Some Bergman type operators and projections on mixed norm and Besov spaces

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As is well known, Bergman (type) projection operators T continuously map weighted Lebesgue and some more general mixed norm spaces $L(p, q, \alpha)$ onto their holomorphic or harmonic subspaces $h(p, q, \alpha)$ for suitable parameters. First, we find a necessary and sufficient condition for the operators T to be bounded on mixed norm spaces $L(p, q, \alpha)$ over the unit ball in $\mathbb{R}^n$. To this end, we define harmonic reproducing kernels P_α of Poisson–Bergman type given by a version of fractional derivative, and next prove sharp lower estimates for the kernels P_α and their mixed norms. Second, for non-positive α, Bergman projection T continuously maps mixed norm space $L(p, q, \alpha)$ onto a harmonic Besov space. Then we turn to Besov spaces and define three-parameter Besov spaces $\Lambda^{p,q}_\alpha$ of smooth functions over the unit ball in $\mathbb{R}^n$. A new family of Bergman type operators is constructed whose members are true projections from the Besov space $\Lambda^{p,q}_\alpha$ onto its harmonic subspace $h\Lambda^{p,q}_\alpha$, see [1], [2].

References

[1] K. Avetisyan, *Estimates for harmonic reproducing kernel and Bergman type operators on mixed norm and Besov spaces in the real ball*, Annals Funct. Anal. **14** (2023), no. 2, Article 40, 29 pp.

[2] K. Avetisyan, *Harmonic Poisson-Bergman kernel and Besov spaces in the real ball*, Indian J. Pure Appl. Math., 2024, (to appear).