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Conical Distributions on the Space of Flat Horocycles

Let $G_0 = \mathfrak{p} \rtimes K$ be the Cartan motion group associated with a noncompact semisimple Riemannian symmetric pair (G, K). Let $\mathfrak{a}$ be a maximal abelian subspace of $\mathfrak{p}$ and let $\mathfrak{p} = \mathfrak{a} + \mathfrak{q}$ be the corresponding orthogonal decomposition. A flat horocycle in $\mathfrak{p}$ is a G_0-translate of $\mathfrak{q}$. A conical distribution on the space Ξ_0 of flat horocycles is an eigendistribution of the algebra $\mathbb{D}(\Xi_0)$ of G_0-invariant differential operators on Ξ_0 which is invariant under the left action of the isotropy subgroup of G_0 fixing $\mathfrak{q}$. We prove that the space of conical distributions belonging to each generic eigenspace of $\mathbb{D}(\Xi_0)$ is one-dimensional, and we classify the set of all conical distributions on Ξ_0 when G/K has rank one. We also consider the question of the irreducibility of the natural representation of G_0 on the eigenspaces of $\mathbb{D}(\Xi_0)$.

Keywords: Conical distributions, Cartan motion group, horocycle Radon transform.

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