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RIEMANNIAN STRUCTURES AND THE CODIMENSION OF EXCEPTIONAL MINIMAL SURFACES IN H^n AND R^n

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0. Introduction

Let $N^n(c)$ denote the n-dimensional simply connected space form of constant curvature c. In particular, set $R^n=N^n(0)$, $S^n=N^n(1)$ and $H^n=N^n(-1)$. Let us consider a kind of rigidity problem to classify those minimal surfaces in $N^n(c)$ which are (locally) isometric to minimal surfaces in $N^3(c)$. Concerning this problem, several results are known (see [6], [7], [8], [9], [10], [11], [13], [14], [15], [16]). In the Euclidean case where $c=0$, Lawson [6] solved this problem completely (cf. [7, Chapter IV]). He showed that if a minimal surface in R^n is isometric to a minimal surface in R^3, then either M lies in a totally geodesic R^3, or M lies fully in a totally geodesic R^6 as a special type of minimal surfaces. Here we say that a subset in $N^n(c)$ lies fully in $N^n(c)$ if it does not lie in a totally geodesic $N^{n-1}(c)$. In particular, his result implies that if $n=4$, $n=5$ or $n\geqq 7$, then the Riemannian structures of minimal surfaces lying fully in R^n are different from those of minimal surfaces in R^3. In the previous paper [13], we showed that if a minimal surface in $N^4(c)$ is isometric to a minimal surface in $N^3(c)$, then M lies in a totally geodesic $N^3(c)$. This result says that the Riemannian structures of minimal surfaces lying fully in $N^4(c)$ are different from those of minimal surfaces in $N^3(c)$. These results suggest that there are some relations between the Riemannian structures and the codimension of minimal surfaces in $N^n(c)$.

In [4] Johnson gave a nice class of minimal surfaces in $N^n(c)$ which can be intrinsically characterized by the generalized Ricci condition. They are called exceptional minimal surfaces and are related to the theory of harmonic sequences in [1], [2] and [17] (see [15]).

In this paper we will discuss the relation between the Riemannian structures and the codimension of exceptional minimal surfaces in H^n and R^n. Our results are stated as follows:

THEOREM 1. *Suppose that an exceptional minimal surface lying fully in H^{n_1} is isometric to an exceptional minimal surface lying fully in H^{n_2}. Then $n_1=n_2$.*

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