We are not able to verify the time-discretisation given in the Cussedu paper. So we are trying to derive our own predictor-corrector model. We are trying to verify if the conservation principle of BSWP model holds.

1. Implicit-Explicit prediction step for $\mathbf{a}^n$:

$$\left(M_\Gamma + \tau D_a K_\Gamma\right)\tilde{\mathbf{a}}^n = M_\Gamma \mathbf{a}^{n-1} + \tau F\left(\mathbf{a}^{n-1}, \mathbf{b}^{n-1}\right) \tag{1}$$

2. Crank-Nicholson step for $\mathbf{b}^n$:

$$\left[M_\Omega + \frac{1}{2}\tau D_b K_\Omega + \frac{1}{2}\tau G(\tilde{\mathbf{a}}^n)\right]\mathbf{b}^n = \left[M_\Omega - \frac{1}{2}\tau D_b K_\Omega - \frac{1}{2}\tau G(\mathbf{a}^{n-1})\right]\mathbf{b}^{n-1} + \frac{1}{2}\tau\beta H\tilde{\mathbf{a}}^n + \frac{1}{2}\tau\beta H\mathbf{a}^{n-1} \tag{2}$$

3. Crank-Nicholson correction step for $\mathbf{a}^n$:

$$\left(M_\Gamma + \frac{1}{2}\tau D_a K_\Gamma\right)\mathbf{a}^n = \left(M_\Gamma - \frac{1}{2}\tau D_a K_\Gamma\right)\mathbf{a}^{n-1} + \frac{1}{2}\tau F(\tilde{\mathbf{a}}^n, \mathbf{b}^n) + \frac{1}{2}\tau F(\mathbf{a}^{n-1}, \mathbf{b}^{n-1}) \tag{3}$$