

Abstract Submitted  
for the DFD08 Meeting of  
The American Physical Society

**Axisymmetric Weakly Compressible Transient Pipe Flow and Water Hammer Control**<sup>1</sup> JIE-ZHI WU, LI-JUN XUAN, FENG MAO, College of Engineering, Peking University, Beijing China — Despite the partial success of existing theoretical models in explaining certain transient water flow phenomena in a long pipe, they can hardly predict the evolution of strong water hammer, in particular the one downstream the valve caused by its closing (reversed water hammer). We attack this important problem by a new perturbation theory based on the unsteady axisymmetric and compressible Navier-Stokes equations. The leading-order transient solution is in excellent agreement with the direction simulation of the original N-S equation. We establish a simple relation between the valve motion and adjacent pressure in reversed water hammer, by which the strategy of optimal control of reversed water hammer is analyzed and illustrated.

<sup>1</sup>Supported by National Natural Science Foundation of China, Key Project No.10532010.

Jie-Zhi Wu  
College of Engineering, Peking University, Beijing China

Date submitted: 01 Aug 2008

Electronic form version 1.4