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Equivariant cohomology of transverse actions and K-contact manifolds

Molino showed that a Riemannian foliation on a simply-connected complete Riemannian manifold (or more generally a Killing foliation) admits a natural transverse action of a finite-dimensional Abelian Lie algebra by transverse vector fields, whose orbits are exactly the leaf closures. We will discuss equivariant cohomology for such actions, and see that it behaves in many respects similar to ordinary equivariant cohomology of a torus action: for example, there is a Borel-type localization theorem, in which the role of the fixed points is played by the closed leaves of the foliation.

We will apply this theory to the characteristic foliation of a K-contact manifold in order to understand the space of closed Reeb orbits. For example, we give a new proof of the fact that on a $2n + 1$-dimensional K-contact manifold M there are at least $n + 1$ closed Reeb orbits, and we show that equality holds if and only if M is a real cohomology sphere.

(Based on joint work with Hiraku Nozawa and Dirk Töben)