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Twistor constructions of hyperkähler and hypercomplex structures near complex submanifolds

We discuss generalizations of the Feix-Kaledin theorem on the existence of hyperkähler structures on cotangent bundles of Kähler manifolds. Using twistor theory, we show that the problem of constructing a hyperkähler structure on a neighbourhood of a complex Lagrangian submanifold in a holomorphic symplectic manifold reduces to the existence of certain deformations of holomorphic symplectic structures. Similarly, hypercomplex structures near half-dimensional complex submanifolds can be constructed from certain deformations of complex structures. By combining these results with Hitchin's unobstructedness theorem on the deformation of holomorphic Poisson structures, we show that every holomorphic symplectic groupoid over a compact Kähler Poisson manifold has a hypercomplex structure on a neighbourhood of its identity section, and that there is a compatible hyperkähler metric if the Poisson manifold has complex dimension two.