

# Methods of tangent and cotangent coverings for Dubrovin-Novikov integrability operators

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The well-established method of tangent and cotangent covering for searching integrability operators, like Hamiltonian, symplectic and recursion operators, was introduced by Kersten, Krasil'shchik and Verbovetsky in 2003. The method consists in describing integrability operators of a given PDE as linear functions of some odd variables which are in the kernel of linearization or adjoint linearization of the PDE. We apply the method to the search of Dubrovin-Novikov integrability operators for hydrodynamic-type PDEs. We recover known results, like: Tsarev's compatibility conditions between a hydrodynamic-type system and a first-order local Dubrovin-Novikov Hamiltonian operator; a geometric interpretation of nonlocalities in Ferapontov's nonlocal homogeneous operators. We obtain new results, like a new system of PDEs that expresses the compatibility of third-order Dubrovin-Novikov and a hydrodynamic-type system, as well as new (integrable?) systems of that type. We will discuss several interesting problems and conjectures that are emerging from the interaction between the two theories.

**Primary author:** Dr RAFFAELE, Vitolo (Universita' del Salento)

**Presenter:** Dr RAFFAELE, Vitolo (Universita' del Salento)