Cohomology of cohomogeneity one and K-contact manifolds

This talk is about two geometrically completely different types of actions, namely cohomogeneity one actions of compact Lie groups on compact differentiable manifolds on the one hand, and on the other hand the canonical transverse action on the Reeb foliation of a K-contact manifold induced by the closure of the Reeb flow.

We will see that both actions share the feature that they are equivariantly formal in the sense that their equivariant cohomologies are free modules over the ring of polynomials on the acting Lie algebra.

Particular emphasis will be put on corollaries involving ordinary (de Rham) cohomology, such as a new proof of the following topological obstruction to the existence of a cohomogeneity one action on a compact manifold: if it has positive Euler characteristic, then its cohomology vanishes in odd degree. In the K-contact case a consequence is a characterization of K-contact manifolds with minimal number of closed Reeb orbits as real cohomology spheres.

(Based on joint works with Augustin-Liviu Mare (the cohomogeneity one part), and Hiraku Nozawa and Dirk Töben (the K-contact part))