Pseudospectrum of asymptotically AdS black holes

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Abstract

In this work we extend our study of pseudospectra of black hole quasi-normal modes to geometries with anti-de Sitter (AdS) asymptotics. This allows for a more precise treatment of certain technical issues in the pseudospectrum analysis, such as dependence on the foliation and numerical convergence. On the one hand, we compare results obtained with a (half-)hyperboloidal and ingoing null foilations, finding slight qualitative differences around fundamental modes. On the other, we analyse the long-standing issue of numerical non-convergence of the resolvent norm used to compute the pseudospectral regions in the compex plane. Particularly, we find that, for the problem posed in the null foliaiton, convergence of this norm with the number of grid points seems to depend entirely on a combination of two factors: the magnitude of the damping scale (i.e. the imaginary part in frequency space), and the order of regularity of the solutions required by the norm used. Our results find remarkable agreement with a work by Warnick (2015) in which quasi-normal modes are characterised as eigenvalues according to the regularity class of their corresponding eigenfunctions.

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