1056-35-725 **Aaron S. Donahue** (adonahue@rohan.sdsu.edu), Department of Mathematics and Statistics, San Diego State University, 5500 Campanille Dr., San Diego, CA 92182, and **Samuel S.P. Shen*** (shen@math.sdsu.edu), Department of Mathematics and Statistics, San Diego State University, 5500 Campanille Dr., San Diego, CA 92182. *A Detailed Bifurcation Diagram and Semi-Analytic Solutions of the Forced Korteweg-de Vries Equation.*

The surface wave in a 2-dimensional water channel caused by a bump moving at uniform speed along the bottom of the channel can be modeled by the forced Korteweg-de Vries (fKdV) equation. Due to the forcing term, the fKdV equation has a variety of solutions different from the free KdV equation. For example, the fKdV can generate a train of solitons of equal size, and the fKdV allows an experiment of a train of two equal size solitons colliding with another train of two equal size solitons. To date, the fKdV equation has not been found integrable. However, the non-stationary transicritical fKdV solutions have beautiful and orderly geometrical properties, which allow semi-analytic solutions to be found. This talk will present the following results: (i) a new approximation formula for the upstream solitons based on a semi-analytic approach, verified by the numerical solutions and a statistical regression, (ii) a detailed bifurcation diagram of the fKdV solutions ranging from sub-critical cnoidal waves, hydraulic fall, transcritical waves, to the super-critical solitary waves, and (iii) various kinds of numerical solutions, their corresponding geometric interpretation of the semi-analytic solutions, and stability simulation results. (Received September 16, 2009)