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Tightness in contact metric manifolds

Since the work of Chern and Hamilton there has been a great deal of work on studying Riemannian metrics adapted to contact structures, but most of this work has focused on properties of the Riemannian metric. There have been few results concerning properties of the contact structure in terms of the Riemannian metric. In this talk I will discuss a version of “Darboux’s theorem with estimates.” More precisely, I will give estimates on the size of a geodesic ball in a contact metric manifold that is contactomorphic to the standard contact 3-ball. This is one of the first results relating the key contact geometric notion of tightness to adapted Riemannian metrics. This leads to a “contact sphere theorem”: if you have a contact 3-manifold and a metric adapted to it with appropriate curvature bounds (the same curvature pinching as in the standard sphere theorem) then the manifold is the sphere and the contact structure is standard. This is joint work with Rafal Komendarczyk and Patrick Massot.