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Continuation of Schwarzschild exterior without a black hole in first order gravity

We present a smooth extension of the Schwarzschild exterior geometry, where the singular interior is superceded by a vacuum phase with vanishing metric determinant. Unlike the Kruskal-Szekeres continuation, this explicit solution to the first-order field equations in vacuum has no singularity in the curvature two-form fields, no horizon and no global time. The underlying non-analytic structure provides a distinct geometric realization of 'mass' in classical gravity. We also find that the negative mass Schwarzschild solution does not admit a similar extension within the first-order theory. This is consistent with the general expectation that degenerate metric solutions associated with the Hilbert-Palatini Lagrangian formulation should satisfy the energy conditions.

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