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<tr><th>authors</th><td>Gang Tian
Jeff Viaclovsky</td></tr>
<tr><th>title</th><td>Volume growth, curvature decay, and critical metrics</td></tr>
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<tr><th>id</th><td>id-473801789790225149</td></tr>
<tr><th>abstract</th><td>We make some improvements to our previous results in [TV05a] and [TV05b] . First, we prove a version of our volume growth theorem which does not require any assumption on the first Betti number. Second, we show that our local regularity theorem only requires a lower volume growth assumption, not a full Sobolev constant bound. As an application of these results, we can weaken the assumptions of several of our theorems in [TV05a] and [TV05b]. Spaces satisfying such a curvature decay condition are said to have asymptotically nonnegative curvature. We remark that by standard comparison theory, (1.2) and (1.3) imply an upper volume growth estimate, for some constant V 0 . Moreover, only a lower bound on the Ricci curvature is needed for this upper volume growth estimate [Zhu94] . It has been understood that such a volume estimate is the core of extending orbifold-compactness theorems for Einstein metrics to metrics satisfying more general equations, such as anti-self-dual or harmonic curvature. To this end, in our investigation of critical metrics in [TV05a], [TV05b] , and in the work of [And05], spaces arise with curvature decay as in (1.2), but the function k(r) only satisfies k(r) â†’ 0 as r â†’ âˆž, and standard comparison arguments do not apply. In [TV05a] we proved an upper volume growth estimate in this case, but our proof required finiteness of the first Betti number to rule out the presence of so-called "bad" annuli. In this paper, we show that adding the condition (1.4) below, eliminates this pathology. For M non-compact, C S is defined to be the best constant so that for all f âˆˆ C 0,1 (M) with compact support. Let Ric âˆ’ denote the negative part of the Ricci tensor. Theorem 1.1. Let (M, g) be a complete, noncompact, n-dimensional Riemannian manifold with base point p. Assume that C S < âˆž, and that sup S(r) |Rm g | = o(r âˆ’2), as r â†’ âˆž, where S(r) denotes the sphere of radius r centered at p. If M |Ric âˆ’ | n 2 dV g < , (1.4) for some constant âˆˆ R, then (M, g) has finitely many ends, and there exists a constant C 2 (depending on g) so that Vol(B(p, r)) â‰¤ C 2 r n . Furthermore, each end is ALE of order 0.</td></tr>
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<tr><th>publication_date</th><td>2006-12-17 00:00:00</td></tr>
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<tr><th>abstract</th><td>We make some improvements to our previous results. First, we prove a version of our volume growth theorem which does not require any assumption on the first Betti number. Second, we show that our local regularity theorem only requires a lower volume growth assumption, not a full Sobolev constant bound. These results allow us to weaken the assumptions of our previous volume growth and convergence theorems.</td></tr>
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