EIMAN - Encontro Internacional de Matemática no Nordeste Brasileiro
Edição N$^{\underline{0}}$ 1, Fevereiro - 2009

Prescribing Gauss-Bonnet curvatures: a perturbative result around space forms

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Abstract

The $2k$-Gauss-Bonnet curvatures are basic scalar invariants of a Riemannian metric which are homogeneous of degree k in the curvature and reduce to the scalar curvature when $k = 1$. A natural problem would be to determine which functions on a manifold are the $2k$-Gauss-Bonnet curvatures of a metric. Using perturbative methods we prove here the following result. Let (X^n, g), $n \geq 3$, be a compact non-flat space form with sectional curvature $\mu \neq 0$. Assume that (X, g) is not isometric to a round sphere and let $\mathcal{S}_\mu^{(2k)}$ be the (constant) $2k$-Gauss-Bonnet curvature of (X, g), where $2 \leq 2k < n$. Then there exists $\varepsilon > 0$ such that any smooth function on X with $\|f - \mathcal{S}_\mu^{(2k)}\|_{C^\alpha(X,g)} < \varepsilon$ is the $2k$-Gauss-Bonnet curvature of a smooth metric on X. This is joint work with Newton Santos (UFPI).