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Regularity of isoperimetric regions that are close to a smooth manifold

In this paper we prove a regularity theorem for isoperimetric regions T that are close in flat norm to an open bounded set B with smooth boundary in a smooth complete (possibly noncompact) n -dimensional Riemannian manifold (M^n, g) (the dimension n being arbitrary) with Ricci curvature bounded below and volume of balls uniformly bounded below with respect to its center by a positive constant. In fact we prove that under the above assumptions the boundary of T is smooth and is the normal graph of a function u whose Hölder norms are controlled by the volume of the symmetric difference $T\Delta B$. Moreover we allow the metric g to be variable and obtain a suitable regularity result for applications to the study of the isoperimetric profile.