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EFFICIENCY OF A HYBRID METHOD FOR ELASTIC WAVES

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Abstract. We study a hybrid finite element/finite difference simulation of the time-dependent elastic wave equation in two and three dimensions.The method is hybrid in the sense that different numerical methods, finite elements and finite differences, are used in different subdomains. The goal of this approach is to combine the flexibility of finite elements and the efficiency of finite differences. An explicit hybrid method for the elastic wave equation is presented, applying finite differences on the structured subdomains and finite elements on the unstructured domains. The hybrid approach is illustrated by the numerical simulations of the elastic wave equation in isotropic case in two and three dimensions with absorbing boundary conditions. Comparison of the efficiency of the different approaches is a very important aspect of this study. In our test cases, the hybrid approach is about 11 times faster in three dimensional computations than the corresponding highly optimized finite element method. We conclude that the hybrid approach may be an important tool to reduce the execution time and memory requirements for large scale computations.