Seminario de Geometría y Topología

Maximum Principles And Geometric Applications

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Resumen:

.

ABSTRACT

The *Omori-Yau maximum principle* is said to hold on an n-dimensional Riemannian manifold M if, for any smooth function $u \in C^2(M)$ with $u^* = \sup_M u < +\infty$ there exists a sequence of points $\{p_k\}_{k \in \mathbb{N}}$ in M with the properties:

(i) $u(p_k) > u^* - \dfrac{1}{k}$, (ii) $\|\nabla u(p_k)\| < \dfrac{1}{k}$, and (iii) $\Delta u(p_k) < \dfrac{1}{k}$.

In this sense, the classical result given by Omori (1967) and Yau (1975) states that the Omori-Yau maximum principle holds on every complete Riemannian manifold with Ricci curvature bounded from below. A *weaker* form of the maximum principle is obtained by dropping condition (ii) above from the requirements on the sequence $\{p_k\}_{k \in \mathbb{N}}$. That is, the *weak maximum principle* is said to hold on M if, for any smooth function $u \in C^2(M)$ with $u^* = \sup_M u < +\infty$ there exists a sequence $\{p_k\}_{k \in \mathbb{N}}$ in M satisfying (i) and (iii) above. It is also known that the fact that the weak maximum principle holds on M is equivalent to the *stochastic completeness* of the manifold. In particular, the weak maximum principle holds on every parabolic Riemannian manifold. The aim of this lecture is to give an introduction to the Omori-Yau maximum principle, starting from its classical formulation up to the most recent generalizations, and to introduce some of its applications to differential geometry.

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