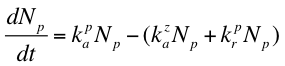
Macintosh HD:Users:gabrielyvon-durocher:Documents:Work:Research:Mesocosms:NERC grant 2012:Food Web Structure-Function:Pulse Chase:15N Pulse-Chase:figs:pulse_chase.pdf

**Figure 2. Effects of warming on trophic transfer of 15N.** Isotopically labelled 15NO3 was added to each mesocosm in June. Samples of phytoplankton (circles, dashed lines) and zooplankton (triangles, dotted lines) were then collected over 60 days and the amount of 15N per μg C-1 was measured.

Another approach – box model

Macintosh HD:Users:user:Desktop:box_model.pdf

Phytoplankton N dynamics can described by the following

 (1)

where is the uptake rate of 15N by the phytoplankton from the inorganic pool,  is the uptake of N from the phytoplankton by zooplankton grazing, is the turnover rate of 15N in the phytoplankton due to metabolism. The uptake term  can be determined from the increase in 15N through time up to the peak using

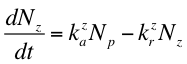
(2)

where is a normalisation constant. The loss of 15N is related to both  and , and is therefore declines over time biexpoentially.

(3)

where and are normalisation constants. I had a play around in R and Eq. (3) fits the phytoplankton data beyond the peak really well, much better than a simple exponential.

For zooplankton, N dynamics can described by the following

(4)

where  is the uptake of N from the phytoplankton by zooplankton grazing, is the turnover rate of 15N in the zooplankton due to metabolism. In Eq. (4) is a function of 15N in the phytoplankton pool, , while is related to . If the above is correct then the turnover rate of 15N in the zooplankton due to metabolism, , can be determined by

(5)

**Parameter estimation strategy.**

Thus far, I have fit a biexponential function to the phytoplankton data to estimate the zooplankton ingestion rate, as well as the 15N turnover in the phytoplankton due to metabolism, . I have also estimated 15N in the zooplankton due to metabolism, using Eq. (5).

**Uncertainties.**

I am not sure whether cutting the 15N time series data before and after the peaks and analysing the using the above functions is the best strategy. Given that the zooplankton N dynamics are related to both the N pool in the phytoplankton and the N pool in the zooplankton, I am not sure of the best statistical modelling strategy. Integrate Eq. (4) and fit to zooplankton 15N data?