Meeting: 1004, Bowling Green, Kentucky, SS 7A, Special Session on Semigroups of Operators and Applications

1004-35-196

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Wellposedness of finite energy solutions to a two-dimensional Kirchhoff-Boussinesq equations. Preliminary report.

We consider the following Kirchhoff-Boussinesq plate model defined on a bounded domain $\Omega \in R^2$:

$$u_{tt} + \Delta^2 u - \operatorname{div}\left(|\nabla u|^2 \nabla u\right) = \Delta(u^2),\ t > 0, \quad u|_{t=0} = u_0,\ u_t|_{t=0} = u_1. \tag{1}$$

The equation (1) is equipped with either clamped, simply supported or free boundary conditions. We are concerned with finite energy solutions defined on $H \equiv H^2_\Gamma(\Omega) \times L_2(\Omega)$, where $H^2_\Gamma(\Omega)$ is complemented with appropriate boundary conditions. In the two-dimensional case (as considered above) the nonlinear term is not bounded (and is not locally Lipschitz) on a finite energy space. For this reason the issue of uniqueness of finite energy solutions in the two-dimensional case has been an open question in the literature. The main aim of this work is to provide an affirmative answer to this open question. The main result to be presented is the following global existence and uniqueness of finite energy solutions.

THEOREM. The flow defined by (1) generates a continuous group of continuous mappings on the space H endowed with the weak topology. (Received January 24, 2005)