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Lie algebra extensions and higher order cocycles. (English) Zbl 1105.53064

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Summary: In this note we present an abstract approach, based on Lie algebra cohomology, to the Lie algebra extensions associated to symplectic manifolds. We associate to any Lie algebra cocycle of degree at least two an abelian extension by some space $\mathfrak{a}$ and central extensions of subalgebras analogous to the Lie algebras of symplectic, respectively, Hamiltonian vector fields. We even obtain a Poisson bracket on $\mathfrak{a}$ compatible with the Hamiltonian Lie subalgebra. We then describe how this general approach provides a unified treatment of cocycles defined by closed differential forms on Lie algebras of vector fields on possibly infinite dimensional manifolds.

MSC:

17B56 Cohomology of Lie (super)algebras
17B63 Poisson algebras
53D17 Poisson manifolds; Poisson groupoids and algebroids
17B66 Lie algebras of vector fields and related (super) algebras

Keywords:

Lie algebra cohomology; symplectic manifolds; Poisson bracket