1077-76-1190 **Kenichi Maruno*** (kmaruno@utpa.edu), 1201 West University Drive, Edinburg, TX 78539, and **Yuji Kodama**, **Hidekazu Tsuji** and **Bao-Feng Feng**. *Two-dimensional interaction of weakly nonlinear solitary waves in shallow water: Mach reflection for the Benney-Luke equation and the KP equation.*

Understanding two-dimensional interaction of nonlinear solitary waves has been an important problem in various fields of physics. In shallow water region, weakly nonlinear water waves are described by the Benney-Luke equation. Assuming weak two-dimensionality, the KP (Kadomtsev-Petviashvili) equation is derived. The KP equation is known as one of integrable systems, and its solutions are written in explicit forms. Various interesting solutions have been found recently in the KP equation, so it is very nice if we can use these exact solutions to understand real water wave phenomena. However, the Benney-Luke equation is not integrable and it is not so clear whether the KP equation is applicable to real shallow water wave phenomena. Thus we need to clarify the difference of solutions of the Benney-Luke and the KP. We propose a method to obtain an approximate 2 soliton solution for the Benney-Luke equation. This method is based on the Hilota's bilinear method and the reductive perturbation method. Using this 2-soliton solution, we compute critical angles of transitions between different solitary wave interactions. These critical angles are confirmed by using direct numerical simulations. We also discuss the application to Mach reflection in shallow water waves. (Received September 17, 2011)