Roberto Frigerio's research interests

Bounded cohomology and simplicial volume The exact value of non-vanishing simplicial volumes is known only for a few classes of manifolds. In collaboration with Bucher and Pagliantini, we recently carried out some computations for families of 3-manifolds with boundary. It would be interesting to provide computations for other classes of manifolds (e.g. locally symmetric spaces).

Bounded cohomology provides a powerful tool for the study of the simplicial volume. In collaboration with Bucher, Burger, Iozzi, Pagliantini and Pozzetti we analyzed the bounded cohomology of graphs of groups with amenable edge groups. As an application, we provided a self-contained proof of the additivity of the simplicial volume with respect to gluings along submanifolds with amenable fundamental group. Could our techniques be used to study the bounded cohomology of free groups in higher dimensions?

A long-standing conjecture by Gromov states that, in the context of closed aspherical manifolds, the vanishing of the simplicial volume implies the vanishing of the Euler characteristic. We discussed some aspects of this problem in a paper with Francaviglia and Martelli, and we are currently interested in any possible progress on this topic.

Geometric group theory and rigidity for manifolds By Mostow Rigidity, smooth rigidity holds within the class of closed hyperbolic n-manifolds, $n \geq 3$. Moreover, up to taking finite extensions, the class of fundamental groups of hyperbolic manifolds is closed with respect to quasi-isometry, so also quasi-isometric rigidity holds in this class. In collaboration with J.F. Lafont and A. Sisto, we defined a class of manifolds which contains many examples not supporting any non-positively curved metric, and we proved results concerning smooth rigidity and quasi-isometric rigidity of manifolds in that class. The fundamental groups of our manifolds are naturally the fundamental groups of graph of groups with non-positively curved vertex groups. It would be interesting to deepen our analysis of the quasi-isometric properties of graph of groups with particular vertex and/or edge groups.

A group theoretic question In studying levels of knotting of handlebodies in the 3-space (with R. Benedetti) we were lead to the following group-theoretic question.

Let a finite presentation of a group G be given. How can one compute the maximal number r such that G surjects onto a free group on r generators (this number is called the *corank* of G)?

Makanin's algorithm for finding solutions to equations in free groups provides a theoretic (but basically non-implementable) answer to our question. Useful obstructions come from homology and Alexander invariants of groups, but I wonder if some geometric tool could be of use here (warning: the corank of a finite-index subgroup of G is usually much greater than the corank of G, so it could be difficult to exploit plain coarse-geometric arguments).