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The topology of low dimensional cohomogeneity one manifolds

A cohomogeneity one manifold is a manifold with the action of a compact Lie group such that the quotient space is one dimensional. Such manifolds are important in Riemannian geometry as well as in other areas of geometry and in physics. W. D. Neumann and J. Parker classified this type of manifold in dimensions 4 and lower and the speaker classified compact simply connected cohomogeneity one manifolds in dimensions 5, 6 and 7. In this talk we will discuss this classification as well as recent progress toward understanding the topology of these manifolds.