Journal of Lie Theory 18 (2008) 141–160

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Complex Manifolds Admitting Proper Actions of High-Dimensional Groups

We explicitly classify all pairs (M, G), where M is a connected complex manifold of dimension $n \geq 2$ and G is a connected Lie group acting properly and effectively on M by holomorphic transformations and having dimension d_G satisfying $n^2 + 2 \leq d_G < n^2 + 2n$. We also consider the case $d_G = n^2 + 1$. In this case all actions split into three types according to the form of the linear isotropy subgroup. We give a complete explicit description of all pairs (M, G) for two of these types, as well as a large number of examples of actions of the third type. These results complement a theorem due to W. Kaup for the maximal group dimension $n^2 + 2n$ and generalize some of the author's earlier work on Kobayashi-hyperbolic manifolds with high-dimensional holomorphic automorphism group.

Keywords: Proper group actions, complex manifolds.

MSC: 53C30, 32M10, 32Q57.