Fig. 3: Working flow chart of ParFlow’s solver for linear and non-linear system solution

- Set initial condition (starting pressure)
- Apply spatial and temporal discretization
- Solver (inexact Newton-Krylov method) iterations
- Test for convergence
- NL residual test
  - If NL residual $> \text{tolerance}$
  - or
  - If step length $> \text{NL step tolerance}$
    - KINSOL fails
      - Decrease time step (repeat up to 3 times)
  - If NL residual $< \text{tolerance}$
    - or
    - If step length $< \text{NL step tolerance}$
      - KINSOL success
      - Output/return values:
        - Function evaluations
        - Preconditioner evaluations
        - Linear iterations
        - Number of line search adjustments
        - NL iterations etc.

- Calls
  - Spatial discretization evaluation
  - Jacobian evaluation
  - Linear system solver
  - User-supplied preconditioner

Apply line search