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Local holomorphicity of generalized complex structures

Generalized complex geometry is a relatively new type of geometry, introduced by Hitchin (2003), which has applications to string theory and mirror symmetry. Symplectic and complex geometry are special cases.

A generalized complex structure determines a Poisson structure and, transverse to its symplectic leaves, a complex structure. In fact, Gualtieri (2004) showed that about a regular point of a generalized complex manifold, there is a local normal form constructed as the product of a symplectic manifold with a complex manifold. However, near points where the Poisson rank changes, much less was known. Abouzaid and Boyarchenko (2004) showed that about any point of a generalized complex manifold there is a local model constructed as the product of a symplectic manifold with a generalized complex manifold whose Poisson tensor vanishes at the point (similar to Weinstein's result on the local normal form of a Poisson structure).

The question that remains of the local structure, then, is: what do generalized complex structures look like near a point with vanishing Poisson tensor, that is, at a point of complex type? We prove that they are induced by *holomorphic* Poisson structures, using a Nash-Moser type rapidly-converging algorithm on shrinking neighbourhoods, in the style of Conn's proof of the normal form of linear Poisson structures.