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Geometric properties of commutative subalgebras of partial differential operators. (English. Russian original) [Zbl 1329.13043](#)

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Authors' abstract: We investigate further algebro-geometric properties of commutative rings of partial differential operators, continuing our research started in previous articles. In particular, we start to explore the simplest and also certain known examples of quantum algebraically completely integrable systems from the point of view of a recent generalization of Sato's theory, developed by the first author. We give a complete characterization of the spectral data for a class of 'trivial' commutative algebras and strengthen geometric properties known earlier for a class of known examples. We also define a kind of restriction map from the moduli space of coherent sheaves with fixed Hilbert polynomial on a surface to an analogous moduli space on a divisor (both the surface and the divisor are part of the spectral data). We give several explicit examples of spectral data and corresponding algebras of commuting (completed) operators, producing as a by-product interesting examples of surfaces that are not isomorphic to spectral surfaces of any (maximal) commutative ring of partial differential operators of rank one. Finally, we prove that any commutative ring of partial differential operators whose normalization is isomorphic to the ring of polynomials $k[u, t]$ is a Darboux transformation of a ring of operators with constant coefficients.

Reviewer: [Ahmed Lesfari \(El Jadida\)](#)

MSC:

[13N15](#) Derivations and commutative rings

[37K20](#) Relations of infinite-dimensional Hamiltonian and Lagrangian dynamical systems with algebraic geometry, complex analysis, and special functions

[14H70](#) Relationships between algebraic curves and integrable systems

Cited in **2** Documents

Keywords:

[commuting differential operators](#); [quantum integrable systems](#); [moduli space of coherent sheaves](#); [Darboux transformation](#)

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