FRANKLIN CRUISES FR 8/90, 5/92 AND 8/93
DATA DOCUMENTATION
JGOFS WESTERN EQUATORIAL PACIFIC PROCESS STUDY

[1] General:

Parameter:	Phytoplankton pigments detemined by HPLC: Cruises FR 9008 and FR 9205.
Level 1	Yes
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List of Parameters: Phytoplankton pigments:

Cli a	chlorophyllide *a*
Chl c_3	chlorophyll c_3
Chl c_1+c_2	chlorophyll c_1+c_2
PERI	peridinin
cPERI	cis-peridinin
19BUT	19'-butanoyloxyfucoxanthin
FUCO	fucoxanthin
c19BUT	cis-19'-butanoyloxyfucoxanthin
NEO	neoxanthin
19HEX	19'-hexanoyloxyfucoxanthin
cFUCO	cis-fucoxanthin
c19HEX	cis-19'-hexanoyloxyfucoxanthin
PRAS	prasinoxanthin
Pb a	pheophorbide *a*
VIOL	violaxanthin
Pb a like 1	pheophorbide *a* like 1
DINO	dinoxanthin
cPRAS	cis-prasinoxanthin
Pb a like 2	pheophorbide *a* like 2
DDX	diadinoxanthin
DDC	diadinochrome
ANTH	antheraxanthin
ALLO	alloxanthin
MON	monadoxanthin
DIAT	diatoxanthin
LUT	lutein
ZEA	zeaxanthin
cZEA	cis-zeaxanthin
CANT	canthaxanthin
SIPN	siphonein
Chl b + dvChl b	chlorophyll *b* + divinyl-chlorophyll *b*
Chl a'	chlorophyll *a* allomer
Chl a + dvChl a	chlorophyll *a* + divinyl-chlorophyll *a*
eChl a	chlorophyll *a* epimer
ECHN	echinenone
Ph b	pheophytin *b*

Ph a	pheophytin *a*
ßΨCA	ßΨ-carotene
ααCA	αα-carotene
ßαCA	ßα-carotene
ßßCA	ßß-carotene
pPh a	pyro-pheophytin *a*
cßαCA	cis-ßα-carotene
cßßCA	cis-ßß-carotene

List of Units: $\mu g\ m^{-3}$

[2] Sampling:

Gear (e.g. CTD, pump, etc.):	CTD; 10 litre niskin bottles
Standard Depths:	Hydrochemistry depths: see Hydrochemistry data
Chemicals used:	none
Special Procedures:	Niskins with silicone rubber o-rings and closure rubbers. Began pressure filtration through Whatman GFF filers as soon as CTD on deck. Filters blotted dry and stored in liquid nitrogen until analysed.
Comments and Notes:	Sampled in dim light.

[3] Analysis:

Instrument:	HPLC
Method:	extraction of pigments from filters followed by ternary gradient HPLC
Precision:	coefficient of variation estimated as 17% over all pigments for triplicate samples from FR 9205
Comments:	(1) FR 9205: • Duplicate extract from station 42, 75.1 m • Duplicate extract from station 51, 96 m • Triplicate samples from station 45, 67 m • 147 ^{0}E transect and 155 ^{0}E, 3 ^{0}S samples not worked up (2) FR 9308: Due to loss of all pigment samples on FR 9308, chlorophyll *a* data can be estimated using fluorescence profiles from FR 9308 and fluorometer calibration from FR 9205

[4] Results:

Quality of Data:	FR 9008 and FR 9205: good. FR 9308: loss of HPLC pigment samples; chlorophyll *a* can be calculated from fluorometric data

(calibrated using FR 5/92 data; see methods for a full description of the calibration procedures).

Known Problems: Loss of pigment samples for FR 8/93.

[5] Brief description of analytical methods

Chl *a* estimation from *in situ* fluorescence

During FR05/92, the fluorometer was calibrated against measurements of extracted Chl *a* (actually chlorophyll *a* plus divinyl-chlorophyll *a* - see Mackey *et al.,* 1995) determined by HPLC with diode array detection. The relationship was:

$$\text{Chl } a \ (\mu g\ l^{-1}) = 0.01204 \times \text{Seatech}(\%) + 0.026 \qquad (r^2 = 0.698,\ n = 94)$$

with a standard error in Chl *a* of 0.06 $\mu g\ l^{-1}$. During FR08/90, the instrument was calibrated against Chl *a* determined spectrophotometrically and the correlation was:

$$\text{Chl } a \ (\mu g\ l^{-1}) = 0.01239 \times \text{Seatech}(\%) + 0.0142 \qquad (r^2 = 0.848,\ n = 174)$$

with a standard error in Chl *a* of 0.05 $\mu g\ l^{-1}$. Between the two cruises, the slope had changed by only 3% and the difference in intercept was less than 20% of the standard error in the calculated concentration of Chl *a*. Unfortunately, samples collected for calibration of the fluorometer on FR08/93 had decomposed because of a faulty Dewar before they could be analysed. We therefore assumed that the calibration for FR08/93 was unchanged from that found in 1992.

Reference: see Mackey et al., *Deep-Sea Research,* **44**, 1951-1978.

Pigment calibration

Water samples (10 L) were generally collected at 25 m intervals to 150 m from Niskin bottles attached to the CTD rosette. The sampling depth closest to the DCM, determined from the *in situ* fluorescence profile, was moved so that samples were always collected from the DCM. The samples were pressure-filtered (5 psi) through Whatman GF/F filters which were blotted dry and stored in liquid nitrogen. In contrast to FR08/90 where pigment analyses of samples was carried out post-cruise in Hobart within 1 - 3 months of collection, pigment samples from FR05/92 were analysed on-board within 24 hours of sampling.

The pigment filters were extracted with acetone (Carpenter *et al.*, 1991) and analysed by HPLC based on the ternary gradient method of Wright *et al.*, (1991) as described in Mackey *et al.*, (1995). Pigments were detected at 436 nm and identified by their retention time and spectra. Calibration standards of Chl a_1 and Chl b_1, and carotenoids from the SCOR-recommended algal cultures (Jeffrey and Wright, 1997) were kindly made available by S. W. Wright. HPLC response factors were determined by the method of external standards (Mantoura and Repeta, 1997) using data provided by (Jeffrey, *et al.,* 1997) and S. W. Wright (personal communication).

Reference: see Higgins, H. W. and Mackey, D. J. (2000) *Deep-Sea Research,* **47**, 1461-1483.

References:

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Jeffrey, S.W. and Wright, S.W. (1997). Qualitative and quantitative analysis of SCOR reference algal cultures. In: Jeffrey, S.W., Mantoura, R.F.C., Wright, S.W. (Eds.), Phytoplankton pigments in Oceanography: Guidelines to Modern Methods. SCOR-UNESCO Paris, pp 343-360.

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Mantoura, R.F.C. and Repeta, D.J. (1997) Calibration methods for HPLC. In: Jeffrey, S.W., Mantoura, R.F.C., Wright, S.W. (Eds.), Phytoplankton pigments in Oceanography: Guidelines to Modern Methods. SCOR-UNESCO Paris, pp 407-428.

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[6] Comments: