

NUMERICAL ANALYSIS AND SCIENTIFIC COMPUTING  
SEMINAR

*Bidirectional Wave Propagation in the Human Arterial Tree*

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**Abstract:** We describe a nonlinear model for the propagation of the pressure and flow velocity waves in the peripheral circulation, which is based on a Boussinesq-type system. The key ingredient is the inclusion of dispersive effects (amplitude-dependent speeds of propagation) in addition to the nonlinear effects. We discuss the formation and propagation of the transmitted and reflected waves at bifurcations and terminal ends. The timing of the reflections as well as the different speeds of the reflected waves are particularly relevant in view of the complex geometry of the peripheral circulation. The advantage of this analysis in the time domain, compared with linear impedance models, is that it applies for non-periodic flows and also allows the direct implementation of accurate time-dependent controls, such as those exhibited in the peripheral circulation. We discuss an application of this model on the study of the latencies measured experimentally during rest and dynamical changes in the cardiovascular system.

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