a

global rate of carbon fixation (GPP) [gC/yr] ()

global mass of Rubisco [g] 

unit conversion

total flux of all Rubisco enzymes [reactions/s]

total number of Rubisco active sites

effective rate of Rubisco [1/s]

b terrestrial Rubisco

unit convesion

$$\frac{1.2\times10^{17}\ \text{gC}}{1\ \text{year}} \times \frac{\frac{1\ \text{mol C}}{12\ \text{gC}} \times \frac{6\times10^{23}}{1\ \text{mol C}} \times \frac{1\ \text{year}}{3\times10^{7}\ \text{s}}}{\frac{1\ \text{mol Rubisco}}{7\times10^{4}\ \text{g Rubisco}} \times \frac{6\times10^{23}}{1\ \text{mol Rubisco}}} \approx \frac{2\times10^{32}\ [1/\text{s}]}{6\times10^{33}} \approx 0.03\ [1/\text{s}]$$

global reaction rate

number of Rubisco active sites

c marine Rubisco

$$\frac{10^{17}\ \text{gC}}{1\ \text{year}} \times \frac{\frac{1\ \text{mol C}}{12\ \text{gC}} \times \frac{6\times10^{23}}{1\ \text{mol C}} \times \frac{1\ \text{year}}{3\times10^{7}\ \text{s}}}{\frac{1\ \text{mol Rubisco}}{7\times10^{4}\ \text{g Rubisco}} \times \frac{6\times10^{23}}{1\ \text{mol Rubisco}}} \approx \frac{1.5\times10^{32}\ [1/\text{s}]}{3\times10^{32}} \approx 0.6\ [1/\text{s}]$$

global reaction rate

number of Rubisco active sites