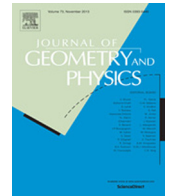




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# Deformed cohomologies of symmetry pseudo-groups and coverings of differential equations

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## ABSTRACT

The work establishes a relation between deformed cohomologies of symmetry pseudo-groups and coverings of differential equations. Examples include the potential Khokhlov–Zabolotskaya equation and the Boyer–Finley equation.

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## 1. Introduction

Deformed cohomologies were introduced in [1–7] as a tool in the theory of analytic functions of several complex variables in geometry of Poisson manifolds, and in the Morse theory for smooth multi-valued functionals. Then they were applied to different problems of symplectic geometry and algebraic topology, see e.g. [8–11]. The objective of the present paper is to establish a relation between the deformed cohomologies of symmetry pseudo-groups of partial differential equations and their coverings.

Differential coverings (or Wahlquist–Estabrook prolongation structures, [12], or zero-curvature representations, [13], or integrable extensions, [14], etc.) are of great importance in geometry of PDEs. The theory of coverings is a natural framework for dealing with inverse scattering constructions for soliton equations, Bäcklund transformations, recursion operators, nonlocal symmetries and nonlocal conservation laws, Darboux transformations, and deformations of nonlinear PDEs, [15–17]. A number of techniques have been devised to handle the problem of recognizing whether a given differential equation has a covering, [12, 18–28]. In [29], examples of coverings of PDEs with three independent variables were found by means of Élie Cartan’s method of equivalence, [30–35]. This idea was developed in [36–38]. In [39] we propose an approach to the covering problem based on the technique of contact integrable extensions (CIEs) of the structure equations of the symmetry pseudo-groups, which is a generalization of the definition of integrable extension from [14, §6] for the

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