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A NEW PROOF ON THE L^P STABILITY OF SOLUTIONS FOR THE BENJAMIN-BONA-MAHONY-BURGERS EQUATION

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Abstract. Establishing a theorem which states the global existence and uniqueness of solutions for a linear partial differential equation, we give a new technique to prove the $L^p(R)$ stability of strong solutions for the Benjamin-Bona-Mahony-Burgers (BBM-B) equation. Consequently, the uniqueness of strong solutions for the BBM-B equation is obtained.

Keywords. L^p local stability; BBM-B equation; Strong solutions.

AMS (MOS) subject classification: 35G25;35L05

1 Introduction and main results

The Benjamin-Bona-Mahony-Burgers (BBM-B) equation takes the form

$$v_t - v_{txx} - av_{xx} + kv_x + v^m v_x = 0, \tag{1}$$

where $a > 0$ and k are constants, and $m \geq 1$ is an integer. Letting $a = 0, k = 1$ and $m = 1$, Eq.(1) becomes the Benjamin-Bona-Mahony model [1,2]

$$v_t - v_{txx} + v_x + vv_x = 0, \tag{2}$$

which is derived in the asymptotic description of long waves of small amplitude in water [2,3] and is often used as an alternative to the KdV equation which describes unidirectional propagation of weakly long dispersive waves [4]. The Eq.(2) is realized to cover not only the surface waves of long wavelength in liquids, but also acoustic waves in anharmonic crystals, hydromagnetic waves in cold plasma, and acoustic gravity waves in compressible fluids (see [4,5,6]). Nonlinear stability of nonlinear periodic solutions of the regularized Benjamin-Ono equation and the Benjamin-Bona-Mahony equation regarding perturbations of the same wavelength is studied in [7]. Mizumachi

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