Primary Production – JGOFS ^{14}C method

^{14}C Working Solution Preparation:

Sodium Carbonate Solution 0.15g in 500ml Nano in acid-cleaned 500ml teflon bottle
^{14}C stock solution 5mCi/2.5ml

- rinse acid-cleaned 100ml teflon bottle (working bottle) with sodium carbonate solution
- transfer 50ml sodium carbonate solution to 100ml teflon bottle
- add 2.5ml ^{14}C stock solution
- use remaining 10ml of sodium carbonate solution to rinse ^{14}C stock solution ampoule
- working solution will be 5mCi/62.5ml or approximately 80uCi/ml
- store working solution in refrigerator until use

Reagents and Supplies:

^{14}C working solution (see above)
HCl cleaning solution – 0.5N HCl
Ethanolamine – prevents radio-labeled inorganic CO_2 from escaping to the atmosphere
Scintillation Cocktail – use Optima Gold XR, same fluor we use for ^{32}Si
250ml polycarbonate bottles for incubation - acid washed / Nano rinsed / taped/labeled / ready for use
Pipettes and tips – all tips should be pre-rinsed with 1N HCl followed by 3 Nano rinses

Sampling:

- light levels for samples as follows: 100%, 54%, 35% 16%, 7%, 3.6%, 1.7%
- for each depth, rinse 2 250ml PC sample bottles (1 clear, 1 dark) 3x with sample water, dump waste in marked bucket, shake carboy between rinses to re-suspend particulates, and fill PC bottle to brim
- put bottles in bottle carrier, take to rad area and add 250uL ^{14}C working solution to each bottle (approximately 20uCi per bottle), note time on data sheet
- place the bottles in the corresponding light bag in the incubator, incubate for 24hours

Processing:

after 24hours, remove bottles from incubator and process as follows:

<u>total radioactivity</u>

1 - pipette 250uL of ethanolamine into labeled glass scintillation vials (EL and ED for lite and dark)
2 - with a clean, acid-rinsed pipette tip withdraw 250uL from the sample bottle and add it to the scintillation vial containing ethanolamine – draw and expel the volume twice to rinse tip before drawing the actual sample to go in the scintillation vial (use same tip for L and D bottles)
3 – add 10ml cocktail, cap and shake vigorously for at least 30seconds to completely mix cocktail with sample and ethanolamine (count of 150 works really well)

<u>filtration</u>

1 - filter contents of sample bottle on to 25mm GF/F filter, using squirt bottle of filtered seawater (FSW), do 2 small rinses of the sample bottle to remove any trace ^{14}C from inside, when filter is almost dry, rinse down sides of funnel with small amount of FSW, record time filter dries
2 - place filter in labeled glass scintillation vial (HL and EL for lite and dark), inside fume hood, pipette 250uL 0.5N HCl on to filter & let stand for several hours
3 – add 10ml cocktail, cap and shake vigorously for at least 30seconds (or to 150 count) – BE SURE FILTER IS NOT STUCK TO BOTTOM OF VIAL!

Counts:

Point Sur counter uses USER 9 for quenched 14C counts, BRZ counter uses USER 1. Be sure the first rack of samples has the USER 9 card in it. Put all samples in racks and place red HALT rack at end. Press both reset buttons at the same time twice and wait for instrument to respond, press USER NUMBER, press 9, press ENTER 3x and wait for instrument to respond, press AUTOCOUNT and let it run.

Calculations:

DPM values are converted to daily productivity rates as follows:

Production (mg C/m^3/d)=((SDPM/V)*(W*0.25*10^{-3})/TDPM)*(1.05/T)

SDPM = DPMs in filtered sample
V = volume of filtered sample in litres
TDPM = total ^{14}C DPMs in 0.25ml aliquot
W = DIC concentration in samples (~25000mg C/m^3)
0.25*10^{-3} = conversion of pipette volume to litres
1.05 = correction for the lower uptake of ^{14}C compared to ^{12}C
T = time in days