

Calculation of Stress and Strain in Metal Casting Operations

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Truchas is a code incorporating fluid flow, heat transfer and phase change that is being developed for casting and welding simulation as part of the DOE ASCI program Telluride. A small strain elastic-viscoplastic capability has been added to Truchas for calculation of stresses and strains in the solid state. This implementation runs in parallel using MPI, and uses a node-centered finite volume discretization scheme. A novel method for preconditioning the Krylov subspace iterative solver has been developed, and has been shown to reduce solution times significantly. The material constitutive models, numerical algorithms and solution methods are discussed, and example problems that are relevant to metal casting processes are presented.