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*Composite Cosine Transforms on Stiefel Manifolds.*

We introduce new higher rank integral transforms that generalize the classical cosine transform, arising in convex geometry, the Banach space theory, and other areas, for functions on the Stiefel and Grassmann manifolds. We call them the composite cosine transforms, by taking into account that their kernel agrees with the composite power function of the cone of positive definite symmetric matrices. We show that injectivity of the composite cosine transforms can be studied using standard tools of the Fourier analysis on matrix spaces and obtain an explicit representation of the corresponding Fourier multiplier. Our technique is based on application of the higher rank Radon transform on matrix spaces. (Received February 15, 2006)