SE: Example $M$ and $I$ calculations for organic matter cycling ($i = 2$) at depth

\[
M_2 = \sigma_{R_2} \left[ \sum_{j=1}^{\infty} \frac{\partial \Omega_j}{\partial X_j} \frac{\partial X_{j,2}}{\partial R_j} \right] = \sigma_{R_2} \left[ S_{R_2} \right]
\]

$R_2$ is phosphate (P), and the values of the various terms are from Table 1 and A1. If we remineralize $\sigma_{R_2}$, $\mu$mol/kg of phosphate worth of organic matter, this...

\[
M_i = 0.60 \text{ } \mu\text{mol P/kg} \left[ 0 \times -0.00028 \frac{db}{\mu\text{mol P/kg}} \right] + \text{... has no effect on pressure}
\]

\[
+ \left( 0 \times 0.014 \frac{\text{C}}{\mu\text{mol P/kg}} \right) + \text{... has no effect on temperature}
\]

\[
+ \left( 0 \times -0.011 \frac{1}{\mu\text{mol P/kg}} \right) + \text{... has no effect on salinity}
\]

\[
+ \left( 1 \times -0.0085 \frac{\mu\text{mol P/kg}}{\mu\text{mol P/kg}} \right) + \text{... increases phosphate}
\]

\[
+ \left( 0 \times -0.00012 \frac{\mu\text{mol Si/kg}}{\mu\text{mol P/kg}} \right) + \text{... has no affect on silicate (soft tissue pump only)}
\]

\[
+ \left( -20.16 \times 0.0082 \frac{\mu\text{mol A}/kg}{\mu\text{mol P/kg}} \right) + \text{... decreases alkalinity by } 1.26 \times 16 \times \text{(phosphate change)}
\]

\[
+ \left( 117 \times -0.0079 \frac{\mu\text{mol C}_T/kg}{\mu\text{mol P/kg}} \right) \text{... increases } C_T \text{ according to the remineralization ratio}
\]

\[
= 0.66
\]

This $M$ value corresponds to an $I$ value of...

\[
I_i = 100% \times \frac{M_i}{\sum_{i=1}^{6} M_i}
\]

\[
I_2 = 100% \times \frac{M_2}{M_1 + M_2 + M_3 + M_4 + M_5 + M_6}
\]

\[
I_2 = \frac{0.66}{0.23 + 0.66 + 0.011 + 0.4 + 0.06 + 0.017} = 48%
\]