Integration of some (2+1)-dimensional integrable systems by inverse scattering and binary Darboux transformation methods

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For space-twodimensional symmetric generalizations of the KdV equation ($2dKdV$) of the form

$$u_t = \left(\frac{\partial^3}{\partial x^3} - k^3 \frac{\partial^3}{\partial y^3}\right) u + 3\mu k^2 \frac{\partial}{\partial y} u \int^x \frac{\partial u}{\partial y} dx - 3\mu k^{-1} \frac{\partial}{\partial x} u \int^y \frac{\partial u}{\partial x} dy \qquad (1)$$

and the modified KdV equation ($2dmKdV$) of the form

$$u_t = \left(\frac{\partial^3}{\partial x^3} - k^3 \frac{\partial^3}{\partial y^3}\right) u + 3\mu k^2 \left(\frac{\partial u}{\partial y} + \frac{1}{2} u \frac{\partial}{\partial y}\right) \int^x \frac{\partial u^2}{\partial y} dx - 3\mu k^{-1} \left(\frac{\partial u}{\partial x} + \frac{1}{2} u \frac{\partial}{\partial x}\right) \int^y \frac{\partial u^2}{\partial x} dy, \quad (2)$$

where $u := u(x, y, t)$, $k, \mu \in R$, for alternative known $L - A - B$ Manakov's triad [1] the Lax pairs $L - A$ have been constructed. The binary Darboux transformations for the associated linear systems with (1), (2) and formulas for solutions of (1), (2) equations in explicit forms were found.

It is shown, that explisit solutions of (2), obtained by the inverse scattering problem method for Dirac's operator [1, 2]

$$L = \begin{pmatrix} \dfrac{\partial}{\partial x} & u \\ \mu u & k \dfrac{\partial}{\partial y} \end{pmatrix},$$

are contained among solutions, obtained by binary Darboux transformations [3], as a special case.

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2. *Nizhnik L.P.* Inverse scattering problems for hiperbolic equations, Kyiv, Naukova Dumka, 232 p. (in Russian).

3. *Sidorenko Yu.M.* Factorization of matrix differential operators and Darboux-like transformations, Mat. Studii, **19**, No.2. (2003) (to be published).