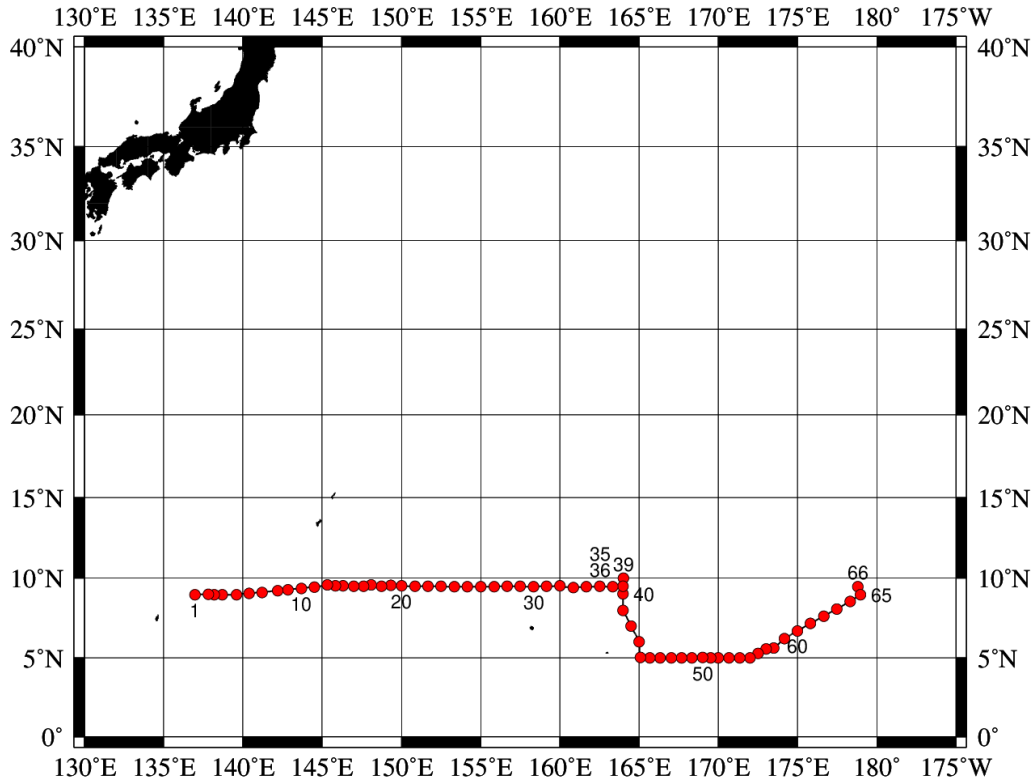


CRUISE REPORT: P04W

(Updated JUL 2018)



Highlights

Cruise Summary Information

| | |
|------------------------------------|--|
| Section Designation | P04W (AKA RF15-07) |
| Expedition designation (ExpoCodes) | 49UP20150724 |
| Chief Scientists | Keizo SHUTTA / JMA |
| Dates | 2015 JUL 24 - 2015 AUG 15 |
| Ship | <i>Ryofu Maru</i> |
| Ports of call | Leg 1: Tokyo – Pohnpei, Leg 2: Pohnpei–Tokyo |
| Geographic Boundaries | 10° 2.41' N 136° 59.66' E 178° 59.82' E 4° 59.45' N |
| Stations | 66 |
| Floats and drifters deployed | 2 floats deployed |
| Moorings deployed or recovered | 0 |

Contact Information:

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Links to Select Topics

Shaded sections are not relevant to this cruise or were not available when this report was compiled.

| Cruise Summary Information | Hydrographic Measurements |
|--|----------------------------------|
| Description of Scientific Program | CTD Data: |
| Geographic Boundaries | Acquisition |
| Cruise Track (Figure) | Processing |
| Description of Stations | Calibration |
| Description of Parameters Sampled | Temperature Pressure |
| Bottle Depth Distributions (Figure) | Salinities Oxygens |
| | |
| Floats and Drifters Deployed | Bottle Data |
| Moorings Deployed or Recovered | Salinity |
| | Oxygen |
| Principal Investigators | Nutrients |
| Cruise Participants | Carbon System Parameters |
| | CFCs |
| Problems and Goals Not Achieved | Helium / Tritium |
| Other Incidents of Note | Radiocarbon |
| | |
| Underway Data Information | References |
| Navigation Bathymetry | |
| Acoustic Doppler Current Profiler (ADCP) | |
| Thermosalinograph | |
| XBT and/or XCTD | |
| Meteorological Observations | Acknowledgments |
| Atmospheric Chemistry Data | |
| | |
| Data Processing Notes | |

A. Cruise narrative

1. Highlights

Cruise designation: RF15-07 (WHP-P04W revisit)

- a. EXPOCODE: 49UP20150724
- b. Chief scientist: Keizo SHUTTA (shutta.kei@met.kishou.go.jp)

Marine Division

Global Environment and Marine Department

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- c. Ship name: R/V Ryofu Maru
- d. Ports of call: Leg 1: Tokyo – Pohnpei, Leg 2: Pohnpei–Tokyo
- e. Cruise dates: Leg 1: 24 July 2015–18 August 2015
Leg 2: 22 August 2015–15 September 2015
- f. Floats and drifters deployed: 2 Floats

2. Cruise Summary Information

RF15-07 cruise was carried out during the period from July 24 to September 15, 2015. The cruise started from Japan, and sailed towards south east to the first station. Hydrographic observation started near Marshal Islands followed by sailing towards west along latitude approximately 10°N. This line was observed by Woods Hole Oceanographic Institution in 1989 as ‘WHP-P04’, which is a part of WOCE (World Ocean Circulation Experiment) Hydrographic Programme.

A total of 66 stations was occupied using a Sea-Bird Electronics (SBE) 36 position carousel equipped with 10-liter Niskin water sample bottles, a CTD system (SBE911plus) equipped with SBE35 deep ocean standards thermometer, JFE Advantech oxygen sensor (RINKO III), Teledyne Benthos altimeter (PSA-916D), and Teledyne RD Instruments L-ADCP (300kHz). To examine consistency of data, we carried out the observation twice at 9°30’N, 162°30’E (Stn.35 and 36). Cruise track and station location are shown in [Figure 1](#).

At each station, full-depth CTDO₂ (temperature, conductivity (salinity) and dissolved oxygen) profile and up to 36 water samples were taken and analyzed. Water samples were obtained from 10 dbar to approximately 10 m above the bottom. In addition, surface water was sampled using a stainless steel bucket at each station. Sampling layer is designed as so-called staggered mesh as shown in [Table 1](#) (Swift, 2010). The bottle depth diagram is shown in [Figure 2](#).

Water samples were analyzed for salinity, dissolved oxygen, nutrients, dissolved inorganic carbon (DIC), total alkalinity (TA), pH, CFC-11, CFC-12 and phytopigment (chlorophyll-a and phaeopigments). Underway measurements of partial pressure of carbon dioxide (*p*CO₂), temperature, salinity, chlorophyll-a, subsurface current, bathymetry and meteorological parameters were conducted along the cruise track.

R/V Ryofu Maru departed Tokyo (Japan) on July 24, 2015. Before the observation at the first station, all watch standers were drilled in the method of sample drawing and CTD operations near Izu-Oshima (34°42’N, 139°51’E). The hydrographic cast of CTDO₂ was started at the first station (Stn.66 (9°30’N, 178°48’E; RF5486)) on August 2, 2015. Leg 1 consisted of 31 stations from Stn.66 to Stn.36 (9°30’N, 162°31’E; RF5516). She called for Pohnpei (Federated States of Micronesia) on August, 18 (Leg 1). She left Pohnpei on August 22, 2015 for Tokyo (Japan) and arrived on September 15, 2015 (Leg 2). Leg 2 consisted of 35 stations from Stn.35 (9°29’N, 162°29’E; RF5517) to Stn.1 (9°N, 137°E; RF5551). Location data of stations is shown in [Table 2](#).

Two Argo floats were deployed along the cruise track. The information of deployed the floats are listed in [Table 3](#).

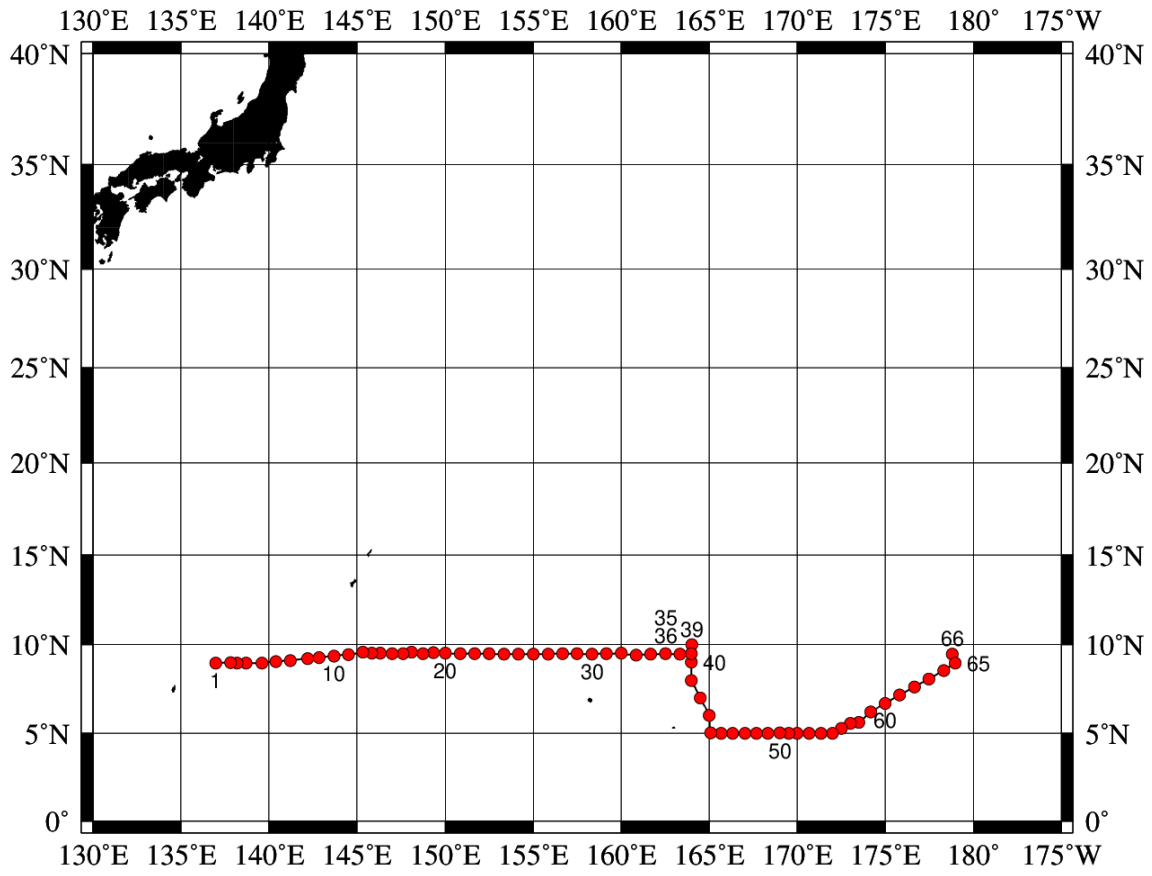


Figure 1. Cruise track of RF15-07.

Bottle Depth Diagram along P04

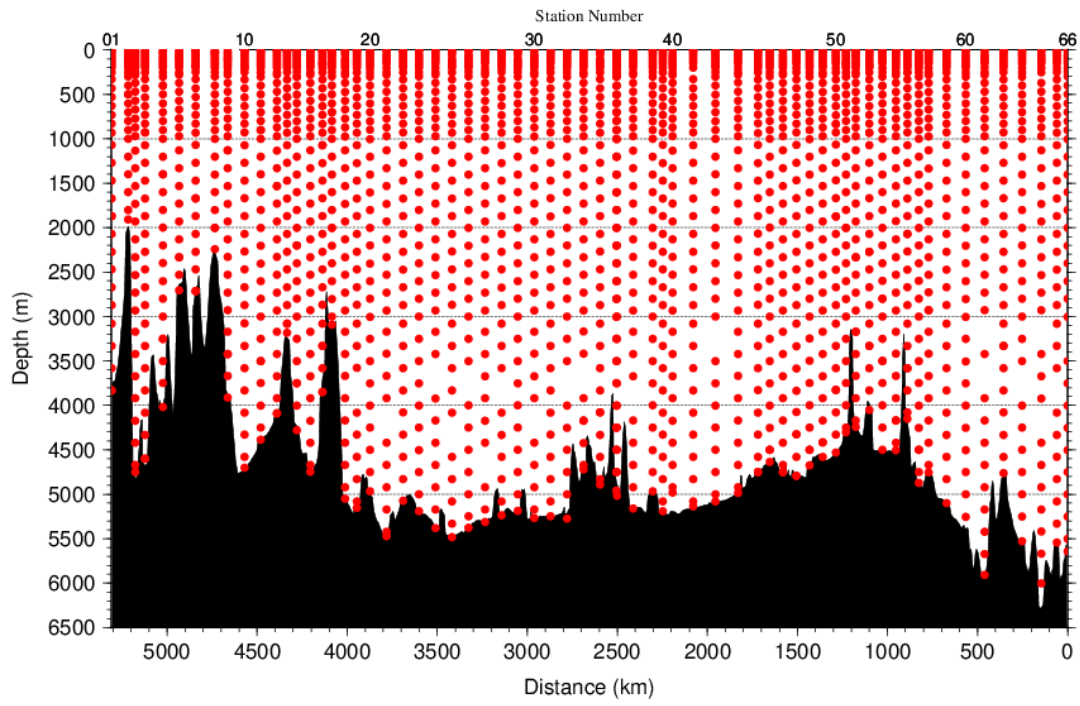


Figure 2. The bottle depth diagram for WHP-P04 revisit.

Table 1. The scheme of sampling layer in meters.

| <i>9 °N (Stn.1 - Stn.66)</i> | | | | <i>9 °N (Stn.1 - Stn.66)</i> | | | |
|------------------------------|----------------|----------------|----------------|------------------------------|----------------|----------------|----------------|
| <i>Bottle count</i> | <i>Scheme1</i> | <i>Scheme2</i> | <i>Scheme3</i> | <i>Bottle count</i> | <i>Scheme1</i> | <i>Scheme2</i> | <i>Scheme3</i> |
| 1 | 10 | 10 | 10 | 21 | 1600 | 1670 | 1530 |
| 2 | 25 | 25 | 25 | 22 | 1800 | 1870 | 1730 |
| 3 | 50 | 50 | 50 | 23 | 2000 | 2070 | 1930 |
| 4 | 75 | 75 | 75 | 24 | 2200 | 2270 | 2130 |
| 5 | 100 | 100 | 100 | 25 | 2400 | 2470 | 2330 |
| 6 | 125 | 125 | 125 | 26 | 2600 | 2670 | 2530 |
| 7 | 150 | 150 | 150 | 27 | 2800 | 2870 | 2730 |
| 8 | 175 | 175 | 175 | 28 | 3000 | 3080 | 2930 |
| 9 | 200 | 200 | 200 | 29 | 3250 | 3330 | 3170 |
| 10 | 250 | 250 | 250 | 30 | 3500 | 3580 | 3420 |
| 11 | 300 | 330 | 280 | 31 | 3750 | 3830 | 3670 |
| 12 | 400 | 430 | 370 | 32 | 4000 | 4080 | 3920 |
| 13 | 500 | 530 | 470 | 33 | 4250 | 4330 | 4170 |
| 14 | 600 | 630 | 570 | 34 | 4500 | 4580 | 4420 |
| 15 | 700 | 730 | 670 | 35 | 4750 | 4830 | 4670 |
| 16 | 800 | 830 | 770 | 36 | 5000 | 5080 | 4920 |
| 17 | 900 | 930 | 870 | 37 | 5250 | 5330 | 5170 |
| 18 | 1000 | 1070 | 970 | 38 | 5500 | 5580 | 5420 |
| 19 | 1200 | 1270 | 1130 | 39 | 5750 | 5830 | 5670 |
| 20 | 1400 | 1470 | 1330 | 40 | 6000 | 6000 | 6000 |

Table 2. Station data of RF15-07 cruise. The ‘RF’ column indicates the JMA station identification number.

| <i>Leg</i> | <i>Station</i> | | <i>Position</i> | | <i>Leg</i> | <i>Station</i> | | <i>Position</i> | |
|------------|----------------|-----------|-----------------|------------------|------------|----------------|-----------|-----------------|------------------|
| | <i>Stn</i> | <i>RF</i> | <i>Latitude</i> | <i>Longitude</i> | | <i>Stn.</i> | <i>RF</i> | <i>Latitude</i> | <i>Longitude</i> |
| 2 | 1 | 5551 | 8-59.51 N | 136-59.79 E | 1 | 36 | 5516 | 9-30.02 N | 162-30.74 E |
| 2 | 2 | 5550 | 9-00.35 N | 137-49.10 E | 1 | 37 | 5515 | 9-29.80 N | 163-20.14 E |
| 2 | 3 | 5549 | 8-59.33 N | 138-11.38 E | 1 | 38 | 5514 | 10-01.06 N | 164-01.07 E |
| 2 | 4 | 5548 | 8-59.23 N | 138-41.11 E | 1 | 39 | 5513 | 9-30.66 N | 163-59.35 E |
| 2 | 5 | 5547 | 8-59.36 N | 139-35.34 E | 1 | 40 | 5512 | 9-01.16 N | 163-59.54 E |
| 2 | 6 | 5546 | 9-04.38 N | 140-23.73 E | 1 | 41 | 5511 | 7-59.93 N | 163-58.52 E |
| 2 | 7 | 5545 | 9-07.51 N | 141-13.56 E | 1 | 42 | 5510 | 7-00.40 N | 164-29.95 E |
| 2 | 8 | 5544 | 9-14.43 N | 142-12.20 E | 1 | 43 | 5509 | 6-01.10 N | 165-00.94 E |
| 2 | 9 | 5543 | 9-17.02 N | 142-51.00 E | 1 | 44 | 5508 | 5-01.27 N | 165-05.64 E |
| 2 | 10 | 5542 | 9-22.65 N | 143-42.11 E | 1 | 45 | 5507 | 5-00.67 N | 165-40.86 E |
| 2 | 11 | 5541 | 9-27.78 N | 144-30.22 E | 1 | 46 | 5506 | 5-00.86 N | 166-20.43 E |
| 2 | 12 | 5540 | 9-35.18 N | 145-19.27 E | 1 | 47 | 5505 | 5-00.73 N | 167-01.30 E |
| 2 | 13 | 5539 | 9-31.20 N | 145-50.19 E | 1 | 48 | 5504 | 5-00.53 N | 167-41.10 E |
| 2 | 14 | 5538 | 9-31.00 N | 146-19.11 E | 1 | 49 | 5503 | 5-00.01 N | 168-20.87 E |
| 2 | 15 | 5537 | 9-30.88 N | 147-00.57 E | 1 | 50 | 5502 | 5-01.17 N | 169-00.67 E |
| 2 | 16 | 5536 | 9-30.48 N | 147-37.58 E | 1 | 51 | 5501 | 5-00.69 N | 169-30.60 E |
| 2 | 17 | 5535 | 9-35.25 N | 148-05.82 E | 1 | 52 | 5500 | 4-59.45 N | 170-00.27 E |
| 2 | 18 | 5534 | 9-30.33 N | 148-45.85 E | 1 | 53 | 5499 | 5-00.96 N | 170-40.84 E |
| 2 | 19 | 5533 | 9-33.77 N | 149-20.78 E | 1 | 54 | 5498 | 5-00.84 N | 171-20.15 E |
| 2 | 20 | 5532 | 9-31.01 N | 150-01.31 E | 1 | 55 | 5497 | 4-59.86 N | 172-00.93 E |
| 2 | 21 | 5531 | 9-30.61 N | 150-51.12 E | 1 | 56 | 5496 | 5-17.28 N | 172-31.21 E |
| 2 | 22 | 5530 | 9-30.80 N | 151-41.26 E | 1 | 57 | 5495 | 5-34.83 N | 173-00.08 E |
| 2 | 23 | 5529 | 9-30.04 N | 152-29.82 E | 1 | 58 | 5494 | 5-37.67 N | 173-30.23 E |
| 2 | 24 | 5528 | 9-29.59 N | 153-20.15 E | 1 | 59 | 5493 | 6-12.87 N | 174-10.65 E |
| 2 | 25 | 5527 | 9-29.59 N | 154-10.33 E | 1 | 60 | 5492 | 6-42.43 N | 175-00.03 E |
| 2 | 26 | 5526 | 9-29.81 N | 155-00.36 E | 1 | 61 | 5491 | 7-10.53 N | 175-49.42 E |
| 2 | 27 | 5525 | 9-29.74 N | 155-51.13 E | 1 | 62 | 5490 | 7-38.81 N | 176-39.10 E |
| 2 | 28 | 5524 | 9-30.69 N | 156-41.11 E | 1 | 63 | 5489 | 8-04.76 N | 177-29.13 E |
| 2 | 29 | 5523 | 9-30.28 N | 157-30.43 E | 1 | 64 | 5488 | 8-33.21 N | 178-19.33 E |
| 2 | 30 | 5522 | 9-29.44 N | 158-20.83 E | 1 | 65 | 5487 | 8-59.18 N | 178-58.44 E |
| 2 | 31 | 5521 | 9-30.38 N | 159-10.14 E | 1 | 66 | 5486 | 9-29.57 N | 178-47.96 E |
| 2 | 32 | 5520 | 9-31.15 N | 160-00.25 E | | | | | |
| 2 | 33 | 5519 | 9-25.17 N | 160-50.30 E | | | | | |
| 2 | 34 | 5518 | 9-29.53 N | 161-40.02 E | | | | | |
| 2 | 35 | 5517 | 9-29.05 N | 162-29.27 E | | | | | |

Table 3. Information of deployed float.

| <i>Float WMO number</i> | <i>Date and Time of deployment (UTC)</i> | <i>Position of deployment</i> | | <i>PI</i> | |
|---------------------------------|--|-------------------------------|------------------|-----------|-------|
| | | <i>Latitude</i> | <i>Longitude</i> | | |
| 5904990 | 2015 July 28 10:59 | 20-23.55 N | 156-44.18 E | JAMSTEC | ARVOR |
| 2902959 | 2015 Sep. 9 02:00 | 24-58.68 N | 138-42.79 E | JMA | APEX |

ARVOR: nke Instrumentation (France)

APEX: Teledyne Webb Research (USA)

List of Principal Investigators for all Measurements

The principal investigator (PI) and the person in charge responsible for major parameters measured on the cruise are listed in Table 4.

Table 4: List of principal investigators and the person in charge on the ship for RF15-07.

| Item | Principal Investigator (PI) | Person in charge on the ship |
|---------------------------|------------------------------------|-------------------------------------|
| <u>Hydrography</u> | | |
| CTDO ₂ / LADCP | Toshiya NAKANO | Nobumi KATO |
| Salinity | Toshiya NAKANO | Koichi WADA |
| Dissolve oxygen | Toshiya NAKANO | Chihiro KAWAMURA |
| Nutrients | Toshiya NAKANO | Takahiro KITAGAWA |
| Phytopigment | Toshiya NAKANO | Takahiro KITAGAWA |
| DIC | Toshiya NAKANO | Shu SAITO |
| Total Alkalinity | Toshiya NAKANO | Shu SAITO |
| pH | Toshiya NAKANO | Shu SAITO |
| CFCs | Toshiya NAKANO | Kazutaka ENYO |
| <u>Underway</u> | | |
| Meteorology | Toshiya NAKANO | Keizo SHUTTA |
| Thermo-Salinograph | Toshiya NAKANO | Shu SAITO |
| <i>p</i> CO ₂ | Toshiya NAKANO | Shu SAITO |
| Chlorophyll-a | Toshiya NAKANO | Takahiro KITAGAWA |
| ADCP | Toshiya NAKANO | Nobumi KATO |
| Bathymetry | Toshiya NAKANO | Nobumi KATO |
| <u>Floats</u> | | |
| Argo float (JMA) | Kazuhiro NEMOTO | Keizo SHUTTA |
| Argo float (JAMSTEC) | Shigeki HOSODA | Keizo SHUTTA |

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Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
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Reference

Swift, J. H. (2010): Reference-quality water sample data: Notes on acquisition, record keeping, and evaluation. *IOCCP Report No.14, ICPO Pub. 134, 2010 ver.1*

CCHDO Data Processing Notes

- **File Online Carolina Berys**

[p04su.txt \(download\)](#) #b71f6

Date: 2018-06-08

Current Status: unprocessed

- **File Online Carolina Berys**

[ct1.zip \(download\)](#) #6b173

Date: 2018-06-08

Current Status: unprocessed

- **File Online Carolina Berys**

[p04_hy1.csv \(download\)](#) #3b911

Date: 2018-06-08

Current Status: unprocessed

- **File Online Carolina Berys**

[A_cruise_narrative_2015_P04W_20180502.doc \(download\)](#) #ea475

Date: 2018-06-08

Current Status: unprocessed

- **File Submission Toshiya NAKANO**

[p04su.txt \(download\)](#) #b71f6

Date: 2018-05-12

Current Status: unprocessed

Notes

Ship Name: Ryofu Maru (Japan Meteorological Agency)

Section: P04-W (RF15-07)

Cruise date:

RF15-07 : 24 July 2015-15 September 2015

- **File Submission Toshiya NAKANO**

[p04_hy1.csv \(download\)](#) #3b911

Date: 2018-05-12

Current Status: unprocessed

Notes

Ship Name: Ryofu Maru (Japan Meteorological Agency)
Section: P04-W (RF15-07)
Cruise date:
RF15-07 : 24 July 2015-15 September 2015

• **File Submission Toshiya NAKANO**

[ct1.zip \(download\)](#) #6b173

Date: 2018-05-12

Current Status: unprocessed

Notes

Ship Name: Ryofu Maru (Japan Meteorological Agency)
Section: P04-W (RF15-07)
Cruise date:
RF15-07 : 24 July 2015-15 September 2015

• **File Submission Toshiya NAKANO**

[A_cruise_narrative_2015_P04W_20180502.doc \(download\)](#) #ea475

Date: 2018-05-12

Current Status: unprocessed

Notes

Ship Name: Ryofu Maru (Japan Meteorological Agency)
Section: P04-W (RF15-07)
Cruise date:
RF15-07 : 24 July 2015-15 September 2015