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TOPOLOGICAL PROPERTIES OF SOME COHOMOGENEITY ON RIEMANNIAN MANIFOLDS OF NONPOSITIVE CURVATURE

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Abstract. In this paper we study some non-positively curved Riemannian manifolds acted on by a Lie group of isometries with principal orbits of codimension one. Among other results it is proved that if the universal covering manifold satisfies some conditions then every non-exceptional singular orbit is a totally geodesic submanifold. When M is flat and is not toruslike, it is proved that either each orbit is isometric to $\mathbb{R}^k \times \mathbb{T}^m$ or there is a singular orbit. If the singular orbit is uniqe and non-exceptional, then it is isometric to $\mathbb{R}^k \times \mathbb{T}^m$.

1. Introduction

Recently, cohomogeneity one Riemannian manifolds have been studied from different points of view. A. Alekseevsky and D. Alekseevsky in [1] and [2] gave a description of such manifolds in terms of Lie subgroups of a Lie group G, Podesta and Spiro in [13] got some nice results in negatively curved case, Searle in [14] provided a complete classification of such manifolds in dimensions less than 6 when they are compact and of positive curvature. The aim of this paper is to deal with some non-positively curved cohomogeneity one Riemannian manifolds. We generalize some of the theorems of [13] to the case where M is a product of negatively curved manifolds. Also in Section 4 we study some cohomogeneity one flat Riemannian manifolds. Our main results are Theorems 3.5, 3.7, 3.10, and 4.4.

2. Preliminaries

Definition 2.0. *Let M be a complete Riemannian manifold and G a Lie group of isometries which is closed in the full group of isometries of M. We say*