CAMASSA-HOLM AND MYRZAKULOV-CIV EQUATIONS WITH SELF-CONSISTENT SOURCES: GEOMETRY AND PEAKON SOLUTIONS

GULMIRA YERGALIYEVA, TOLKYNAY MYRZAKUL, GULGASSYL NUGMANOVA and RATBAY MYRZAKULOV

Eurasian International Center for Theoretical Physics, Eurasian National University Nur-Sultan, 010008, Kazakhstan

Abstract. In this paper, we study one of generalized Heisenberg ferromagnet equations with self-consistent sources, namely, the so-called Myrzakulov-CIV equation with self-consistent sources (M-CIVESCS). The Lax representation of the M-CIVESCS is presented. We have shown that the M-CIVESCS and the CH equation with self-consistent sources (CHESCS) is geometrically equivalent to each other. The gauge equivalence between these equations is proved. Soliton (peakon) and pseudo-spherical surfaces induced by these equations are considered. The one peakon solution of the M-CIVESCS is presented.

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1. Introduction

Camassa-Holm equation (CHE) has the form

$$u_t + 2\omega u_x - u_{xxt} + 3uu_x = 2u_x u_{xx} + uu_{xxx} \tag{1}$$

where $u = u(x, t)$ is the fluid velocity in the x direction and ω=const is related to the critical shallow water wave speed. This equation has several equivalent forms, for instance, the following ones

$$q_t + 2u_x q + uq_x = 0, \qquad q - u + u_{xx} - \omega = 0 \tag{2}$$