, 2016.
- [21] V. KOKILASHVILI AND A. MESKHI, H. RAFEIRO, S. SAMKO, *Integral Operators in Non-Standard Function Spaces, Vol. 2*, Oper. Theory Adv. Appl. 249, Birkhäuser, Cham, 2016.
- [22] Y. KOMORI, *Notes on singular integrals on some inhomogeneous Herz spaces*, Taiwanese J. Math., **8** (3): 547–556, 2004.
- [23] O. KAVACIK AND J. RAKOSNIK, *On spaces $L^{p(x)}$ and $W^{k,p(x)}$* , Czechoslovak Math. J., **41** (116): 592–618, 1991.
- [24] A. MESKHI, *Weighted criteria for the Hardy transform under the B_p condition in grand Lebesgue spaces and some application*, J. Math. Sci. (N. Y.), **178**, no. 6, 622–636, 2011.
- [25] A. MESKHI, *Criteria for the boundedness of potential operators in grand Lebesgue spaces*, Proc. A. Razmadeze Math. inst., **169**, 119–132, 2015.
- [26] A. MESKHI, H. RAFEIRO, AND M. A. ZAIGHUM, *Central Calderon-Zygmund Operators On Herz-type Hardy Spaces Of Variable Smoothness and Integrability*, Ann. Funct. Anal., 2017.
- [27] B. MUCKENHOUPT, R. L. WHEEDEN, *Weighted norm inequalities for singular and fractional integrals*, Trans. Am. Maths. Soc. 249–258, 161 (1971).
- [28] H. NAFIS, H. RAFEIRO, M. A. ZAIGHUM, *A note on the Boundedness of Sublinear Operators on Grand Variable Herz Spaces*, J. Inequal. Appl., 2020, 1 (2020).
- [29] V. D. RADULESCU, D. REPOVES, *Partial differential equations with variable exponents: variational methods and qualitative analysis, 1st edition*, Chapman and Hall/CRC, pub. June 24, 2015.
- [30] H. RAFEIRO, AND S. SAMKO, *Riesz potential operator in continual variable exponents Herz spaces*, Math. Nach., 288 (4), 465–475, 2015.
- [31] H. RAFEIRO, S. SAMKO, AND S. UMARKHADZHIEV, *Grand Lebesgue sequence spaces*, Georgian Math. J., 2018.
- [32] M. RUZICKA, *Electrorheological Fluids: Modeling and Mathematical Theory*, Springer, Lecture Notes in Math., vol. **1748**, 176 pages, 2000.
- [33] S. G. SAMKO, *On a progress in the theory of Lebesgue spaces with Variable exponents: maximal and singular operators*, Integr. Transf. and Spec. Funct., **16** (5–6): 461–482, 2005.
- [34] S. G. SAMKO, *Variable exponents Herz space*, *Mediterr. J. Math.*, **10** (4): 2007–2025, 2013.
- [35] F. SORIA AND G. WEISS, *A remark on singular integrals and power weights*, Indiana University Mathematical Journal, vol. **43**, no. 1, pp. 187–204, 1994.
- [36] E. STEIN, *On the functions of Littlewood-Paley, Lusin, and Marcinkiewicz*, Trans. Amer. Math. Soc., 88: 430–466, 1958.
- [37] H. WANG, *Commutators of Marcinkiewicz integrals on Herz spaces with variable exponent*, *Czechoslovak Mathematical Journal* 66: 251–269, 2016.