

ON THE COMPACTNESS OF THE STEVIĆ–SHARMA OPERATOR ON THE LOGARITHMIC BLOCH SPACES

FANG ZHANG AND YONGMIN LIU

Abstract. Let $H(\mathbb{D})$ denote the space of all analytic functions on the unit disc \mathbb{D} of the complex plane \mathbb{C} , $\psi_1, \psi_2 \in H(\mathbb{D})$, and φ be an analytic self-map of \mathbb{D} . In this paper, we characterize the compactness of the Stević-Sharma operator on the logarithmic Bloch spaces.

Mathematics subject classification (2010): 47B38, 47B33, 46E15, 30D45.

Keywords and phrases: Compactness, logarithmic Bloch space, multiplication operator, composition operator, differentiation operator.

REFERENCES

- [1] R. CASTILLO, D. CLAHANE, J. FARIÁS LÓPEZ AND J. RAMOS FERNÁNDEZ, *Composition operators from logarithmic Bloch spaces to weighted Bloch spaces*, Appl. Math. Comput. **219**, 12 (2013), 6692–6706.
- [2] C. COWEN AND B. MACCLUER, *Composition operators on spaces of analytic functions*, Studies in Advanced Mathematics, CRC Press, Boca Raton, FL, USA, 1995.
- [3] P. GALANOPOULOS, *On \mathcal{B}_{\log} to Q_{\log}^p pullbacks*, J. Math. Anal. Appl. **337**, 1 (2008), 712–725.
- [4] A. GARCÍA ORTIZ AND J. RAMOS-FERNÁNDEZ, *Composition operators from logarithmic Bloch spaces to Bloch-type spaces*, Georgian Math. J. **20**, 4 (2013), 671–686.
- [5] R. A. HIBSCHWEILER AND N. PORTNOY, *Composition followed by differentiation between Bergman and Hardy spaces*, Rocky Mountain J. Math. **35**, 3 (2005), 843–855.
- [6] O. HYVÄRINEN AND I. NIEMINEN, *Weighted composition followed by differentiation between Bloch-type spaces*, Rev. Mat. Complut. **27**, 2 (2014), 641–656.
- [7] Z. JIANG, *On a class of operators from weighted Bergman spaces to some spaces of analytic functions*, Taiwanese J. Math. **15**, 5 (2011), 2095–2121.
- [8] Z. JIANG, *On a product-type operator from weighted Bergman-Orlicz space to some weighted type spaces*, Appl. Math. Comput. **256**, 2015, 37–51.
- [9] S. KRANTZ AND S. STEVIĆ, *On the iterated logarithmic Bloch space on the unit ball*, Nonlinear Anal. TMA **71**, (5–6) (2009), 1772–1795.
- [10] S. LI, *Products of weighted composition operator and differentiation operator on H^∞* , J. Math. (Wuhan) **30**, (2) (2010), 212–216.
- [11] S. LI AND S. STEVIĆ, *Composition followed by differentiation between Bloch type spaces*, J. Comput. Anal. Appl. **9**, (2) (2007), 195–205.
- [12] S. LI AND S. STEVIĆ, *Composition followed by differentiation from mixed-norm spaces to α -Bloch spaces*, Sb. Math. **199**, (12) (2008), 1847–1857.
- [13] S. LI AND S. STEVIĆ, *Composition followed by differentiation between H^∞ and α -Bloch spaces*, Houston J. Math. **35**, (1) (2009), 327–340.
- [14] S. LI AND S. STEVIĆ, *On an integral-type operator from iterated logarithmic Bloch spaces into Bloch-type spaces*, Appl. Math. Comput. **215**, (8) (2009), 3106–3115.
- [15] Y. LIANG AND Z. ZHOU, *Essential norm of the product of differentiation and composition operators between Bloch-type spaces*, Arch. Math. **100**, (4) (2013), 347–360.
- [16] Y. LIANG AND Z. ZHOU, *New estimate of essential norm of composition followed by differentiation between Bloch-type spaces*, Banach J. Math. Anal. **8**, (1) (2014), 118–137.

- [17] Y. LIU AND Y. YU, *Weighted differentiation composition operators from mixed-norm to Zygmund spaces*, Numer. Funct. Anal. Optim. **31**, (7–9) (2010), 936–954.
- [18] X. LIU AND Y. YU, *The product of differentiation operator and multiplication operator from H^∞ to Zygmund spaces*, J. Xuzhou Norm. Univ. Nat. Sci. Ed. **29**, (2011), 37–39.
- [19] Y. LIU AND Y. YU, *Composition followed by differentiation between H^∞ and Zygmund spaces*, Complex Anal. Oper. Theory **6**, (1) (2012), 121–137.
- [20] Y. LIU AND Y. YU, *On a Stević-Sharma operator from Hardy spaces to the logarithmic Bloch spaces*, J. Inequal. Appl. **2015**, (2015) 2015:22, DOI 10.1186/s13660-015-0547-1.
- [21] Y. LIU AND Y. YU, *Products of composition, multiplication and radial derivative operators from logarithmic Bloch spaces to weighted-type spaces on the unit ball*, J. Math. Anal. Appl. **423**, (1) (2015), 76–93.
- [22] Y. LIU AND J. ZHOU, *On an operator $M_{\mu, \mathcal{R}}$ from mixed norm spaces to Zygmund-type spaces on the unit ball*, Complex. Anal. Oper. Theory **7**, (3) (2013), 593–606.
- [23] K. MADIGAN AND A. MATHESON, *Compact composition operator on the Bloch space*, Trans. Amer. Math. Soc. **347**, (7) (1995), 2679–2687.
- [24] A. MONTES-RODRÍGUEZ, *Weighted composition operators on weighted Banach spaces of analytic functions*, J. London Math. Soc. (2) **61**, (3) (2000), 872–884.
- [25] S. OHNO, *Products of composition and differentiation between Hardy spaces*, Bull. Austral. Math. Soc. **73**, (2) (2006), 235–243.
- [26] H. QU, Y. LIU AND S. CHENG, *Weighted differentiation composition operator from Logarithmic Bloch spaces to Zygmund-type spaces*, Abstr. Appl. Anal., **2014**, (2014), Article ID 832713, 14 pp.
- [27] S. STEVIĆ, *Generalized composition operators from logarithmic Bloch spaces to mixed-norm spaces*, Util. Math. **77**, (2008), 167–172.
- [28] S. STEVIĆ, *On a new integral-type operator from the weighted Bergman space to the Bloch-type space on the unit ball*, Discrete Dyn. Nat. Soc. **2008**, (2008), Article ID 154263, 14 pp.
- [29] S. STEVIĆ, *On a new operator from H^∞ to the Bloch-type space on the unit ball*, Util. Math. **77**, (2008), 257–263.
- [30] S. STEVIĆ, *On a new operator from the logarithmic Bloch space to the Bloch-type space on the unit ball*, Appl. Math. Comput. **206**, (1) (2008), 313–320.
- [31] S. STEVIĆ, *Integral-type operators from a mixed norm space to a Bloch-type space on the unit ball*, Sib. Math. J. **50**, (6) (2009), 1098–1105.
- [32] S. STEVIĆ, *Norm and essential norm of composition followed by differentiation from α -Bloch spaces to H^∞_μ* , Appl. Math. Comput. **207**, (1) (2009), 225–229.
- [33] S. STEVIĆ, *On an integral-type operator from logarithmic Bloch-type and mixed-norm spaces to Bloch-type spaces*, Nonlinear Anal. TMA **71**, (12) (2009), 6323–6342.
- [34] S. STEVIĆ, *On new Bloch-type spaces*, Appl. Math. Comput. **215**, (2) (2009), 841–849.
- [35] S. STEVIĆ, *Products of composition and differentiation operators on the weighted Bergman space*, Bull. Belg. Math. Soc. Simon Stevin **16**, (4) (2009), 623–635.
- [36] S. STEVIĆ, *Products of integral-type operators and composition operators from the mixed norm space to Bloch-type spaces*, Sib. Math. J. **50**, (4) (2009), 726–736.
- [37] S. STEVIĆ, *Weighted differentiation composition operators from mixed-norm spaces to weighted-type spaces*, Appl. Math. Comput. **211**, (1) (2009), 222–233.
- [38] S. STEVIĆ, *On an integral operator between Bloch-type spaces on the unit ball*, Bull. Sci. Math. **134** (4) (2010), 329–339.
- [39] S. STEVIĆ, *On an integral-type operator from logarithmic Bloch-type spaces to mixed-norm spaces on the unit ball*, Appl. Math. Comput. **215**, (11) (2010), 3817–3823.
- [40] S. STEVIĆ, *On an integral-type operator from Zygmund-type spaces to mixed-norm spaces on the unit ball*, Abstr. Appl. Anal. **2010**, (2010), Article ID 198608, 7 pp.
- [41] S. STEVIĆ, *On operator P_ϕ^S from the logarithmic Bloch-type space to the mixed-norm space on unit ball*, Appl. Math. Comput. **215** (12) (2010), 4248–4255.
- [42] S. STEVIĆ, *Weighted composition operators from the logarithmic weighted-type space to the weighted Bergman space in \mathbb{C}^n* , Appl. Math. Comput. **216**, (3) (2010), 924–928.
- [43] S. STEVIĆ, *Weighted differentiation composition operators from H^∞ and Bloch spaces to n th weighted-type spaces on the unit disk*, Appl. Math. Comput. **216**, (12) (2010), 3634–3641.
- [44] S. STEVIĆ, *Characterizations of composition followed by differentiation between Bloch-type spaces*, Appl. Math. Comput. **218**, (8) (2011), 4312–4316.

- [45] S. STEVIĆ, *On a product-type operator from Bloch spaces to weighted-type spaces on the unit ball*, Appl. Math. Comput. **217**, (12) (2011), 5930–5935.
- [46] S. STEVIĆ, *Norm of some operators from logarithmic Bloch-type spaces to weighted-type spaces*, Appl. Math. Comput. **218**, (22) (2012), 11163–11170.
- [47] S. STEVIĆ, *Weighted radial operator from the mixed-norm space to the n th weighted-type space on the unit ball*, Appl. Math. Comput. **218**, (18) (2012), 9241–9247.
- [48] S. STEVIĆ AND R. AGARWAL, *Weighted composition operators from logarithmic Bloch-type spaces to Bloch-type spaces*, J. Inequal. Appl. **2009**, (2009), Article ID 964814, 21 pp.
- [49] S. STEVIĆ, A. SHARMA AND A. BHAT, *Essential norm of products of multiplication composition and differentiation operators on weighted Bergman spaces*, Appl. Math. Comput. **218**, (6) (2011), 2386–2397.
- [50] S. STEVIĆ, A. SHARMA AND A. BHAT, *Products of multiplication, composition and differentiation operators on weighted Bergman space*, Appl. Math. Comput. **217**, (20) (2011), 8115–8125.
- [51] S. STEVIĆ AND S. UEKI, *Integral-type operators acting between weighted-type spaces on the unit ball*, Appl. Math. Comput. **215**, (7) (2009), 2464–2471.
- [52] S. YE, *Multipliers and cyclic vectors on the weighted Bloch space*, Math. J. Okayama Univ. **48**, (2006), 135–143.
- [53] S. YE, *A weighted composition operator on the logarithmic Bloch space*, Bull. Korean Math. Soc. **47**, (3) (2010), 527–540.
- [54] S. YE, *Norm and essential norm of composition followed by differentiation from logarithmic Bloch spaces to H_{μ}^{∞}* , Abstr. Appl. Anal. **2014**, (2014), Article ID 725145, 6 pp.
- [55] R. YONEDA, *The composition operators on weighted Bloch space*, Arch. Math. (Basel) **78**, (4) (2002), 310–317.
- [56] Y. YU AND Y. LIU, *The product of differentiation operator and multiplication operator from the mixed-norm to Bloch-type space (Chinese)*, Acta Math. Sci. Ser. A Chin. Ed. **32**, (1) (2012), 68–79.
- [57] Y. YU AND Y. LIU, *On Stević type operator from H^{∞} space to the logarithmic Bloch spaces*, Complex Anal. Oper. Theory, **9**, 8 (2015), 1759–1780. DOI: 10.1007/s11785-015-0465-8.
- [58] Y. YU AND Y. LIU, *Boundedness of product-type operators on the logarithmic Bloch spaces*, Chinese Journal of Contemporary Mathematics, in press.
- [59] F. ZHANG AND Y. LIU, *Products of multiplication, composition and differentiation operators from mixed-norm spaces to weighted-type spaces*, Taiwanese J. Math. **18**, (6) (2014), 1927–1940.
- [60] J. ZHOU AND Y. LIU, *Products of radial derivative and multiplication operators from $F(p, q, s)$ to weighted-type spaces on the unit ball*, Taiwanese J. Math. **17**, (1) (2013), 161–178.
- [61] J. ZHOU AND Y. LIU, *Products of radial derivative and multiplication operator between mixed norm spaces and Zygmund-type spaces on the unit ball*, Math. Inequal. Appl. **17**, (1) (2014), 349–366.
- [62] J. ZHOU AND X. ZHU, *Product of differentiation and composition operators on the logarithmic Bloch space*, J. Inequal. Appl. **2014**, (2014), 2014:453, DOI 10.1186/1029-242X-2014-453.
- [63] X. ZHU, *Products of differentiation, composition and multiplication from Bergman type spaces to Bers type spaces*, Integral Transforms Spec. Funct. **18**, (3–4) (2007), 223–231.