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# Spectral decomposition on the space of flat surfaces: Laplacians and Siegel—Veech Transforms

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A classical result in spectral theory is that the space of square integrable functions on the modular surface X = SL(2,Z) \ SL(2,R) can be decomposed as the space of Eisenstein series and its orthogonal complements, the cusp forms. The former space corresponds to the spectral projection on the continuous spectrum of the Laplacian on X, and the cusp forms to the projection on the point spectrum. This result is relevant in the geometry of numbers and in dynamics because the modular surface can parameterise the space of all unimodular lattices (and, thus, also the space of all unit area flat tori).

In this talk, I will explain how to extend these ideas to the study of spaces of flat surfaces of higher genus with singularities. We replace the Eisenstein series with the range of the Siegel—Veech transform and in some specific cases can also identify precisely the cusp forms. I will focus on the case of marked flat tori, this space corresponding to the space of affine lattices. In this situation, we can also identify an operator; which is not the Laplacian but a foliated Laplacian; where the natural decomposition corresponds to its spectrum.

This is joint work with Jayadev S. Athreya (Washington), Martin Möller (Frankfurt) and Martin Raum (Chalmers)

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