

# Finite-sided deformation spaces of complete affine 3-manifolds

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A Margulis spacetime is a complete affine 3-manifold  $M$  with nonsolvable fundamental group. Associated to every Margulis spacetime is a noncompact complete hyperbolic surface  $S$ . We show that every Margulis spacetime is orientable, even though  $S$  may be nonorientable. We classify Margulis spacetimes when  $S$  is homeomorphic to a two-holed cross-surface, that is, the complement of two disjoint discs in the real projective plane. We show that every such manifold is homeomorphic to a solid handlebody of genus two, and admits a fundamental polyhedron bounded by crooked planes. Furthermore, the deformation space is a bundle of convex quadrilateral cones over the space of marked hyperbolic structures. The sides of each quadrilateral cone are defined by invariants of the two boundary components and the two orientation-reversing simple curves. The two-holed cross-surface, together with the three-holed sphere, are the only topologies for which the deformation space of complete affine structures is finite-sided.

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