MORREY SPACES ARE CLOSELY EMBEDDED BETWEEN VANISHING STUMMEL SPACES

STEFAN SAMKO

Abstract. We prove a new property of Morrey function spaces by showing that the generalized local Morrey spaces are embedded between weighted Lebesgue spaces with weights differing only by a logarithmic factor. This leads to the statement that the generalized global Morrey spaces are embedded between two generalized Stummel classes whose characteristics similarly differ by a logarithmic factor. We give examples proving that these embeddings are strict. For the generalized Stummel spaces we also give an equivalent norm.

Mathematics subject classification (2010): Primary 46E15; Secondary 42B35.

Keywords and phrases: function space, local Morrey space, global Morrey space, generalized Morrey space, weighted space, Stummel class.

REFERENCES

- [1] D. R. ADAMS, Lectures on L^p-potential theory, UmeåUniversity Reports, no. 2, 1981.
- [2] T. ALVAREZ AND C. PÉREZ, Estimates with A_∞ weights for various singular integral operators, Boll. Un. Mat. Ital. A (7) 8, 1 (1994), 123–133.
- [3] H. ARAI AND T. MIZUHARA, Morrey spaces on spaces of homogeneous type and estimates for □_b and the Cauchy-Szegö projection, Math. Nachr. 185, 1 (1997), 5–20.
- [4] V. I. BURENKOV AND H. GULIYEV, Necessary and sufficient conditions for boundedness of the maximal operator in local Morrey-type spaces, Studia Math. 163, 2 (2004), 157–176.
- [5] ERIDANI AND H. GUNAWAN, Stummel class and Morrey spaces, Southeast Asian Bull. Math. 29 (2005), 1053–1056.
- [6] A. ERIDANI, V. KOKILASHVILI, AND A. MESKHI, Morrey spaces and fractional integral operators, Expo. Math. 27, 3 (2009), 227–239.
- [7] M. GIAQUINTA, Multiple integrals in the calculus of variations and non-linear elliptic systems, Princeton Univ. Press, 1983.
- [8] V. GULIYEV, Integral operators on function spaces on homogeneous groups and on domains in Rⁿ, Doctor's Theses, Steklov Math. Inst. Moscow, 1994 (in Russian).
- [9] V. GULIYEV, Function spaces, integral operators and two weighted inequalities on homogeneous groups. Some applications, Baku, 1999 (in Russian).
- [10] V. GULIYEV, J. HASANOV, AND S. SAMKO, Maximal, potential and singular operators in the local "complementary" variable exponent Morrey type spaces, J. Math. Anal. Appl. 401, 1 (2013), 72–84.
- [11] A. KUFNER, O. JOHN, AND S. FUČIK, Function Spaces, Noordhoff International Publishing, Leyden, 1977.
- [12] S. LEONARDI, Remarks on the regularity of solutions of elliptic systems, A. Sequeira, H. B. Veiga, and J. H. Videman, Editors, Applied Nonlinear Analysis, Kluwer, New York, 1999, 325–344.
- [13] S. LEONARDI, Weighted Miranda-Talenti inequality and applications to equations with discontinuous coefficients, Comment. Math. Univ. Carolin. 43, 1 (2002), 43–59.
- [14] D. LUKKASSEN, L.-E. PERSSON AND S. SAMKO, Weighted Hardy operators in complementary Morrey spaces, J. Funct. Spaced Appl., to appear.
- [15] E. NAKAI, Hardy-Littlewood maximal operator, singular integral operators and the Riesz potentials on generalized Morrey spaces, Math. Nachr. 166 (1994), 95–103.



- [16] H. RAFEIRO, N. SAMKO, AND S. SAMKO, Morrey-Campanato spaces: an overview, In Oper. Theory, PDE and Math. Phys. Operator Theory: Advances and Applications, Birkhäuser, 228 (2013), 293– 324.
- [17] M. A. RAGUSA AND P. ZAMBONI, A potential theoretic inequality, Czech. Math. J. 51 (126) (2001), 55–65.
- [18] F. STUMMEL, Singuläre elliptische Differential-operatorenin Hilbertschen Räumen, Math. Ann. 132 (1956), 150–176.
- [19] M. E. TAYLOR, Tools for PDE: Pseudodifferential Operators, Paradifferential Operators, and Layer Potentials, volume 81 of Math. Surveys and Monogr., AMS, Providence, R. I. 2000.
- [20] C. T. ZORKO, Morrey space, Proc. Amer. Math. Soc. 98, 4 (1986), 586-592.