Mathematical
Inequalities
& Applications
Volume 19, Number 2 (2016), 499–522
doi:10.7153/mia-19-38

MULTIPLE SINGULAR INTEGRALS AND MAXIMAL OPERATORS WITH MIXED HOMOGENEITY ALONG COMPOUND SURFACES

FENG LIU AND DAIQING ZHANG

Abstract. In this paper we present the L^p mapping properties for a class of multiple singular integral operators along polynomial compound surfaces provided that the integral kernels are given by the radial function $h \in \Delta_\gamma$(or $h \in U_\gamma$) for some $\gamma > 1$ and the sphere function $\Omega \in \tilde{\mathcal{F}}_\beta(S^{m-1} \times S^{n-1})$ for some $\beta > 0$, which is distinct from $L(\log^+ L)^2(S^{m-1} \times S^{n-1})$. In addition, the L^p bounds for the related maximal operators are also established. Some previous results are greatly extended and improved.

Mathematics subject classification (2010): 42B20, 42B25.
Keywords and phrases: Singular integrals, maximal operators, mixed homogeneity, product domains.

REFERENCES

[1] A. AL-SALMAN, *Parabolic Marcinkiewicz integrals along surfaces on product domains*, Acta. Math. Sin. (Engl. Ser.), **27**, (2011), 1–18.
[2] A. AL-SALMAN, *Maximal operators with rough kernels on product domains*, J. Math. Anal. Appl., **311**, (2005), 338–351.
[3] A. AL-SALMAN, *A note on parabolic Marcinkiewicz integrals along surfaces*, Proc. A Razmadze Math. Inst., **154**, (2010), 21–36.
[4] A. AL-SALMAN, *Marcinkiewicz integrals along subvarieties on product domains*, Inter. J. Math. Math. Sci., **72**, (2004), 4001–4011.
[5] A. AL-SALMAN, H. AL-QASSEM AND Y. PAN, *Singular integrals on product domains*, Indiana Univ. Math. J., **55**, (2006), 369–387.
[6] K. AL-BALUSH AND A. AL-SALMAN, *Certain L^p bounds for rough singular integrals*, J. Math. Inequa., **8**, (2014), 803–822.
[7] H. AL-QASSEM AND Y. PAN, *A class of maximal operators related to rough singular integrals on product domains*, J. Integr. Equa. Appl., **17**, (2005), 331–356.
[8] J. CHEN, *L^p boundedness of singular integrals on product domains*, Sci. China (Ser. A), **44**, (2001), 681–689.
[9] L. CHEN AND H. LE, *Singular integrals with mixed homogeneity in product spaces*, Math. Inequal. Appl., **14**, (2011), 155–172.
[10] Y. DING, *A note on a class of rough maximal operators on product domains*, J. Math. Anal. Appl., **232**, (1999), 222–228.
[11] J. DUOANDIKOETXEA, *Multiple singular integrals and maximal functions along hypersurfaces*, Ann. Inst. Fourier Gronble, **36**, (1986), 185–206.
[12] E. FABES AND N. REVIÉRE, *Singular integrals with mixed homogenity*, Studia Math., **27**, (1966), 19–38.
[13] D. FAN AND Y. PAN, *Singular integral operators with rough kernels supported by subvarieties*, Amer. J. Math., **119**, (1997), 799–839.
[14] R. FEFFERMAN, *Singular integrals on product domains*, Bull. Amer. Math. Soc., **4**, (1981), 195–201.
[15] F. FEFFERMAN AND E. M. STEIN, *Singular integrals on product domains*, Adv. Math., **45**, (1982), 117–143.
[16] L. GRAFAKOS AND A. STEFANOV, *L^p bounds for singular integrals and maximal singular integrals with rough kernels*, Indiana Univ. Math. J., **47**, (1998), 455–469.

Paper MIA-19-38

[17] S. LAN, F. LIU AND H. WU, *Singular integrals and Marcinkiewicz integrals along compound curves on product domains*, Adv. Math. (China), **43**, 6 (2014), 921–941.
[18] Z. LI, B. MA AND H. WU, *Maximal operators and singular integrals with non-isotropic dilation on product domains*, Acta. Math. Sin. (Engl. Ser.), **26**, (2010), 1847–1864.
[19] F. LIU AND H. WU, *Multiple singular integrals and Marcinkiewicz integrals with mixed homogeneity along surfaces*, J. Inequal. Appl., **2012**, 189 (2012), 1–23.
[20] F. LIU AND H. WU, *Rough singular integrals and maximal operators with mixed homogeneity along compound curves*, Math. Nachr., **287**, (2014), 1166–1182.
[21] L. MA, D. FAN AND H. WU, *L^p bounds for singular integrals with rough kernels on product domains*, Acta. Math. Sin. (Engl. Ser.), **28**, (2012), 133–144.
[22] E. M. STEIN, *Harmonic Analysis: Real-variable methods, orthogonality and oscillatory integral*, Princeton University Press, Princeton, 1993.
[23] T. WALSH, *On the function of Marcinkiewicz*, Studia Math., **44**, (1972), 203–217.
[24] H. WU, *General Littlewood-Paley functions and singular integral operators on product spaces*, Math. Nachr., **279**, (2006), 431–444.
[25] H. WU AND S. YANG, *On multiple singular integrals along polynomial curves with rough kernels*, Acta Math Sin (Engl Ser), **24**, (2008), 177–184.
[26] Y. YING, *A note on singular integral operators on product domains*, J. Math. Study (in Chinese), **32**, (1999), 264–271.