

## WEIGHTED COMPOSITION OPERATORS FROM THE LIPSCHITZ SPACE INTO THE ZYGMUND SPACE

FLAVIA COLONNA AND SONGXIAO LI

*Abstract.* In this work, we give several characterizations of the bounded and the compact weighted composition operators from the Lipschitz space into the Zygmund space.

*Mathematics subject classification (2010):* Primary 47B33; secondary 30H05.

*Keywords and phrases:* Weighted composition operator, Lipschitz space, Zygmund space.

### REFERENCES

- [1] R. F. ALLEN, F. COLONNA AND G. R. EASLEY, *Multiplication operators on the weighted Lipschitz space of a tree*, J. Oper. Theory, to appear.
- [2] B. CHOE, H. KOO AND W. SMITH, *Composition operators on small spaces*, Integr. Equ. Oper. Theory **56** (2006), 357–380.
- [3] F. COLONNA, *New criteria for boundedness and compactness of weighted composition operators mapping into the Bloch space*, Cent. Eur. J. Math. **11** (1) (2013), 55–73.
- [4] F. COLONNA AND G. R. EASLEY, *Multiplication operators on the Lipschitz space of a tree*, Integr. Equ. Oper. Theory **68** (2010), 391–411.
- [5] F. COLONNA AND S. LI, *Weighted composition operators from the minimal invariant space to the Bloch space*, *Mediterr. J. Math.* **10** (1) (2013), 395–409.
- [6] F. COLONNA AND S. LI, *Weighted composition operators from  $H^\infty$  into the Zygmund space*, Complex Anal. Oper. Theory, to appear.
- [7] C. COWEN AND B. D. MACCLUER, *Composition Operators on Spaces of Analytic Functions*, Studies in Advanced Mathematics, CRC Press, Boca Raton, 1995.
- [8] J. DAI AND C. OUYANG, *Compact composition operators on generalized Lipschitz spaces*, Acta Math. Sci. **31** (2011), 1347–1356.
- [9] K. DELEEUW, W. RUDIN AND J. WERMER, *The isometries of some Banach spaces*, Proc. Amer. Math. Soc. **11** (1960), 694–698.
- [10] P. L. DUREN, *Theory of  $H^p$  Spaces*, Academic press, New York, 1970.
- [11] P. L. DUREN, B. W. ROMBERG AND A. L. SHIELDS, *Linear functionals on  $H^p$  spaces with  $0 < p < 1$* , J. Reine Angew. Math. **238** (1969), 32–60.
- [12] M. EL-GEBEILY AND J. WOLFE, *Isometries of the disk algebra*, Proc. Amer. Math. Soc. **93** (1985), 697–702.
- [13] F. FORELLI, *The isometries of  $H^p$* , Canad. J. Math. **16** (1964), 721–728.
- [14] G. H. HARDY AND J. E. LITTLEWOOD, *Some properties of fractional integrals, II*, Math. Z. **34** (1932), 403–439.
- [15] C. KOLASKI, *Isometries of weighted Bergman spaces*, Canad. J. Math. **34** (1982), 910–915.
- [16] S. LI, *Weighted composition operators from minimal Möbius invariant spaces to Zygmund spaces*, Filomat, to appear.
- [17] S. LI AND S. STEVIĆ, *Generalized composition operators on Zygmund spaces and Bloch type spaces*, J. Math. Anal. Appl. **338** (2008), 1282–1295.
- [18] S. LI AND S. STEVIĆ, *Weighted composition operators from Zygmund spaces into Bloch spaces*, Appl. Math. Comput. **206** (2008), 825–831.
- [19] Y. LIU AND Y. YU, *Composition followed by differentiation between  $H^\infty$  and Zygmund spaces*, Complex Anal. Oper. Theory **6** (2012), 121–137.

- [20] M. MADIGAN, *Composition operators on analytic Lipschitz spaces*, Proc. Amer. Math. Soc. **119** (1993), 465–473.
- [21] P. NIEMINEN, *Compact differences of composition operators on Bloch and Lipschitz Spaces*, Comput. Method Funct. Theory **7** (2007), 325–344.
- [22] S. OHNO, K. STROETHOFF AND R. ZHAO, *Weighted composition operators between Bloch-type spaces*, Rocky Mountain J. Math. **33** (2003), 191–215.
- [23] R. ROAN, *Composition operators on a space of Lipschitz functions*, Rocky Mountain J. Math. **10** (1980), 371–380.
- [24] J. SHAPIRO, *Composition Operators and Classical Function Theory*, Springer-Verlag, New York, 1993.
- [25] S. STEVIĆ, *Composition followed by differentiation from  $H^\infty$  and the Bloch space to  $n$ -th weighted-type spaces on the unit disk*, Appl. Math. Comput. **216** (2010), 3450–3458.
- [26] S. STEVIĆ, *Weighted differentiation composition operators from mixed-norm spaces to the  $n$ -th weighted-type space on the unit disk*, Abstr. Appl. Anal. Vol. 2010, Article ID 246287, (2010), 15 pages.
- [27] S. STEVIĆ, *Weighted differentiation composition operators from  $H^\infty$  and Bloch spaces to  $n$ -th weighted-type spaces on the unit disk*, Appl. Math. Comput. **216** (2010), 3634–3641.
- [28] H. WULAN, D. ZHENG AND K. ZHU, *Compact composition operators on  $BMOA$  and the Bloch space*, Proc. Amer. Math. Soc. **137** (2009), 3861–3868.
- [29] K. ZHU, *Bloch type spaces of analytic functions*, Rocky Mountain J. Math. **23** (1993), 1143–1177.