TOTAL PRESSURE-BASED FREQUENCY-DOMAIN FORMULATION AND CONVERGENCE ANALYSIS OF BIOT'S POROELASTICITY EQUATIONS WITH A NEW FINITE ELEMENT STABILIZATION

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Abstract. In this research, we deal with a complex-variable-based poroelastic problem arising from the field of Imaging Elastography [**?**]. These problems incorporate a frequency-domain parameter into their model, introducing a novel dimension to their complexity. Our exploration not only encompasses their theoretical aspects but also extends to practical solutions. We begin by examining the solvability of these problems, using the well-known Gårding inequality. To tackle the challenges posed by fulfilling the discrete inf-sup condition, we introduce a novel and robust stabilized numerical scheme, enabling efficient computations. Furthermore, our investigation include a priori analysis of the solutions as well a numerical study of their stability with respect to the permeability constant. To illustrate our findings, we complement our theoretical work with numerical examples. These illustrations provide compelling evidence of the practical applicability and effectiveness of the proposed numerical scheme. In essence, our research bridges the theoretical complexities of complex-variable-based poroelastic problems with practical solutions, offering valuable insights for applications in Imaging Elastography and beyond.

Keywords: Biot, poroelasticity, magnetic resonance elastography, stabilized finite element.

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