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

$$M_2 = \sigma_{R_2} \left| \sum_{j=1}^{7} \frac{\partial \Omega_C}{\partial X_j} \frac{\partial X_{j,2}}{\partial R_i} \right| = \sigma_{R_2} \left| S_{R_2} \right|$$

R_2 is phosphate (P), and the values of the various terms are from Table 1 and A1. If we remineralize σ_{R_2} μmols/kg of phosphate worth of organic matter, this…

$$M_i = 0.60 \text{ μmol P/kg} \left| \left(0\frac{1}{\text{db}} \times -0.00028 \frac{\text{db}}{\text{μmol P/kg}} \right) + \right.$$ … has no effect on pressure

$$+ \left(0\frac{1}{°C} \times 0.014 \frac{°C}{\text{μmol P/kg}} \right) +$$ … has no effect on temperature

$$+ \left(0 \times -0.011 \frac{1}{\text{μmol P/kg}} \right) +$$ … has no effect on salinity

$$+ \left(1\frac{1}{\text{μmol P/kg}} \times -0.0085 \frac{\text{μmol P/kg}}{\text{μmol P/kg}} \right) +$$ … increases phosphate

$$+ \left(0\frac{1}{\text{μmol Si/kg}} \times -0.00012 \frac{\text{μmol Si/kg}}{\text{μmol P/kg}} \right) +$$ … has no affect on silicate (soft tissue pump only)

$$+ \left(-20.16 \frac{1}{\text{μmol } A_T \text{/kg}} \times 0.0082 \frac{\text{μmol } A_T \text{/kg}}{\text{μmol P/kg}} \right) +$$ … decreases alkalinity by $1.26 \times 16 \times$ (phosphate change)

$$+ \left. \left(117 \frac{1}{\text{μmol } C_T \text{/kg}} \times -0.0079 \frac{\text{μmol } C_T \text{/kg}}{\text{μmol P/kg}} \right) \right|$$ … increases C_T according to the remineralization ratio

$$= 0.66$$

This *M* value corresponds to an *I* value of…

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

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

$$I_2 = \frac{100\% \times 0.66}{0.23 + 0.66 + 0.011 + 0.4 + 0.06 + 0.017} = 48\%$$