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A family of symplectic-complex Calabi-Yau manifolds that are nonKahler

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A Kahler manifold is a smooth manifold with compatible complex and symplectic structures. In general, a compact manifold which admits both complex and symplectic structures may not admit any Kahler structure. Hodge theory and hard Lefschetz theorem have very strong implications on the homotopy type of compact Kahler manifolds. We introduce a family of 6-dimensional compact manifolds $M(A)$, which admit both Calabi-Yau symplectic and Calabi-Yau complex structures. They satisfy all the consequences of classical Hodge theory and hard Lefschetz theorem. However, we show that they are not homotopy equivalent to any compact Kahler manifold using a recently developed cohomology jump loci method. This is joint work with Lizhen Qin.

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