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## OZGOFs

### Australian Western Equatorial JGOFS Data

Data plus Users Guide.

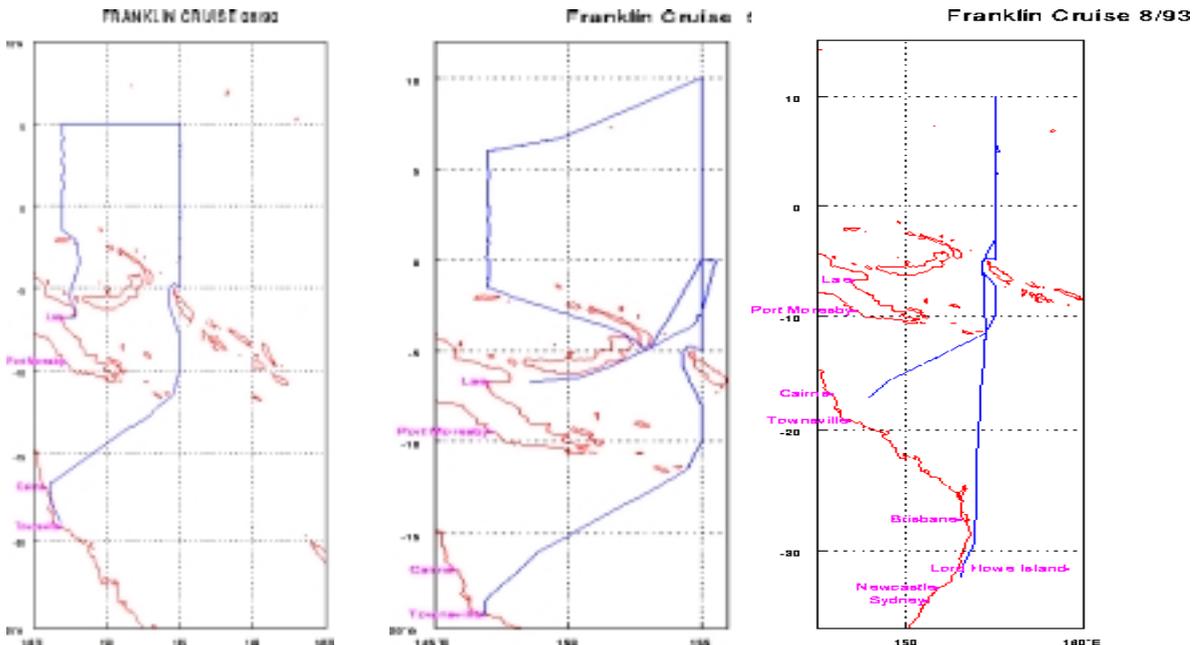
Data sets and documentation compiled by Brian Griffiths.

The OZGOFs research project was a multidisciplinary project comprising 3 research cruises on the R.V. Franklin in October 1990, July 1992 and November 1993. The area of operations was between 2°S and 6°N along 147°E and between 10°S and 10°N along 155°E.

#### Introduction

The Australian Equatorial JGOFS (OzGOFs) investigations were conducted on three cruises in 1990, 1992 and 1993 on transects along between 6°N and 2°S along 147°E and between about 12°S to 10°N along 155°E. The cruise tracks are shown below. The convention used in naming of the cruises was two letters to identify the ship, two digits to identify the calendar year, and two digits to identify the sequential number of the cruise within the calendar year. Thus, FR 9008 stands for Franklin (FR) done in 1990 (90) and the 8<sup>th</sup> cruise in 1990 (08). Data from the two legs of FR 9205 have been combined into a single "cruise" on the disk. FR 9008 was made between 2-17 October 1990; FR 9205 between 15 June and 13 July 1992, and FR 9308 between 5 November and 1 December 1993. The cruise in 1990 (FR 9008) was carried out after the 1988/89 La Nina but before the 1991/92 La Nino event. The cruises in 1992 (FR 9205) and 1993 (FR 9308) were done during the middle and end of a prolonged El Nino event.

## Cruise tracks



On FR 9205, Leg 1 was a repeat of cruise FR 9008, with one transect along each of 147° E and 155° E. Leg 2 was used to conduct JGOFS time series studies at 0° S, 155° E and 3° S, 155° E to complement the transect data collected on Leg 1. The process sites were chosen to be at the Equator, and in a region of high productivity at 3°S identified on Leg 1. Free-floating sediment trap arrays, modeled on the Knauer design, were deployed at 200 and 700m depths for 3 days. These were treated as Lagrangian drifters, and the ship followed these carrying out the other sampling. The process studies addressed physical, chemical and biological processes and their variation on time scales of hours to days, and space scales of tens of kilometers. Detailed cruise reports for each cruise are given in the directory labeled "Cruise Summaries".

## Objectives

The objectives of the cruises were to:

- 1) To measure vertical and horizontal profiles of pH, carbon dioxide and fluorescence in waters of the western equatorial Pacific Ocean.
- 2) To study the primary and secondary productivity of these waters.
- 3) To study the physical, chemical and biological processes that determines the vertical fluxes of carbon across the air-sea interface and within the water column.
- 4) To study the chemical, physical and biological processes leading to increased biomass along the equator at the western boundary of the Pacific Ocean.
- 5) To use chemical methods, such as lipid and pigment analyses, to characterize the phytoplankton community structure within different water masses.

The research vessel Franklin carried a maximum of 12 scientific staff. Two hydrochemistry staff, responsible for nutrient, salinity, and oxygen analyses on board, plus one computing specialist and one electronics specialist meant there were only 8 places for JGOFS scientists on board. This restricted the number of JGOFS core measurements that could be made on these cruises. However, a significant number of these core measurements were made, and most of the data from successful experiments has been included on the CD-ROM

## CD-ROM overview

The data have been arranged in directories, with the measurement type as the directory name. Files containing the parameter plus ancillary data are in each directory. Data in the files are in comma separated value format. The data are fully described in metafiles (saved as pdf format and rich text files [rtf]) in the directory. The metadata descriptions include a general introduction, including parameter type and investigators name, sampling and analytical methods, methods, error estimates, comments on data quality, a brief description of the analytical method, and a comments section.

## Data description

The ADCP data is presented in 8 meter bins at 20 minute averages along the major transects. CTD data for each cruise is presented as individual stations. The first 12 lines in each profile are header information: ship, date, start time, bottom time, finish time (UTC), cruise number, start position, bottom position, and finish position (as dd mm.ss), maximum depth and ocean depth.

The CTD data, plus density (as sigma-t), fluorescence and PAR is presented in 2 meter bins. Where no information is presented under a header (e.g. PAR, fluorescence) the sensor was not present on the CTD during the cast. Fluorescence profiles from a SeaTech fluorometer mounted on the CTD converted to chlorophyll-a profiles using a regression of fluorescence burst data (taken when a niskin bottle is closed) and the extracted chlorophyll sample at that depth. The fluorescence profiles were calibrated using chlorophyll-a evaluated using the trichromatic equations for FR 9008, but HPLC chlorophyll-a on FR 9205. The regressions are given in the metafiles. Where possible, the extracted chlorophyll-a data have been depth-matched and included on the data files.

The parameters sampled from niskin bottles (salinity, nutrients, chlorophyll and pigments, bacteria and cyanobacteria, lipids, nutrients, primary production) use the same template, derived from the hydrochemistry sampling sheets, but are in separate directories. The general form is for each station to be listed, along with a counter, time and date of sampling, station position, niskin number and position on the rosette (when supplied), and then the data.

Radionuclide data was taken at one site on FR 9205, and three on FR 9308, and consisted of measurements of dissolved and particulate  $^{226}\text{Ra}$ ,  $^{210}\text{Pb}$ , and  $^{210}\text{Po}$ .

Underway data are found in the Surface CO<sub>2</sub> directories. Surface pCO<sub>2</sub> data measured using an equilibrators are from FR 9205 only, and contain date, time, position, surface temperature and salinity, atmospheric pressure and fCO<sub>2</sub> data. There are estimates of pCO<sub>2</sub> from pH studies in surface waters from FR 9008, FR

9205, and FR 9308. These files contain Files in the Underway Data directory contain date, time, position, surface temperature, salinity, fluorescence (in uncalibrated Turner units), pH and pCO<sub>2</sub> data.

The free-floating sediment trap data, from FR 9308 only, consists of HPLC pigments and pigment flux estimates, and flux estimates for dry weight, carbonate, organic matter, and total carbon, nitrogen and phosphorus fluxes.

Zooplankton was sampled on FR 9205 and FR 9308 using a 200 micron mesh aperture free-fall plankton net. Settled volumes and dominant taxa only were recorded.

## Data description

The data are fully described in metafiles (saved as either pdf format or rich text files [rtf]) files in the appropriate directory. The metadata descriptions include a general introduction, including parameter type and investigators name, sampling and analytical methods, methods, error estimates, comments on data quality, a brief description of the analytical method, and a comments section. An overview of the parameters available is given in the table at the end of this document.

## Honour roll

These cruises were part of the CSIRO Divisions of Fisheries and Oceanography JGOFS research programs funded by the Department of Industry, Science and Technology Greenhouse Project. They could not have been successful without the support from the ORV Franklin Steering Committee. In particular, support at sea was given by the computing group (Bob Beattie), Electronics (Erik Masden and Phil Adams). The Hydrochemistry group (Ron Plaschke, Dave Terhell, Bob Griffiths, Les Drury, and Val Latham) did the salinity, nutrient, and oxygen analyses at sea, and the post-cruise quality control and data processing this data. Dave Vaudrey carried out the post-cruise CTD and oxygen sensor processing. The ADCP data was processed by Jeff Dunn, and underway meteorology and navigation data was processed by Bernadette Heaney. Niskin bottle sampling was done by Pru Bonham, Jeanette O'Sullivan, Don McKenzie, Sandy Garland, Ros Watson, Danny Holdsworth, and Mark Pretty. Filtering for the pigment samples was carried out by Harry Higgins, Jeanette O'Sullivan, Don McKenzie and anyone else standing around with time on their hands. Trichromatic chlorophyll and HPLC chlorophyll pigment analyses on shore was done by Harry Higgins and Lesley Clementson. Bacterial counts and picoplankton sampling was done by Harry Higgins. The primary production estimates were carried out by Pru Bonham, Don McKenzie and Brian Griffiths. The free-floating sediment traps were constructed by the CSIRO Workshop, and Don McKenzie, Pru Bonham, Sandy Garland and Jeanette O'Sullivan carried out the deployments and initial sample processing, while Lesley Clementson and Sandy Garland carried out the post-cruise analyses. The pH and underway fluorescence systems were kept operational and calibrated by Jeanette O'Sullivan and Denis Mackey while Bronte Tilbrook and Mark Pretty ran the CO<sub>2</sub> equilibrator on FR 9205, and produced the fCO<sub>2</sub> data. Philip Towler carried out the radionuclide sampling and processing as part of a PhD project based at the University of Melbourne. Don McKenzie, Pru Bonham and Brian Griffiths carried out the zooplankton sampling, and Pru Bonham measured the settled volumes and provided the data on major taxa in the samples.

The efforts of the Chief Scientists on the cruises (Denis Mackey, John Parslow) and the other Principal Investigators (Ed Butler, John Volkman, and Bronte Tilbrook) contributed greatly to the success of the experiments. The cruises could not have been successful without the support given by Captain Neil Cheshire and the officers and crew on the ORV Franklin: their cheerful responses to the requests of scientists were very much appreciated by the scientific parties.

## **Acknowledgements**

The publication of this data was not possible without the help of the CSIRO Data Group, in particular Kim Finney, Tony Rees and Terry Byrne, and the various scientists identified above who willingly made their data, including unpublished data, available. The guidance of Roy Lowry (British Oceanographic Data Center, Birkenhead, U.K.) was particularly appreciated, as were comments from the International JGOFS Data Management Task Team.

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## **Citation**

All of the data on this CD are available in the public arena via CSIRO Division of Marine Research. However, it is still necessary to acknowledge the use of any data in subsequent publications just as if the CD were a journal. Sufficient information has been provided in the metadata files to identify the originators of the data. It is suggested that the data be acknowledged by reference to the originator (e.g. Jones, 2000) with the CD ROM cited as "Australian Equatorial JGOFS Data Set, CD ROM Electronic Publication, CSIRO Division of Marine Research, Hobart, Tasmania, Australia, 2000."

## **Problems with the data?**

Please contact Brian Griffiths at [Brian.Griffiths@marine.csiro.au](mailto:Brian.Griffiths@marine.csiro.au) or at CSIRO Division of Marine Research, GPO Box 1538, Hobart, Tasmania Australia 7001.

Table 1: Overview of parameters available on the CD-ROM

Parameter / Directory	FR 9008	FR 9205	FR 9308
Acoustic doppler current profiler data	8 meter depth bins, 20 minute averages along cruise track	8 meter depth bins, 20 minute averages along cruise track	8 meter depth bins, 20 minute averages along cruise track
Chlorophyll-a and phytoplankton pigments	HPLC and trichromatic data from niskin bottle data on most casts	HPLC data from niskin bottle data on most casts	Restricted HPLC data set available as profile samples lost.
CTD data	Temperature, salinity, sigma-t, fluorescence, PAR and oxygen profiles	Temperature, salinity, sigma-t, fluorescence, PAR and oxygen profiles	Temperature, salinity, sigma-t, fluorescence, PAR and oxygen profiles
Cyanobacteria and bacteria	Counts and abundance data at 4 (bacteria) and 21 (cyanobacteria) stations	Counts and abundance data at 8 (bacteria) and 25 (cyanobacteria) stations	No samples taken.
Natural radionuclides	No sampling	One profile of $^{226}\text{Ra}$ , $^{210}\text{Pb}$ , and $^{210}\text{Po}$	Three depth profiles of $^{226}\text{Ra}$ , $^{210}\text{Pb}$ , and $^{210}\text{Po}$
Nutrients	Nitrate+nitrite, silicate, and phosphate at most stations	Nitrate+nitrite, silicate, and phosphate at most stations. Some stations have separate estimates of nitrite	Nitrate+nitrite, silicate, and phosphate at most stations. Some stations have separate estimates of nitrite
Primary production	P vs I parameters, modeled production	P vs I parameters, modeled production	P vs I parameters, modeled production
Sediment trap data	No samples	Samples lost	Samples from 200m and 700m at 2 sites
Surface fCO <sub>2</sub> data	Date, time, position, temperature salinity, temperature, pH, pCO <sub>2</sub> ,	fCO <sub>2</sub> , and pCO <sub>2</sub> from pH and Date, time, position, temperature salinity, temperature, pH, pCO <sub>2</sub> , fluorescence	Date, time, position, temperature salinity, temperature, pH, pCO <sub>2</sub> , fluorescence
Zooplankton	No data	36 stations, settled volume and taxa	40 stations, settled volume and taxa