o w/ in a newton slave

Right preconditioned

1. Construct new source & cross X's

2. Perform initial sweep to produce b

3. GMRES returns v^{ℓ}

3a. Perform DSA solve to approximate L^{-1}_{y}, i.e.

$$Y^{\ell} = F^{-1} V^{\ell}, \quad F^{-1} \text{ is DSA matrix solve}$$

3b. Build scattering source based on Y^{ℓ}, call it $S\phi_{Y}^{\ell}$

3c. Sweep $\quad V^{(\ell+1/2)} = L^{-1} S\phi_{Y}^{\ell}$ (no q here)

3d. $V^{\ell+1} = (V^{\ell} - V^{\ell+1/2})$

3e. GMRES computes new V^{ℓ}

4. $\boxed{\Psi = F^{-1} V}$

1.-2. (same)

2a. Solve $b^{*} = F^{-1} b$, pass b^{*} to krylov

3. GMRES returns v^{ℓ}

3a. Build scattering source based on v^{ℓ}, call it $S\phi_{v}^{\ell}$

3b. Sweep $\quad V^{\ell+1/3} = L^{-1} S\phi_{v}^{\ell}$ (no q here)

3c. $V^{\ell+2/3} = V^{\ell} - V^{\ell+1/3}$

3d. $V^{\ell+1} = F^{-1} V^{\ell+2/3}$

4. $\boxed{\Psi = V}$

Preconditioned Krylov

- GMRES for S2:

M: moment to discrete
D: discrete to moment

$$L\tilde{\psi}^{(\ell+1)} = S\phi^{(\ell)} + Q$$

$$L\tilde{\psi}^{(\ell+1)} - MSD\psi^{(\ell)} = Q$$

$$(I - \underbrace{L^{-1}MSD}_{\text{sweep}})\psi = L^{-1}Q$$

$$A\psi = b = L^{-1}Q$$

initial pass to GMRES

- Preconditioned form, want approximate inverse (right preconditioner)

$$(AF^{-1})\underbrace{(F\psi)}_{Y} = b$$

$$(AF^{-1})V_i = b$$

- GMRES produces vector V_i^{ℓ}. Solve $FY = V^{\ell}$ for Y, pass Y to operators A
- Apply A to Y (i.e., ψ – (sweep on scattering source)).
- Now just need to define full algorithm.

- Left preconditioned: $(F^{-1}A)\psi = F^{-1}b$.
- Apply F^{-1} to b before passing to GMRES
- Solve $FV^{(\ell+1/2)} = V^{\ell}$ after A has been applied

$\uparrow$ DSA matrix.