ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

INVITATION TO THE DOCTORAL SEMINAR

Nonlinear wave equations in bubbly liquids – the Westervelt-Rayleigh-Plesset model

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Chaired by Barbara Kaltenbacher | Department of Mathematics

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ABSTRACT

Ultrasound contrast imaging is a specialized imaging technique that applies microbubble contrast agents to traditional medical sonography providing real-time visualization of blood flow and vessels. Gas filled microbubbles are injected into the body where they undergo compression and rarefaction and interact nonlinearly with the ultrasound waves. Therefore, the propagation of sound through bubbly liquid is a strongly nonlinear problem that can be modeled by a nonlinear acoustic wave equation for the propagation of the pressure waves coupled with an ordinary differential equation for the bubble dynamics. We start by deriving different models and then focus on the coupling of the Westervelt equation and the Rayleigh-Plesset equation, where we show well-posedness locally in time under suitable conditions on the initial data. Finally, we present numerical experiments on the single bubble dynamics and the interaction of the microbubbles and ultrasound waves.

We hope to see you there!

