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The cohomology of 4-dimensional toric orbifolds

A toric orbifold is an even dimensional orbifold formed by gluing tori together in a combinatorial way determined by a simple polytope and a characteristic function. Examples include weighted projective spaces and quasitoric manifolds.

In 2006 Masuda and Suh posed the cohomological rigidity problem: in which class of toric spaces the geometric / topological structures of the spaces are determined solely by their cohomology rings? It has become one of the major and longstanding problems in toric topology. Extensive work has been done to prove an affirmative answer in several smooth cases and to investigate various adaptions of the problem. In the orbifold case, the cohomology rigidity problem is even more challenging and very little is known.

In addition, despite being fundamental objects in toric topology, the cohomology rings of toric orbifolds remain largely unknown except for very few special cases. A central problem is to understand the interplay between their cohomology ring structures and the underlying combinatorial data.

In my presentation I will talk about my joint projects on the cohomological rigidity and the cohomology ring structures of 4-dimensional toric orbifolds.

This is joint work with Xin Fu (Beijing Institute of Mathematical Sciences and Applications) and Jongbaek Song (Pusan National University).