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Fractional Calculus and Wavelet Transforms in Integral Geometry

Each Radon transform under consideration gives rise to a certain family of fractional integrals generating the relevant wavelet transforms. This approach enables us to obtain explicit inverses (in the framework of L^p-spaces) to the following transforms: the k-plane transforms on R^n; the Radon transform and the hemispherical transform on the sphere; the totally geodesic transform and the horocycle transform on real hyperbolic spaces. An explicit solution to the Kolmogorov problem on reconstructing a finite Borel measure on R^n from its values for all half-spaces is obtained in the "wavelet form". Part of these results, related to hyperbolic spaces, is joint work with C. A. Berenstein and W. O. Bray.

Reference: [1] Helgason, S., Geometric analysis on symmetric spaces, Amer. Math. Soc., Providence, RI, 1994. [2] Rubin, B., Fractional integrals and potentials, Addison Wesley Longman, Essex, U. K., 1996.