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**Cohomology of complex non-Kähler manifolds
and harmonic forms on almost Hermitian manifolds**

Abstract

Let (M, J) be a compact almost complex manifold. When the almost complex structure J is integrable, natural complex cohomologies can be defined, using the operators ∂ and $\bar{\partial}$, namely, the *Dolbeault*, *Bott-Chern* and *Aeppli* cohomology groups, denoted respectively as $H_{\bar{\partial}}^{\bullet, \bullet}(M)$, $H_{BC}^{\bullet, \bullet}(M)$ and $H_A^{\bullet, \bullet}(M)$. For any given Hermitian metric g on (M, J) , such cohomology groups are isomorphic to the kernel of suitable elliptic differential operators, $\Delta_{\bar{\partial}}$, Δ_{BC} and Δ_A . When J is not integrable, the above differential operators are still elliptic but their kernels have no more cohomological meaning as in the complex case.

We will report about some recent results on the study of cohomology groups $H_{BC}^{\bullet, \bullet}(M)$ and $H_A^{\bullet, \bullet}(M)$ on compact complex manifolds and on the study of the spaces of Dolbeault and Bott-Chern harmonic forms on compact almost Hermitian manifolds.