# NOC_CNCo_Pacific_Celebes

# Discrete measurements (TCO2, TALK, pCO2, and pH) metadata form

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Dataset Info:
Dataset ID:**NOC_CNCo_Pacific_Celebes_2007-2010**
Submission Dates:
Initial Submission: **2010/09/24**
Revised Submission: **2013/11/16**

Cruise Info:
Experiment:
Experiment Name:
**NOC_CNCo_Pacific_Celebes**
Cruise:
Cruise ID: (Expocode)
Section: (Leg)
Geographical Coverage:
Geographical Region:
**Pacific, Atlantic, Indian Ocean, Mediterranean Sea, Red Sea, Arabian Sea. Before May 2009, the ship travelled on a route which circumnavigated the globe from west to east. Between May 2009 and October 2009, it traded on a route that ran through the Suez Canal to Indonesia before passing the Cape of Good Hope travelling to America. From October 2009, the ship repeatedly crossed the Pacific between west US/Canada and New Zealand.**

Bounds:
Westernmost Longitude: **-180.000**
Easternmost Longitude: **+180.000**

Northernmost Latitude**: +48.514**
Southernmost Latitude: **-41.604**

Temporal Coverage:
Start Date: **2007/06/11**
End Date: **2012/03/18**
Ports of Call: (One per line)
Vessel:
Vessel Name: **MV Pacific Celebes**
Vessel ID:  **IMO: 8126599, MMSI: 477868000**
Country: **Hongkong, China**
Vessel Owner: **China Navigation Company, the Swire Group**

Variables Info:
Variable:
Variable Name: **ShipID**
Description of Variable: (units)
**The ID of the ship used for collecting the DIC/TA samples**
Variable Name: **Longitude**
Description of Variable: (units)
**Longitude in decimal degrees; recording GPS position of ship at time sample was taken**
Variable Name: **Latitude**
Description of Variable: (units)
**Latitude in decimal degrees; recording GPS position of ship at time sample was taken**
Variable Name: **Sampling Time**
Description of Variable: (units) **Sampling time (yyyy/mm/dd HH:MM)**
Variable Name: **Year**
Description of Variable: (units) **Sampling year**
Variable Name: **Month**
Description of Variable: (units) **Sampling month**
Variable Name: **Depth**
Description of Variable: (units) **Sampling depth (m)**
Variable Name: **Temperature**
Description of Variable: (units)
**In situ temperature (degree C); measured by a hull mounted Seabird SBE48 temperature sensor**
Variable Name: **Salinity**
Description of Variable: (units)
**Salinity calculated from temperature and conductivity (measured by Aanderaa 3919 sensor), and calibrated by daily discrete samples which were analysed by a salinometer (8400 B Autosal, Guildline, Canada).**
Variable Name: **Oxygen_µmol/kg**
Description of Variable: (units)
**Dissolved oxygen (µmol kg-1); measured by three Aanderaa Optode 3835 and corrected for the effects of temperature and salinity.**
Variable Name: **DIC(TCO2)_µmol/kg**
Description of Variable: (units)

**Dissolved inorganic carbon (µmol kg-1), measured by VINDTA 3C (Marianda, Germany).**
Variable Name: **DIC_flag: (WOCE WHP bottle parameter data quality flags): 1 = Sample for this measurement was drawn from water bottle but analysis not received; 2 = Acceptable measurement; 3 = Questionable measurement; 4 = Bad measurement; 5 = Not reported; 6 = Mean of replicate measurements; 7 = Manual chromatographic peak measurement; 8 = Irregular digital chromatographic peak integration; 9 = Sample not drawn for this measurement from this bottle.**

Description of Variable: (units)
**DIC quality flag,**
Variable Name: **TA_µmol/kg**
Description of Variable: (units)
**Total alkalinity (µmol kg-1), measured by VINDTA 3C (Marianda, Germany).**
Variable Name: **TA_flag**
Description of Variable: (units)
**TA quality flag: (WOCE WHP bottle parameter data quality flags): 1 = Sample for this measurement was drawn from water bottle but analysis not received; 2 = Acceptable measurement; 3 = Questionable measurement; 4 = Bad measurement; 5 = Not reported; 6 = Mean of replicate measurements; 7 = Manual chromatographic peak measurement; 8 = Irregular digital chromatographic peak integration; 9 = Sample not drawn for this measurement from this bottle.**

Total Variables in the Data Set: **14**

Method Description:
DIC Analysis Method:
Total C02 Data:
TCO2 Analysis Method:
**The analysis of DIC was undertaken using VINDTA 3C (Marianda, Germany) at the National Oceanography Centre, Southampton. By reaction with phosphoric acid, dissolve inorganic carbon of the sample was converted to $CO_2$. The $CO_2$ gas was carried by $N_2$ into the coulometer cell and reacts with monoethanolamine to form a titratable acid which causes the fade of blue indicator. Respond to the colour change, a current flow would generate base to remove the acid and restore the indicator to the original colour. The amount of $CO_2$ can be estimated from the required coulombs of the required current (corrected for blank), and DIC concentration can then be calculated given the known sample volume.**
Standardization Technique:
Technique Description:
**In order to standardize the results, Certified Reference Materials (CRM) from A.G. Dickson, Scripps Institution of Oceanography were analysed as standards to calibrate the instrument at the beginning and end of each day of analysis. A daily correction factor was applied to all measured values according to Millero et al. (1998).**
Sample Volume: (mL) **19.1681**

CRM Info:

Correction Magnitude: **the averaged correction factor is 0.9937**
Batch Number: (One Used Batch Number per Line)
**90**
**91**
**93**
**97**
**99**
**105**
**109**

CRM Analysis Info: (e.g., Refer to plots for CRMs):

Field Replicate Info:
**Repeated measurements on the same batch of seawater (n>=3) in the lab gave consistent results (precision for the whole dataset estimated as 2.0±0.7 µmol kg-1). But the reproducibility of the measurements of duplicate samples (n=10, root mean square deviation is 3.92 µmol kg-1) is not as good as the lab result. This may mainly be due to the fact that these duplicate samplings were taken when the ship's speed was ~13.5 knot.**
Poisoning Info:
Poisoning Correction Description: (e.g., Refer to plots for CRMs)
**Saturated HgCl2 (0.05 mL) is added to the collected sample to prevent the sample from biological modification. Since we use a large sampling volume (250 mL), the dilution effect of adding HgCl2 is neglectable (0.02%).**

Poison Volume: (mL) **0.05**
Accuracy Info: (Estimate overall precision and accuracy, and why)
**Repeated measurements on the same batch of seawater (n>=3) were undertaken every day prior to sample analysis in order to assess the precision of the method. The precision was estimated for the whole dataset to be 2.0±0.7 µmol kg-1 for DIC and 1.2±0.5 µmol kg-1 for TA. The accuracy of the measurement is assured by the standardization using the CRM from A.G. Dickson, Scripps Institution of Oceanography on daily basis.**
Method References: (Publication(s) describing method)
**Dickson, A. G., C. L. Sabine, and J. R. Christian. 2007. Guide to best practices for ocean CO2 measurements. PICES Special Publication 3. 191 pp.**
**Dumousseaud, C., E. P. Achterberg, T. Tyrrell, A. Charalampopoulou, U. Schuster, M. Hartman, and D. J. Hydes. 2010. Contrasting effects of temperature and winter mixing on the seasonal and inter-annual variability of the carbonate system in the Northeast Atlantic Ocean. Biogeosciences 7: 1481-1492.**
**Millero, F. J., Dickson, A. G., Eischeid, G., Goyet, C., Guenther, P., Johnson, K. M., Key, R. M., Lee, K., Purkenson, D., Sabine, C. L., Schottle, R. G., Wallace, D. W. R., Lewis, E., and Winn, C. D.: Assessment of the quality of the shipboard measurements of total alkalinity on the WOCE Hydrographic Program Indian Ocean CO2 survey cruises 1994–1996, Mar. Chem., 63, 9–20, 1998**

Alkalinity:
Curve Fitting Method: **non-linear curve fitting (least-squares) approach (Dickson et al., 2007)**
Type of Titration:

**Titration with HCl (~0.10 mol/L) uses a closed cell procedure with an open cell, with a pH half cell electrode (glass bodied Orion 8101SC, Ross, USA) and an Ag/AgCl reference electrode (model 6.0729.100, Metrohm, Switzerland).**
Description of Other Titration: (If other, please describe)
Cell Type: **open cell**
CRM Scale: *???*
Sample Volume: (mL) **97.409**
Magnitude of Blank Correction: *???*
Accuracy Info: (Estimate overall precision and accuracy, and why)
**Repeated measurements on the same batch of seawater (n>=3) were undertaken every day prior to sample analysis in order to assess the precision of the method. The precision was estimated for the whole dataset to be 2.0±0.7 µmol kg-1 for DIC and 1.2±0.5 µmol kg-1 for TA. The accuracy of the measurement is assured by the standardization using the CRM from A.G. Dickson, Scripps Institution of Oceanography on daily basis.**
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Additional information:
Hydes, D.J.; Hartman, M.C.; Campbell, J.M.; Jiang, Z-P.; Hartman, S.E.; Pagnani, M.; Kelly-Gerreyn, B.A.;Donahoe, J.. 2013 *Report of the SNOMS Project 2006 to 2012, SNOMS SWIRE NOCS Ocean Monitoring System. Part 1: Narrative description*. Southampton, National Oceanography Centre, 40pp. (National Oceanography Centre Research and Consultancy Report, 33)
Hydes, D.J. and Campbell, J.M. (2007) *Report on the SNOMS Swire NOCS Ocean Monitoring System. Maintenance and underway sampling protocols and safety information for the MV Pacific Celebes system fitted June 2007.* Southampton, UK, National Oceanography Centre Southampton, 27pp. (National Oceanography Centre Southampton Internal Document, 9)
Hydes, D.J. and Campbell, J.M. (2007) *Report on the SNOMS Swire NOCS Ocean Monitoring System. System description and inventory for the MV Pacific Celebes system fitted June 2007.* Southampton, UK, National Oceanography Centre Southampton, 15pp. (National Oceanography Centre Southampton Internal Document, 8)
Hydes, D.J. and Campbell, J.M. (2007) *SNOMS Swire NOCS Ocean Monitoring System: Diary of the system development and installation on the MV Pacific Celebes in 2006 and 2007.* Southampton, UK, National Oceanography Centre Southampton, 22pp. (National Oceanography Centre Southampton Internal Document, 10)

Data Set References: (Publication(s) describing data set)

Citation: (How to cite this data set)

Data Set Link:
URL: **http://www.noc.soton.ac.uk/snoms/**
Label: **NOC_CNCo_Pacific_Celebes**
Link Note: (Optional instructions or remarks)