Paolo de Bartolomeis: Complex Deformation Theories in Symplectic and Contact Geometry

Abstract: Given a $2n$-dimensional symplectic manifold $(M,\, \kappa)$, we can associate to it the contractible class of κ-tamed (almost) complex structures (i.e. those (almost) complex structures J such that

$$g_J = \frac{1}{2}(\kappa(J\cdot,\, \cdot) - \kappa(\cdot,\, J\cdot))$$

is a positive definite J-Hermitian metric) and thus develop a κ-tamed Hermitian Geometry.
As especially interesting case, we consider the following class of objects:
Definition
a Quantum Inner State structure (QIS) *on* $(M,\, \kappa)$ *is the datum of* $(J,\, \epsilon)$, *where* J *is a(n almost)* κ*-tamed complex structure on* M *and* $\epsilon \in \wedge_J^{n,0}(M)$ *satisfies*

- $\epsilon \wedge \bar{\epsilon}$ *is a volume form*
- $\bar{\partial}_J \epsilon = 0$.

Within this general frame, in the quest of new symplectic invariants, we investigate deformations of Calabi-Yau manifolds in the larger class of Quantum Inner State structures.
Analogous constructions are studied in the case of contact structures, and highly non trivial examples are discussed.