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Adiabatic Solutions in General Relativity as Null Geodesics on the Space of Boundary Diffeomorphisms

We use a trick similar to that of Weinberg's for adiabatic modes, in a Manton approximation for general relativity on a spacetime whose spatial slices have a boundary. We show that this results in a description of the slow-time dependent solutions as null geodesics on the space of boundary diffeomorphisms, with respect to a metric we prove to be composed solely of the boundary data. We partially show and partially conjecture how the solutions in the bulk space are fixed via the constraint equations of general relativity. To discuss certain features, we study some simple cases in 3+1 and 2+1 dimensions and show that for the solutions we propose the harder-to-untangle Hamiltonian constraint becomes the real homogeneous Monge-Ampere equation for the latter.

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