

FICHE META_INFORMATION_PARAMETRES

(A renseigner AVANT la mission / Fill before the cruise)

1. PARAMETRES CONCERNES / PROJECT TITLE

(1 ligne par paramètre / 1 line per parameter)

(Indiquer en premier le numéro du paramètre / First indicate the number of the parameter)

5 Dissolved Oxygen O₂

2. OPERATION & CAMPAIN

BIOSOPE

3. PROJET ETUDE / PROJECT TITLE

Dissolved gases in the water column

4. RESPONSABLE SCIENTIFIQUE / PRINCIPAL INVESTIGATOR

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5. BREVE DESCRIPTION Du PROJET / BRIEF DESCRIPTION OF THE PROJECT

To characterize the vertical variability (water column) as well as spatial variability (along latitudinal gradient) in the O₂ conditions in which the main autotrophic and heterotrophic communities are growing.

To determine gross and net primary production in the water column

(A compléter APRES la mission / Fill BEFORE THE END of the cruise or AFTER the cruise)

6. DESCRIPTION DES PARAMETRES / PARAMETER DESCRIPTION

6.1. Ce qui a été mesuré et comment / What did you measure and how did you do it (include references for analytical methods)?

Dissolved oxygen will be measured using semi-automated Winker titration. In essence, the dissolved oxygen present within a seawater sample is coerced under alkaline conditions to quantitatively oxidize divalent manganese to a trivalent state. The solution is then acidified, which converts iodide ion to iodine in an amount stoichiometrically proportional to the amount of dissolved oxygen contained within the original sample. The amount of iodine is then determined by titration with a thiosulfate solution of known concentration. The end result of the chemical reactions involved is that one mole of dissolved oxygen in the seawater sample will manifest as four moles of thiosulfate, and the original oxygen concentration of the seawater sample can be calculated. Photometric endpoint detector and a piston burette (Metrohm, Dosimat 716) will be used. As change will be introduced when we are working in an area of low oxygen-high nitrite as it is being observed in upwelling off Chile. In this case, sodium azide will be added to reagent 2.

The method is suitable for levels of oxygen between 0.1 and 400 $\mu\text{mol kg}^{-1}$, and achieves a precision better than 0.1% coefficient of in the upper concentration range. Accuracy of the dissolved oxygen titrations is difficult to estimate as there are currently no reference standards available for dissolved gases in seawater.

METHOD-----

Determination of dissolved oxygen during Biosope cruise

The protocol was taken from “WHP Operations and methods” (Culberson 1991). The formula used to calculate dissolved oxygen was:

$$\text{O}_2 (\text{ml/L}) = \frac{(V_x - V_{blk,dw}) \times V_{IO_3} \times N_{IO_3} \times 5598}{(V_{std} - V_{blk,dw})} - (1000 \times DO_{reg})$$
$$\frac{(V_{bot} - 10) - V_{blk,dw}}$$

Where:

$$V_x = \text{thiosulfate titer of sample (cm}^3\text{)}$$

$V_{\text{blk;dw}}$ = thiosulfate titer of pure water blank (cm^3)

V_{std} = thiosulfate titer of standard (cm^3)

V_{bot} = volume of sample bottle (cm^3) at the temperature of sampling

V_{reg} = volume (2 cm^3) of sample displaced by reagents

V_{IO_3} = volume of iodate standard (cm^3) at temperature of standardization

N_{IO_3} = normality of iodate standard at temperature of standardization

DO_{reg} = absolute amount of oxygen added with reagents, 0.0017 mL

O_2 = oxygen concentration in sample (mL/L)

Reference:

Culberson, C.H. 1991, "Dissolved oxygen" in "WHP Operations and methods":
http://whpo.ucsd.edu/manuals/pdf/91_1/culber2.pdf

6.2. Stratégie d'échantillonnage / Sampling strategy

Automated Winkler Titration for determining dissolved oxygen on board ship

6.3. Décrire quels types de données sont nécessaires pour vous compléter votre propre jeu de données **avant** envoi à la base de données, et estimer le délai avant la disponibilité de vos données pour la base de données / Post-cruise data analysis/treatment required, and the time frame for this

Post analysis will be required after to collect the data in conjunction with CTD in order to estimate geochemical parameters as AOU, percentage of saturation, and anthropogenic CO₂.

6.4. Estimations des erreurs, précision, sensibilité des données / Error estimates, precision and accuracy of the data

6.5 SPECIAL NOTES

- We assumed a blank equal to zero. We had problems with the blank during the Winkler titration. Apparently, the double point of titration that was made to obtain the reagent blank could not be obtained in the used automatic system during Biosope.

According to my experience, the blank usually fluctuated between 0,01-0,05. Ignoring the blank will introduce small and systematic errors into the oxygen calculations, but these errors will be the same for all depth and will not affect the comparison and tendency of the results

3.-We could not have sufficient bottles to sample all the depths, nor could either make replication of sample, this we could not estimate precision or other statistical parameters.

7. FICHIERS / FILES

7.1. Nom de fichier de données / file name

oxygene final.xls

7.2. Explication des têtes de colonne, des unités et des abréviations utilisées dans le fichier de données / data file structure

Ox ctd (ml/l) : Concentration O2 donnée par la sonde CTD

Winkler (ml/l) : Concentration O2 donnée par la méthode Winkler

Flag ODV :

0	good	$(\text{Winkler} - \text{Oxctd}) < 2\% \text{ Oxctd}$
4	questionable	$2\% < (\text{Winkler} - \text{Oxctd}) < 5\%$
8	bad	$5\% < (\text{Winkler} - \text{Oxctd})$

8. RESULTATS PRELIMINAIRES

9. REFERENCES

References

Carpenter, J.H. 1965. The Chesapeake Bay Institute technique for the Winkler dissolved oxygen method. *Limnology and Oceanography*, 10: 141–143.

Hansen, H.-P. 1999. Determination of oxygen. *In* *Methods of seawater analysis*, 3rd edition, pp. 75–89. Ed. by K. Grasshoff *et al.* Wiley-VCH, Germany.

Weiss, R.F. 1970. The solubility of nitrogen, oxygen, and argon in water and sea water. *Deep Sea Research*, 17: 721–735.

WOCE. 1994. Operational Manual. Volume 3: The Observational Programme.

