

## Geometry of $G$ -structures via intrinsic torsion

**Kamil Niedziałomski**

University of Łódź, Poland  
kamiln@math.uni.lodz.pl

*Session: 12. Geometry and Topology of Manifolds*

We consider a  $G$ -structure on a manifold, i.e. the (oriented) Riemannian manifold such that the orthonormal frame bundle  $SO(M)$  has the reduction  $P$  of the structure group to  $G \subset SO(n)$ . We additionally assume that the quotient  $SO(n)/G$  is reductive. We study the geometry of  $P$  in  $SO(M)$ . Mainly we consider extrinsic geometry. We show that minimality is equivalent to harmonicity of induced section of homogeneous bundle with respect to some modification of the Riemannian metric on the base manifold  $M$ . This may lead to the slightly new concept of harmonic  $G$ -structure [1]. We give relevant examples [3].

Considerations are based on the study of properties of intrinsic torsion of  $G$ -structure, i.e. the section of adjoint bundle, which can be identified with the difference of the Levi-Civita connection and the  $G$ -connection [2, 4].

### References

- [1] J. C. Gonzalez-Davila, F. Martin Cabrera, *Harmonic  $G$ -structures*, Math. Proc. Cambridge Philos. Soc. 146, 2009, no. 2, 435–459.
- [2] A. Gray, L. Hervella, *The Sixteen Classes of Almost Hermitian Manifolds and Their Linear Invariants*, Ann. Mat. Pura Appl. (4) 123, 1980, 35–58.
- [3] K. Niedziałomski, *On the frame bundle adapted to a submanifold*, preprint, arXiv, <http://arxiv.org/abs/1311.6172>
- [4] F. Tricerri, *Locally homogeneous Riemannian manifolds*, Rend. Sem. Mat. Univ. Poi. Torino Vol. 50, 1992, 411–426.