Homogeneity of Lorentzian three-manifolds with recurrent curvature

Stana Nikčević Simić

k-Curvature homogeneous three-dimensional Walker metrics are described for $k = 0, 1, 2$. This allows a complete description of locally homogeneous three-dimensional Walker metrics, showing that there exist exactly three isometry classes of such manifolds. As an application one obtains a complete description of all locally homogeneous Lorentzian manifolds with recurrent curvature. Moreover, potential functions are constructed in all the locally homogeneous manifolds resulting in steady gradient Ricci and Cotton solitons.