

Phytoplankton pigment concentration data series for cruise Valdivia VA174

Principal Investigator and Data Originator

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Content of data series

Parameter	Unit	Parameter code	Number of samples	Number of stations	Comments
Chlorophyll <i>a</i> (Lorenzen)	µg l ⁻¹	CPHLSP1	37	8 CTD	high standard deviation
Phaeopigment <i>a</i> (Lorenzen)	µg l ⁻¹	PHAESPP1	37	8 CTD	high standard deviation
Chlorophyll <i>a</i> (SCOR)	µg l ⁻¹	CPHLSSP1	36	8 CTD	none
Chlorophyll <i>b</i> (SCOR)	ng l ⁻¹	CHLBSSP1	36	8 CTD	none
Chlorophyll <i>c</i> (SCOR)	ng l ⁻¹	CHLCSSP1	36	8 CTD	none
Carotenoids (SCOR)	µg l ⁻¹	CAROSSP1	36	8 CTD	none

CTD= CTD-Rosette water column sampling station.

Originator's protocol

Water samples were collected from 4 to 5 depths using the CTD-rosette water sampler. About 2 litres of seawater were filtered through 47 mm GF/F filters, which were then extracted overnight in buffered 90% acetone. Optical densities (od) were measured against a 90% acetone blank in a Shimadzu UV-1202 spectrophotometer using 50 mm pathlength sub-micro cells. Measurements were made at 750, 665, 664, 647, 630, 510 and 480 nm, and, after addition of 2 drops 1N HCl (od_{acid}), at 750 and 665 nm. Concentrations of chlorophyll *a* and phaeopigments were calculated by the Lorenzen method, of chlorophylls *a*, *b* and *c* by the Trichromatic equations (with coefficients of Jeffrey & Humphrey, 1975), and of total carotenoids from the optical densities at 510 and 480 nm.

Lorenzen method:

$$\begin{aligned} \text{chlorophyll } a \text{ (}\mu\text{g l}^{-1}\text{)} &= A * K * (\text{od}_{(665)} - \text{od}_{\text{acid}(665)}) * E / (V * p) \\ \text{pheophytin } a \text{ (}\mu\text{g l}^{-1}\text{)} &= A * K * ((R * \text{od}_{\text{acid}(665)} - \text{od}_{(665)})) * E / (V * p) \end{aligned}$$

where:

$$\begin{aligned} A &= \text{Lorenzen coefficient for chlorophyll } a \text{ (11 } \mu\text{g cm ml}^{-1}\text{)} \\ R &= \text{chlorophyll } a\text{:pheophytin absorbance at 665 nm (1.7)} \\ K &= R / (R - 1) \end{aligned}$$

Trichromatic method (SCOR):

$$\begin{aligned} \text{chl. } a \text{ (mg m}^{-3}\text{)} &= (11.85 * \text{od}_{(664)} - 1.54 * \text{od}_{(647)} - 0.08 * \text{od}_{(630)}) * E / (V * p) \\ \text{chl. } b \text{ (mg m}^{-3}\text{)} &= (-5.43 * \text{od}_{(664)} + 21.03 * \text{od}_{(647)} - 2.66 * \text{od}_{(630)}) * E / (V * p) \\ \text{chl. } c1+c2 \text{ (mg m}^{-3}\text{)} &= (-1.67 * \text{od}_{(664)} - 7.60 * \text{od}_{(647)} + 24.52 * \text{od}_{(630)}) * E / (V * p) \end{aligned}$$

Carotenoids:

$$\text{carotenoids (mg m}^{-3}\text{)} = (7.6 * (\text{od}_{(480)} - 1.49 * \text{od}_{(510)})) * E / (V * p)$$

where:

$$\begin{aligned} E &= \text{extract volume (ml)} \\ V &= \text{volume of sample water filtered (l)} \\ p &= \text{pathlength of cuvette (cm)} \end{aligned}$$

BODC processing

In order to standardise parameter units with that held in BODC's database, chlorophyll b and c concentrations were converted from $\mu\text{g l}^{-1}$ to ng l^{-1} by multiplying their original values by 1000. The rest of the data were loaded into a database under the ORACLE Relational Database Management System without modification.

Comments on data quality from data originator

Measurements suffered from high and somewhat variable blanks, and the standard deviation of replicate chlorophyll a estimated by the Lorenzen method was too high (0.19 mg m^{-3}) for these values to be considered reliable. The standard deviations of replicate estimates of chlorophyll a by the Trichromatic method ($0.05 \mu\text{g l}^{-1}$) and of carotenoids ($0.06 \mu\text{g l}^{-1}$) were acceptable.

Reference

Jeffrey SW, Humphrey SF (1975) New spectrophotometric equations for determining chlorophylls *a*, *b*, *c1* and *c2* in higher plants, algae and phytoplankton. *Biochem. Biophysiol. Pflanzen*, 167, 191-194.