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ACCEPTED MANUSCRIPT

THE EXISTENCE OF SOLITARY WAVE SOLUTIONS OF DELAYED CAMASSA-HOLM EQUATION VIA A GEOMETRIC APPROACH

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Abstract. This paper is concerned with the Camassa-Holm equation, which is a model for shallow water waves. We first establish the existence of solitary wave solutions for the equation without delay. And then we prove the existence of solitary wave solutions for the equation with a special local delay convolution kernel and a special nonlocal delay convolution kernel by using the method of dynamical system, especially the geometric singular perturbation theory and invariant manifold theory. According to the relationship between solitary wave and homoclinic orbit, the Camassa-Holm equation is transformed into the ordinary differential equations with fast variables by using the variable substitution. It is proved that the equation with disturbance also possesses homoclinic orbit, and there exists solitary wave solution of the delayed Camassa-Holm equation.

Keywords: Camassa-Holm equation, solitary wave solutions, geometric singular perturbation theory, invariant manifold, homoclinic orbits.

Mathematics Subject Classification: 35Q35, 35L05, 74J30, 34D15.

1. Introduction

It is well known that the study of nonlinear wave equations and their traveling wave solutions is of great importance in fluid mechanic fields. There exist many shallow water

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