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On the equivalence of Ricci-semisymmetry and semisymmetry

Every *semisymmetric* ($R(X,Y) \cdot R = 0$) semi-Riemannian manifold (M, g), $\dim M \geq 3$, is *Ricci-semisymmetric* ($R(X,Y) \cdot S = 0$), where R and S is the curvature tensor and the Ricci tensor of (M, g), respectively, and $R(X,Y)\cdot$ denote derivations induced by R. The converse statement is not true. However, under some additional assumptions both conditions are equivalent for certain manifolds. A review of results related to this problem will be presented. For instance, these conditions are equivalent for non-Einstein Riemannian manifolds with pseudosymmetric Weyl tensor [1] as well as for 4-dimensional hypersurfaces in semi-Riemannian space forms [2].

References: [1] K. Arslan, Y. Çelik, R. Deszcz and R. Ezentaș, On the equivalence of Ricci-semisymmetry and semisymmetry, *Colloquium Math.* **76** (1998), 279–294.
[2] F. Defever, R. Deszcz, Z. Șentürk, L. Verstraelen and Ș. Yaprak, P. J. Ryan's problem in semi-Riemannian space forms, *Glasgow Math. J.* , in print.