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Torsion and Lie Groups

The rational cohomology of a compact connected Lie group G can be expressed and explicitly determined using invariant theory. One need only determine the rational cohomology of BG, the classifying space of G, and that can be expressed as a ring of invariants determined by the action of the Weyl group W (associated to G) on the rational cohomology of BT, the classifying space of any maximal torus $T < G$.

When one moves to $\mathrm{mod}\, p$ cohomology the same pattern holds unless the group G has p torsion in its integral cohomology. In the torsion case one needs new tools and a new pattern. We will explore the use of the generalized invariants, as defined by Kac and Peterson, to address this question for both algebra and coalgebra structures.