Dr. Romaric NTCHANTCHO TCHOUYA (defence : December 2008)

Title : *Numerical simulation of the propagation of solitary waves in blood vessels with lesions and prostheses*

Abtsract: This thesis deals with the mathematical and numerical studies of blood flow in arteries taking into account various factors: viscosity, natural variations of the mechanical and geometric characteristics of the vessel wall, diseases and prostheses. The mathematical analysis leads to a Korteveg de Vries equation with perturbations coming from blood viscosity and natural variation of the vessel characteristics. An analytical solution is found for that equation. A new condition for a perfect prosthesis is also obtained. Based on finite difference scheme, a direct numerical simulation of the full blood wave equations interacting with the vessels dynamics is carried out. The results obtained from the numerical simulations confirm and complement the mathematical results by providing new details on the effects of prostheses and diseases on blood waves.