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PRECONDITIONING OF NONSYMMETRIC SADDLE POINT SYSTEMS AS ARISING IN MODELLING OF VISCOELASTIC PROBLEMS*

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Abstract. In this paper we consider numerical simulations of the so-called glacial rebound phenomenon and the use of efficient preconditioned iterative solution methods in that context. The problem originates from modeling the response of the solid earth to large scale glacial advance and recession which may have provoked very large earthquakes in Northern Scandinavia. The need for such numerical simulations is due to ongoing investigations on safety assessment of radioactive waste repositories. The continuous setting of the problem is to solve an integro-differential equation in a large time-space domain. This problem is then discretized using a finite element method in space and a suitable discretization in time, and gives rise to the solution of a large number of linear systems with nonsymmetric matrices of saddle point form. We outline the properties of the corresponding linear systems of equations, discuss possible preconditioning strategies, and present some numerical experiments.

Key words. viscoelasticity, (in)compressibility, nonsymmetric saddle-point system, preconditioning, Schur complement approximation, algebraic multilevel techniques

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