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Riemannian manifolds for which a power of the radius is k-harmonic. (English)

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Let (M, g) be a Riemannian manifold and y a point of M . Further let x be a point of a normal neighborhood $N(y)$ of y and put $d = d(x, y)$. R. Caddeo, P. Matzeu, J. Eichborn and the reviewer studied Riemannian manifolds such that for all y and all $x \in N(y)$ $\Delta^k d^{2\ell} = 0$, where $k \in \mathbb{N}_0$ and ℓ is a real number. Δ denotes the Laplacian on (M, g) .

In this paper a similar problem for pseudo-Riemannian manifolds is considered. Let $\sigma(x, y)$ denote Synge's two-point function, that is, for $x = \exp_y \sum x^i e_i$, $\sigma(x, y) = g(y)_{\alpha\beta} x^\alpha x^\beta$. Further, let $N(y)^- = \{x \in N(y) \mid \sigma(x, y) \neq 0\}$. The author studies in detail pseudo-Riemannian manifolds such that $\Delta^k |\sigma|^\ell = 0$ or $\Delta^k \log |\sigma| = 0$ for all $y \in M$ and all $x \in N(y)^-$. As could be expected, this theory is richer than in the Riemannian case.

Reviewer: [L. Vanhecke](#)

MSC:

[53B30](#) Local differential geometry of Lorentz metrics, indefinite metrics

[53C50](#) Global differential geometry of Lorentz manifolds, manifolds with indefinite metrics

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