Some quick notes/documentation of how to actually implement the sqrt in the $\underline{\underline{\Pi}}$ approx

So in general

$$\underline{\underline{E}} = \psi_1(\underline{N}\,\underline{N} - \frac{\underline{\underline{\delta}}}{3}) + \psi_2(\underline{M}\,\underline{M} - \frac{\underline{\underline{\delta}}}{3}) \tag{1}$$

but mostly here **just use the first term** (the uniaxial approximation). Then we want to approximate $\underline{\underline{\Pi}} = \underline{N}\,\underline{N}$ using the following method

$$\underline{\underline{\Pi}} = \frac{\underline{\underline{E}}}{\psi_1} + \frac{\underline{\underline{\delta}}}{3} \tag{2}$$

where getting ψ_1 is the problem, for that use

$$\frac{3}{2}\underline{\underline{E}} : \underline{\underline{E}} = \psi_1^2 \tag{3}$$

but we need to take a square root – this is the problem, this can give back $\pm\psi_1$, if it gives $-\psi_1$ our approximation yields

$$\underline{\underline{\Pi}}' = -\underline{N}\,\underline{N} + \frac{2\underline{\underline{\delta}}}{3} \tag{4}$$

So we need a method to numerically tell $\underline{\underline{\Pi}}$ and $\underline{\underline{\Pi}}'$ apart, for that try to get a matrix square of each

$$\underline{\underline{\Pi}} \cdot \underline{\underline{\Pi}} = \underline{N}\,\underline{N} = \underline{\underline{\Pi}} \tag{5}$$

$$\underline{\underline{\Pi}}' \cdot \underline{\underline{\Pi}}' = \underline{N}\,\underline{N} - \frac{4\underline{N}\,\underline{N}}{3} + \frac{4\underline{\underline{\delta}}}{9} = -\frac{1}{3}\underline{N}\,\underline{N} + \frac{4}{9}\underline{\underline{\delta}} \tag{6}$$

so clearly $\underline{\underline{\Pi}} \cdot \underline{\underline{\Pi}} - \underline{\underline{\Pi}} \sim 0$, use that as a test and if it is failed go back and fix the extra - sign. To get a threshold consider

$$\underline{\underline{\Pi}}' \cdot \underline{\underline{\Pi}}' - \underline{\underline{\Pi}}' = -\frac{1}{3}\underline{N}\,\underline{N} + \frac{4}{9}\underline{\underline{\delta}} + \underline{N}\,\underline{N} - \frac{2}{3}\underline{\underline{\delta}} = \frac{2}{3}\underline{N}\,\underline{N} - \frac{2}{9}\underline{\underline{\delta}} = \frac{1}{3}\frac{\underline{\underline{E}}}{\psi_1} \tag{7}$$

I haven't done the math but am quite confident that it is guaranteed that at least one of the components will be large, given the other should be precisely 0 we can just test for a relatively small threshold of say 0.1 or even less.