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Upper bound on the revised first Betti number and torus stability for RCD spaces

Abstract: It was shown by Gromov and Gallot that for a fixed dimension $n$ there exists a positive number $\varepsilon(n)$ so that any $n$-dimensional closed Riemannian manifold $(M, g)$ satisfying $\text{Ricci diam}^2 \geq -\varepsilon(n)$ must have first Betti number smaller than or equal to $n$. Later on, Cheeger and Colding showed that if the first Betti number of $M$ equals $n$ then $(M, g)$ has to be bi-Hölder homeomorphic to a flat torus.

In this talk we will generalize the previous results to the case of $\text{RCD}(K, N)$ spaces, which is the synthetic notion of riemannian manifolds satisfying $\text{Ricci} \geq K$ and $\text{dim} \leq N$. This class of spaces include Ricci limit spaces and Alexandrov spaces.

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