## Benchmark 3-OLD

## Benchmark 3

Viscoelastic relaxation of stresses resulting from an imposed simple shear strain. No body forces are imposed.

Benchmark 3a: Solve using a Maxwell viscoelastic material rheology
Benchmark 3b: Solve using a Burger's body rheological description

Benchmark 3c: Solve using a power-law material description

## GOALS

- Test relevant constitutive relations
- Verify timing of output in specific codes (i.e., is output written at the beginning or end of the step).


## DETAILED DESCRIPTION

- Model size: 24 km by 24 km by 24 km (0 km ? x; y ? 24 km ; - 24 km ? z ? 0 km )
- Elastic material properties: Poisson solid, G = 30 GPa
- Maxwell viscoelastic material properties: ? $=10^{18} \mathrm{~Pa}-\mathrm{s}$
- Burger's body material properties: Maxwell element as above, Kelvin-Voigt element has $G_{k v}=$ $10 \mathrm{GPa}, ?_{\mathrm{M}}=10^{17} \mathrm{~Pa}-\mathrm{s}$
- Power-law material properties: ? ${ }_{\text {ref }}=10^{18} \mathrm{~Pa}-\mathrm{s}$ and $?_{\text {ref }}=10^{5} \mathrm{~Pa}$. (Note: This value is chosen because the maximum initial elastic stress is of order $10^{6} \mathrm{~Pa}$; although all of that is deviatoric, the deviatoric stress decreases with time.)
- Density and Gravity: None
- Boundary conditions: Bottom pinned Sides pinned in $y$ and $z$; free in $x$
Top pinned in $y$ and $z ; 1 \mathrm{~m}$ of displacement imposed in x
- Coarse mesh node spacing: $\mathrm{dx}=\mathrm{dy}=\mathrm{dz}=2 \mathrm{~km}$


## ESTED OUTPUT AND RESULTS

/ariations: As memory, time, and patience allow, run models at $1 / 2,1 / 4$, and $1 / 8$, etc. the original coarse pacing, investigate variable mesh spacing, and/or employ a variety of element types.

Benchmark Variations:

Stresses along a path through $(0,0,-24)$ and $(24,24,0)$ at $t=0,1,5$, and 10 years.

Displacements along a path through $(0,0,-24)$ and $(24,24,0)$ at $t=0,1,5$, and 10 years. CPU time, wallclock time, memory usage info, compiler info, and platform info
tions for each material rheology will be posted at geoweb.mit.edu/fe.

## NOTES

