

On the first eigenvalue on degenerating hyperbolic surfaces

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We consider the first non-zero eigenvalue λ_1 of the Laplacian on hyperbolic surfaces for which one disconnecting collar degenerates and prove that $8\pi\nabla \log \lambda_1$ essentially agrees with the dual of the differential of the degenerating Fenchel-Nielsen length coordinate. This result is mainly based on analysing properties of holomorphic quadratic differentials and relating quadratic holomorphic differentials to Fenchel-Nielsen coordinates. As a corollary we obtain that λ_1 essentially only depends on the length of the collapsing geodesic σ and the topology of $M \setminus \sigma$, with error estimates that are sharp for all surfaces of genus greater than 2.

This is joint work with Melanie Rupflin (Oxford), arXiv: 1701.08491. The first part will focus on the general picture and preliminaries on the used methods. In the second part we give the results, the proof ideas and some constructions used in the proof.