



Set initial condition  
(starting pressure)

Apply spatial and  
temporal  
discretization

Solver (inexact Newton-Krylov  
method) iterations

Calls

Spatial discretization  
evaluation  
Jacobian evaluation

Test for convergence

Linear system solver

User-supplied  
preconditioner

NL residual test

If NL residual  
>  
tolerance

If NL residual  
<  
tolerance

or

or

If step length  
> NL step  
tolerance

If step length  
< NL step  
tolerance

Apply line search

KINSOL fails

KINSOL success

Decrease time step  
(repeat up to 3 times)

Output/return values:  
- Function evaluations  
- Preconditioner evaluations  
- Linear iterations  
- Number of line search adjustments  
- NL iterations etc.