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5. Differential Geometry and Global Analysis

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Local homogeneity and differential operators

A Riemannian manifold is said to be *locally homogeneous* if its pseudogroup of local isometries acts transitively on the manifold. In 1960, I. M. Singer proved necessarity and sufficient tensor conditions for a Riemannian manifold to be locally homogeneous. In the case of D'Atri spaces, commuting natural differential operators induce a lot of scalar global constant curvature invariants. Motivated by this property, F. Prüfer, F. Tricceri, and L. Vanhecke found scalar conditions at a Riemannian manifold to be locally homogeneous. This criteria characterizes such spaces by the property that some scalar curvature invariants built from the curvature tensor and its derivatives have to be global constants on the manifold. As an application, it can be shown that every Riemannian manifold where the Laplacian commutes with some set of invariant differential operators is a locally homogeneous space. These results are joint work with F. Tricceri, L. Vanhecke, and P. Günther.