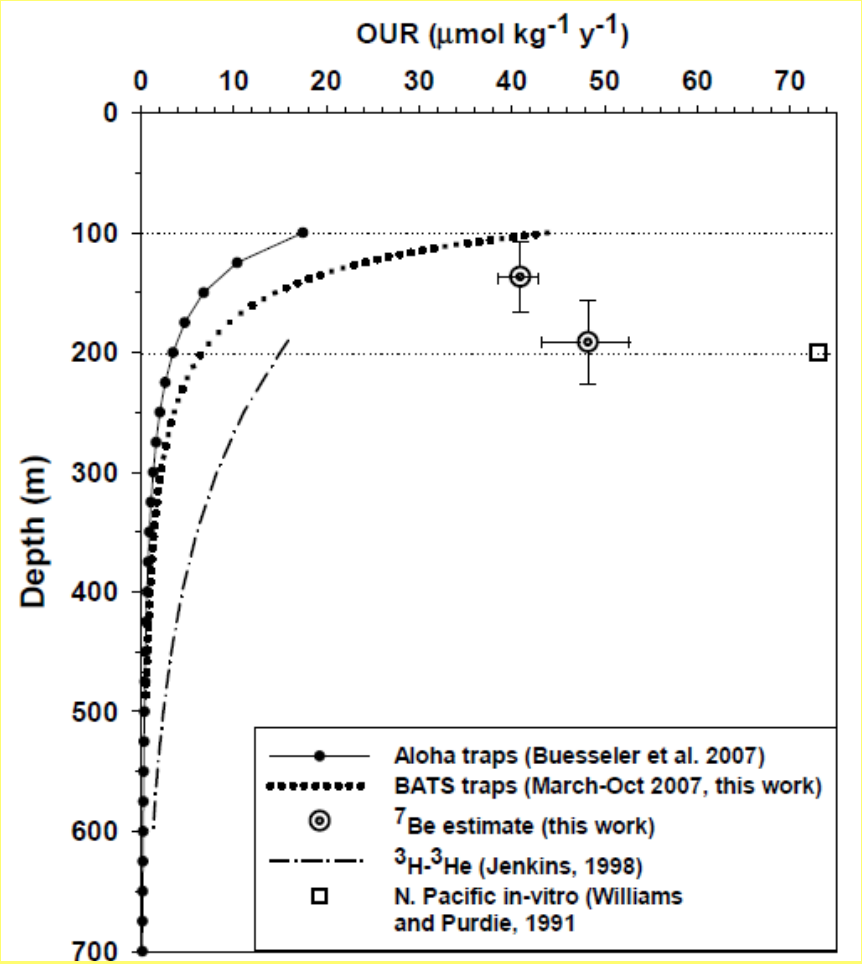
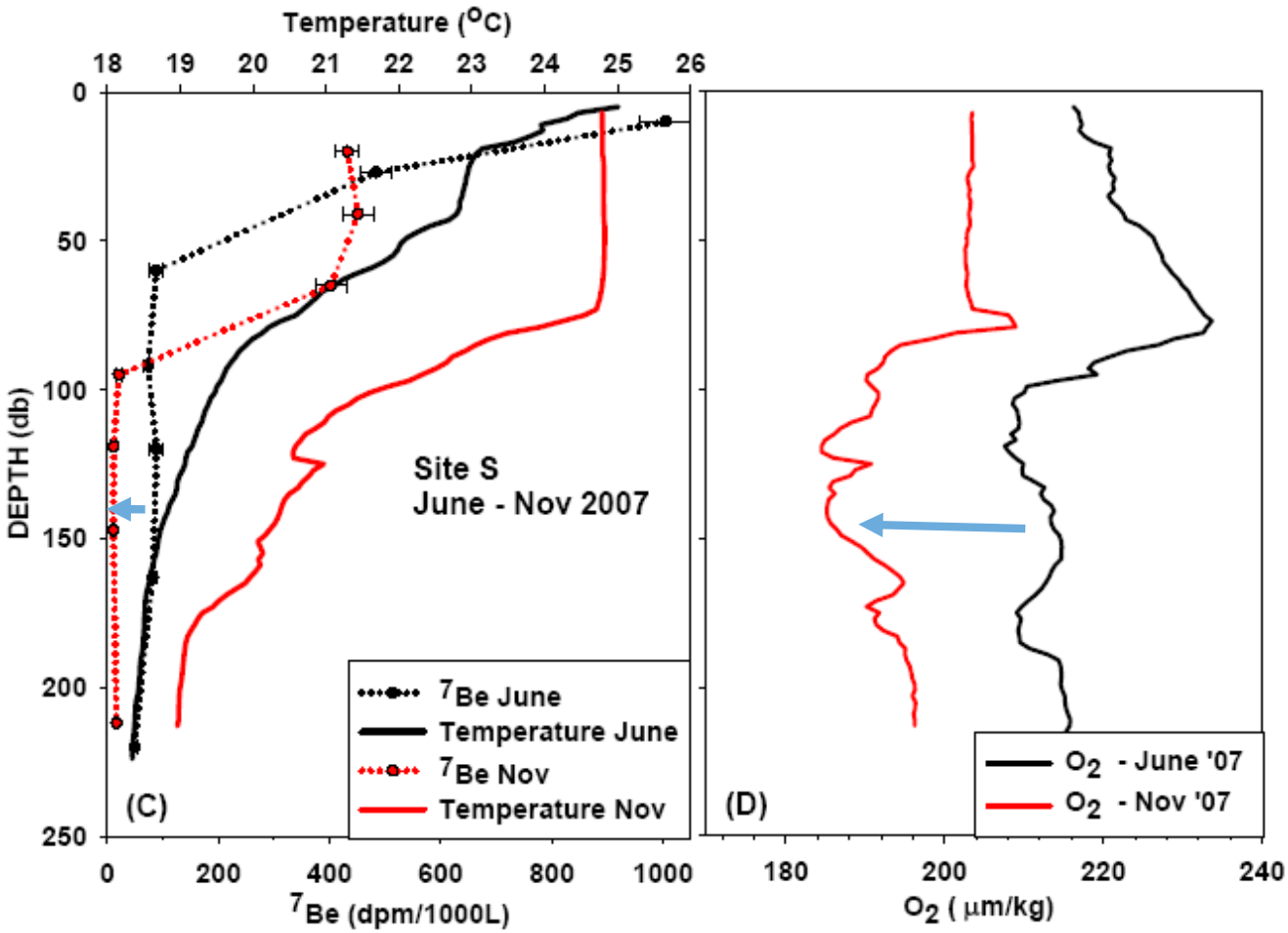
Depth dependence of OUR – what does it mean? Horizontal vs. vertical C flux



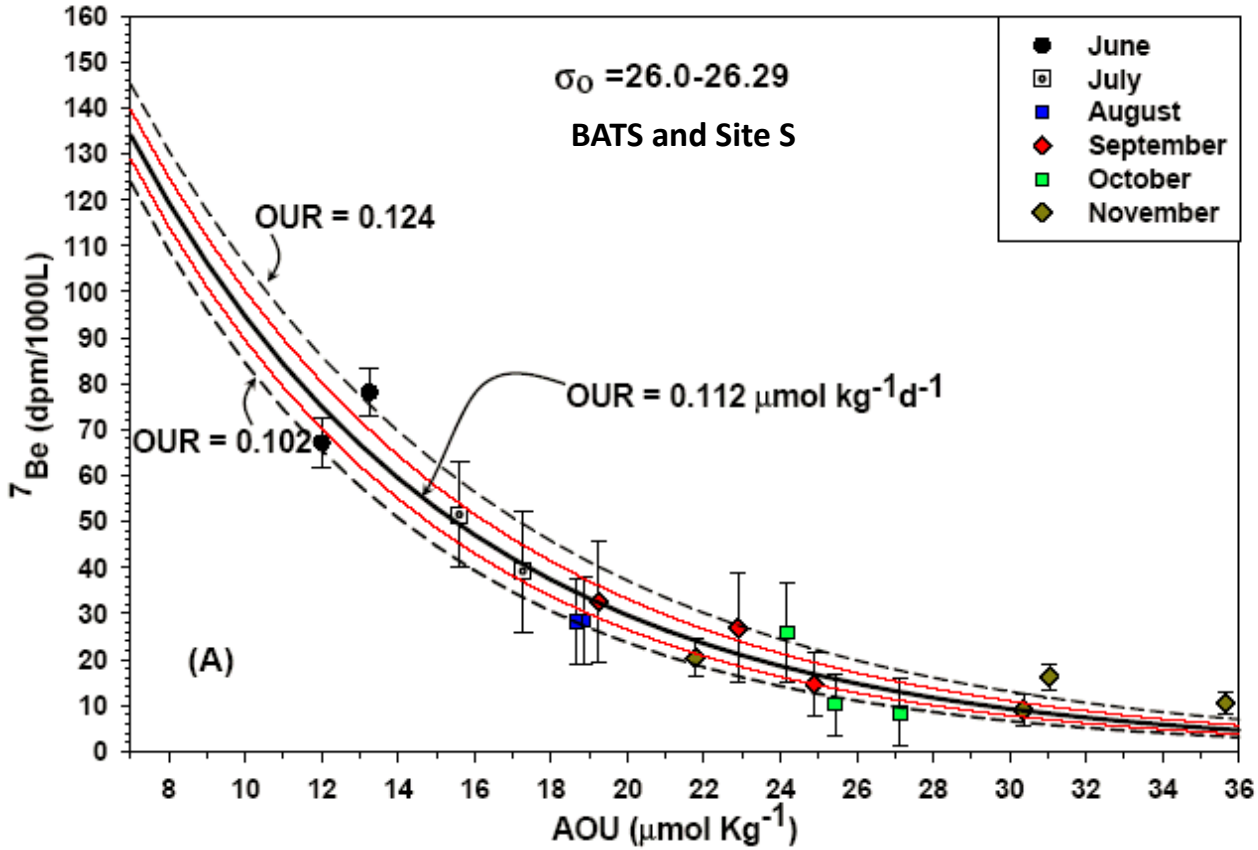
The ^{7}Be tracer ($T_{1/2}$=53d) technique allows estimation of shallow intense respiration rates

Depth-integrated C respiration rate based on O_2 utilization from ^{7}Be (100-200m) is 3.2 mol C m^{-2} yr^{-1}. This is 65% of the total (4.9 mol C m^{-2} yr^{-1}) derived from the sum of ^{7}Be and ^{3}H-^{3}He (200m-1000m) methods.

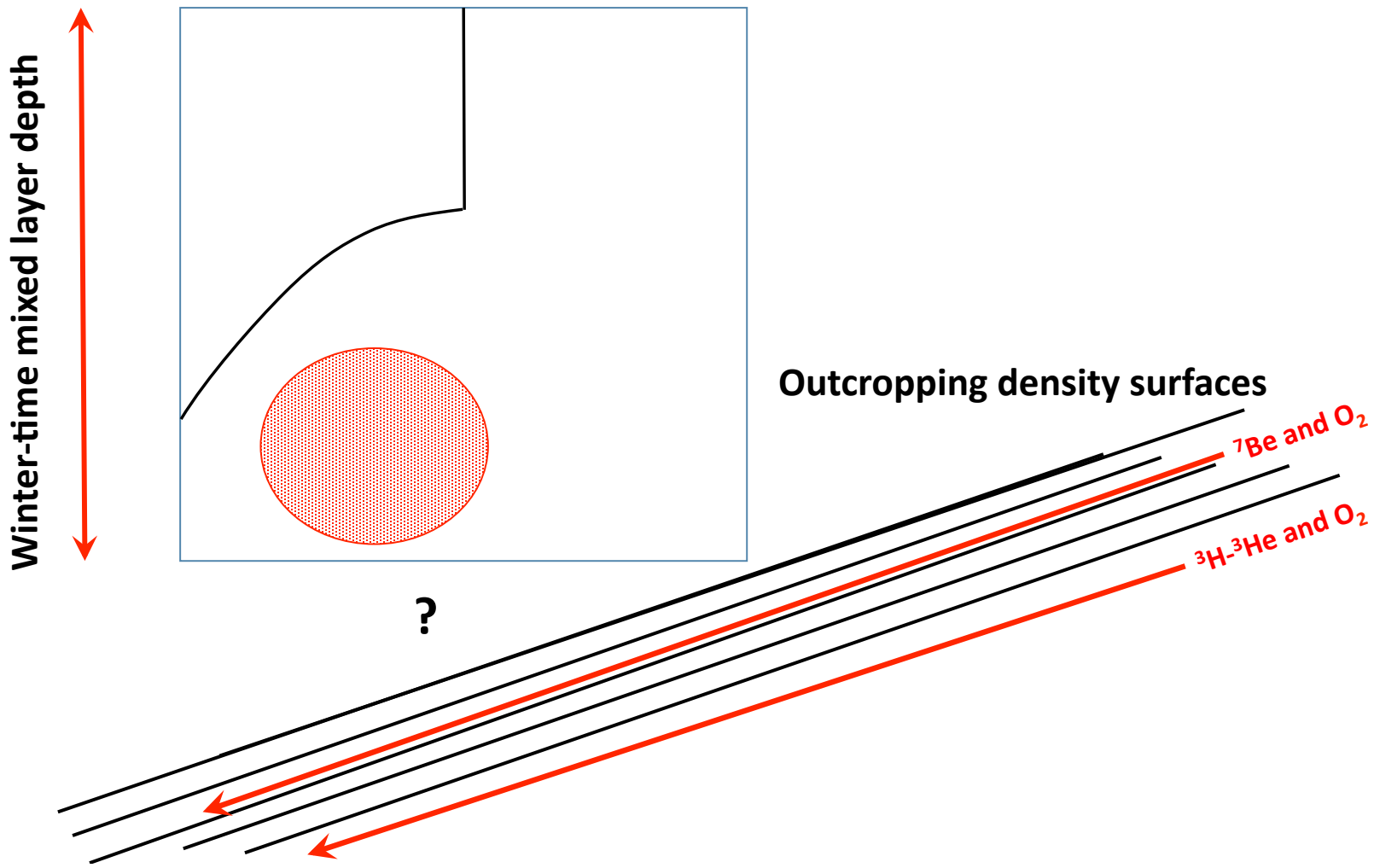
Fig: Oxygen Utilization Rate Profiles obtained by different methods (Kadko, 2009-GBC)

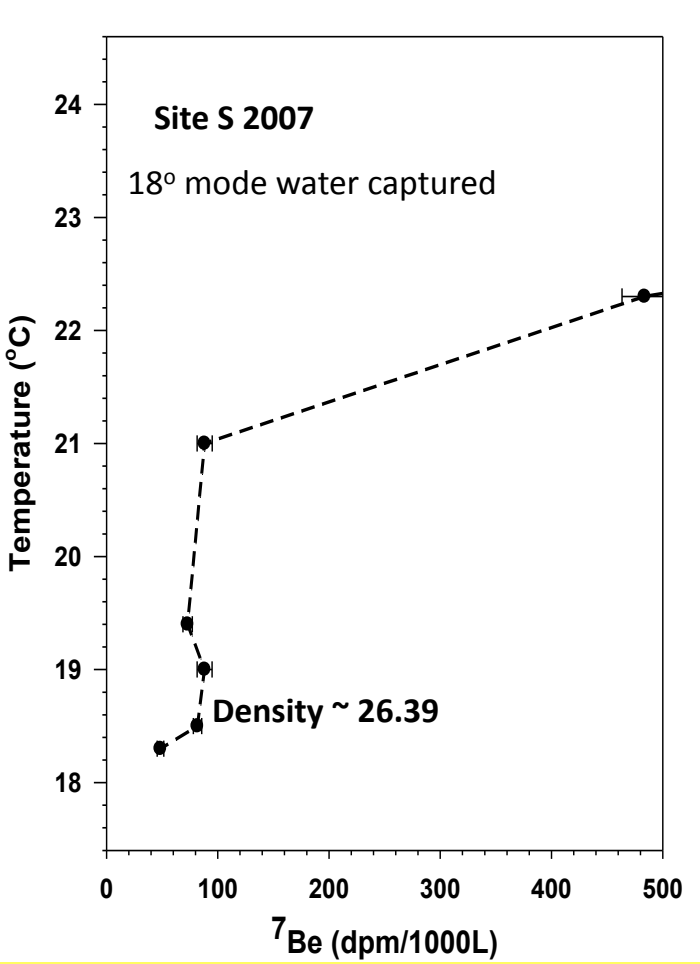

Temperature (°C)
18
19
20
21
22
23
24
25
26
0
50
100
150
200
250
DEPTH (db)
Site S
June - Nov 2007
7Be June
Temperature June
7Be Nov
Temperature Nov
(C)
0
200
400
600
800
1000
7Be (dpm/1000L)
(D)
O2 - June '07
O2 - Nov '07
180
200
220
240
O2 (µm/kg)

Rapid oxygen utilization in the ocean twilight zone assessed with the cosmogenic isotope ^{7}Be



Kadko, D. (2009) Global Biogeochem. Cycles


Winter-time mixed layer depth
Outcropping density surfaces
^{7}Be and O_2
^{3}H-^{3}He and O_2
?



Initial, or upstream conditions?

With ^{7}Be flux =0.05 dpm $cm^{-2}d^{-1}$, a mixed layer of 150 m would have ^{7}Be ~ 260 dpm/m^3.

At 160m, ^{7}Be = 82 dpm/m^3. This yields ~ 90 days.

At 160m, O_2 =209.9 µm/kg
O_2 saturation = 233.8 µm/kg

ΔO_2 ~ 24 µm/kg

Implies an OUR ~0.25 µm kg^{-1} d^{-1}

Kadko and Johnson, 2008 (ASLO)