The Second Moments of Hecke-Maass Forms for $SL(3,\mathbb{Z})$

We consider Hecke-Maass forms, which are smooth complex valued cuspidal functions on the generalized upper half-plane, $\mathfrak{h}^3$, and are eigenfunctions of all Hecke operators. For $z \in \mathfrak{h}^3$, we have $z = x \cdot y$, where $\cdot$ means that matrix multiplication,

$$x = \begin{pmatrix} 1 & x_2 & x_3 \\ 0 & 1 & x_1 \\ 0 & 0 & 1 \end{pmatrix} \text{ and } y = \begin{pmatrix} y_1 y_2 & 0 & 0 \\ 0 & y_1 & 0 \\ 0 & 0 & 1 \end{pmatrix},$$

$x_1, x_2, x_3, y_1, y_2 \in \mathbb{R}$ and $y_1 > 0, y_2 > 0$.
The measure here on $\mathfrak{h}^3$ is

$$dx_1 dx_2 dx_3 \frac{dy_1 dy_2}{(y_1 y_2)^3}.$$

The techniques we apply come from number theory and nonabelian Fourier analysis on Lie groups. This is a joint work with Professor Xiaoqing Li.