

DUMITRU Dan, Particular Cases of Special Robertson-Walker Multiply Warped Products Having an Affine Connection

Abstract

In this paper we study some particular cases of Einstein equations for special Robertson-Walker multiply warped products $M = I \times_{f_1} F_1 \times \dots \times_{f_m} F_m$, where $I \subset \mathbb{R}$ is an open interval, $\dim I = 1$, $f_i : I \rightarrow (0, \infty)$, $f_i \in C^\infty(I)$, $\dim F_i = k_i \geq 1$ for every $i \in \{1, \dots, m\}$, $m \geq 1$, having an affine connection. We compute the warping functions in the following cases:

A). M is Ricci flat having a quarter-symmetric non-metric connection and all the fibres have the dimensions equal to 1.

B). M is Ricci flat having a quarter-symmetric metric connection and all the fibres have the dimensions equal to 1.

C). M is Ricci flat having a quarter-symmetric metric connection and all the the warping functions are equal.

D). M is Ricci flat having a quarter-symmetric non-metric connection and all the warping functions are equal.

E). M is Ricci flat having a semi-symmetric non-metric connection with the supplementary condition $H = \sum_{i=1}^m k_i \frac{f_i'}{f_i} = 0$.

F). M is Ricci flat with a quarter-symmetric non-metric connection with the supplementary condition $H = \sum_{i=1}^m k_i \frac{f_i'}{f_i} = (\bar{n} - 1)\lambda_1 - \lambda_2$.

Keywords: Einstein space, multiply warped product, warping function, quarter-symmetric connection.

AMS Classification: 53C25, 53C50