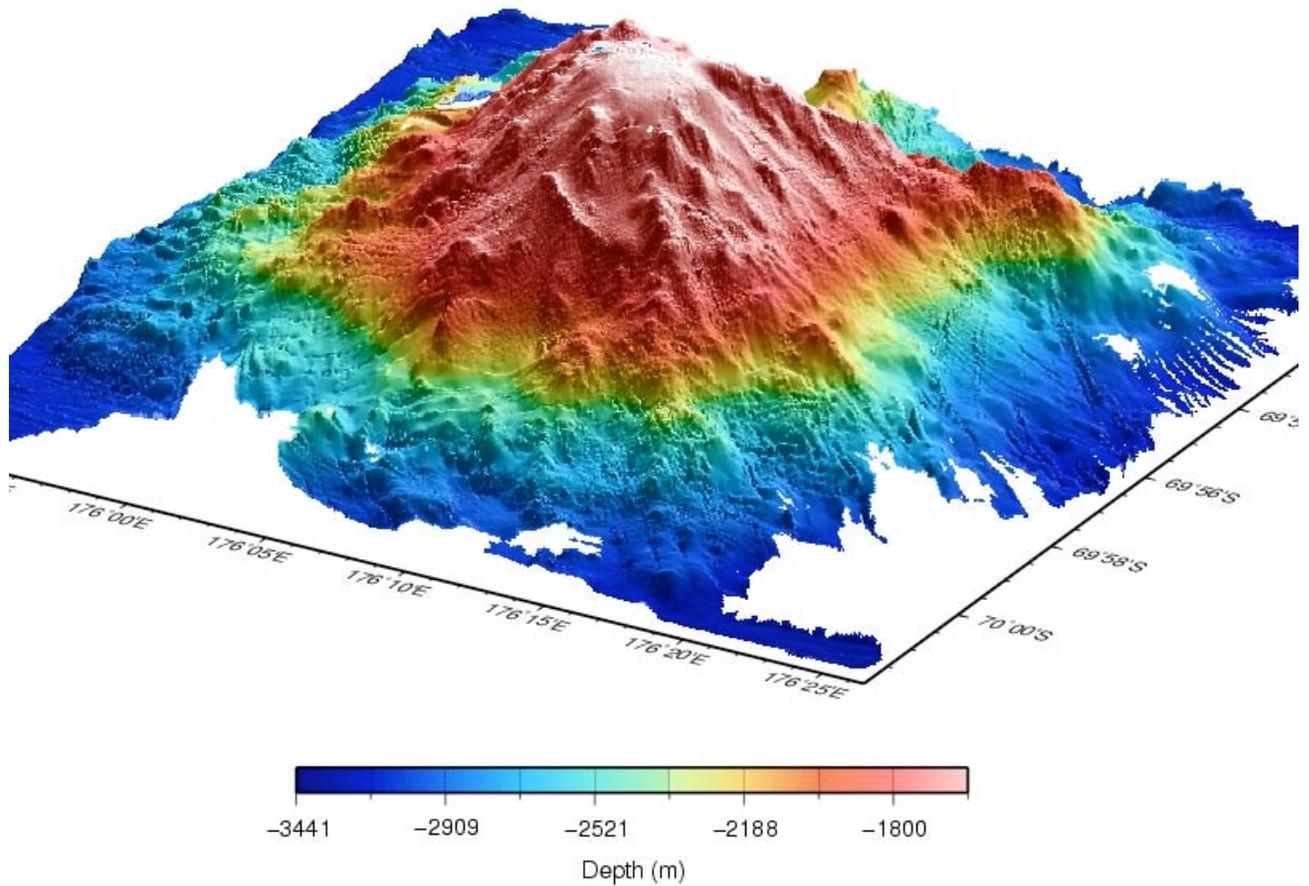


NBP0701

MultibeamEnd of Cruise Report

Figure 1- MarionSeamount



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Multibeam Work Area Plots

NBP0701 Survey Areas

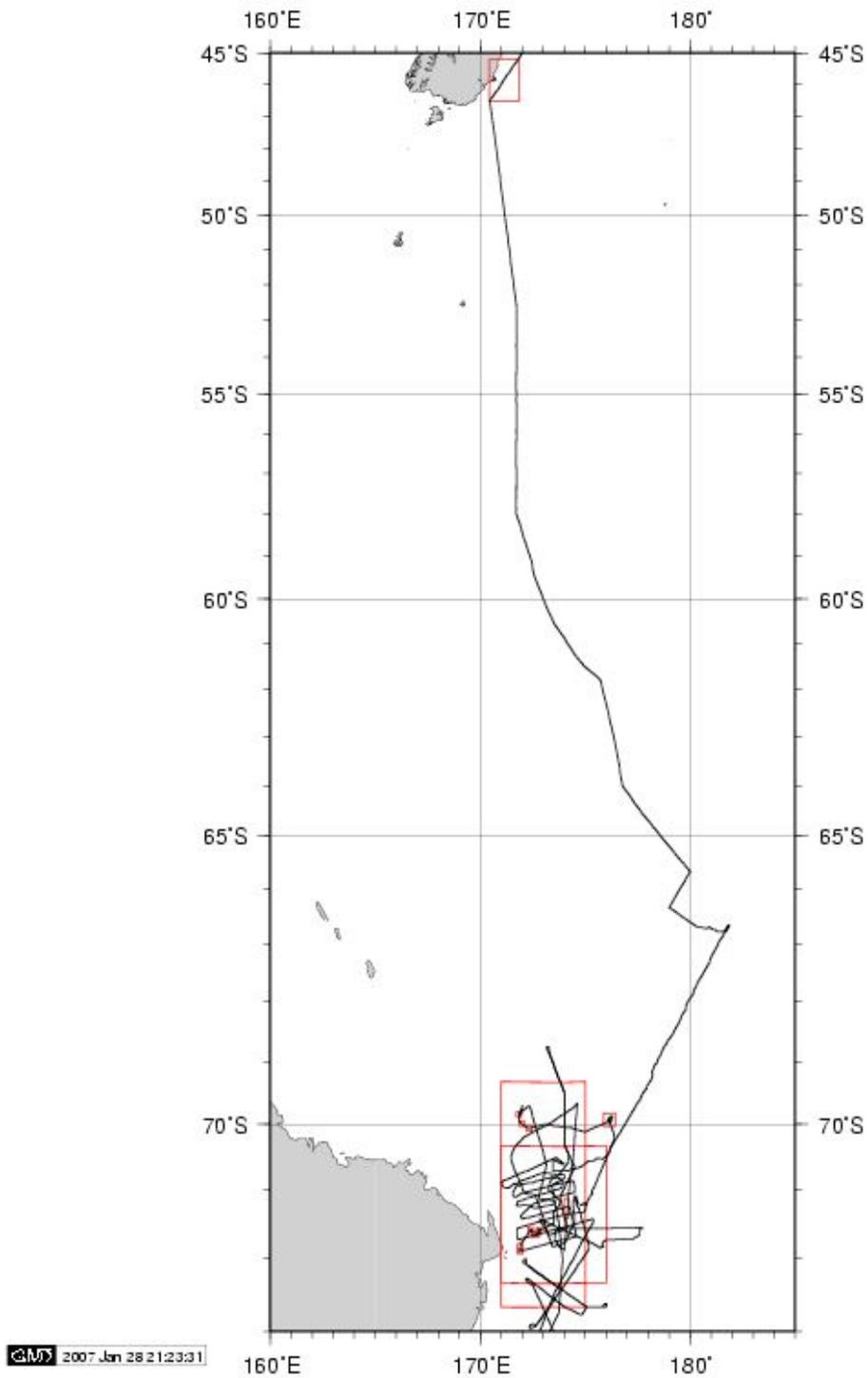


Figure 2 - NBP0701 Study Areas

NBP0701 Ross Sea

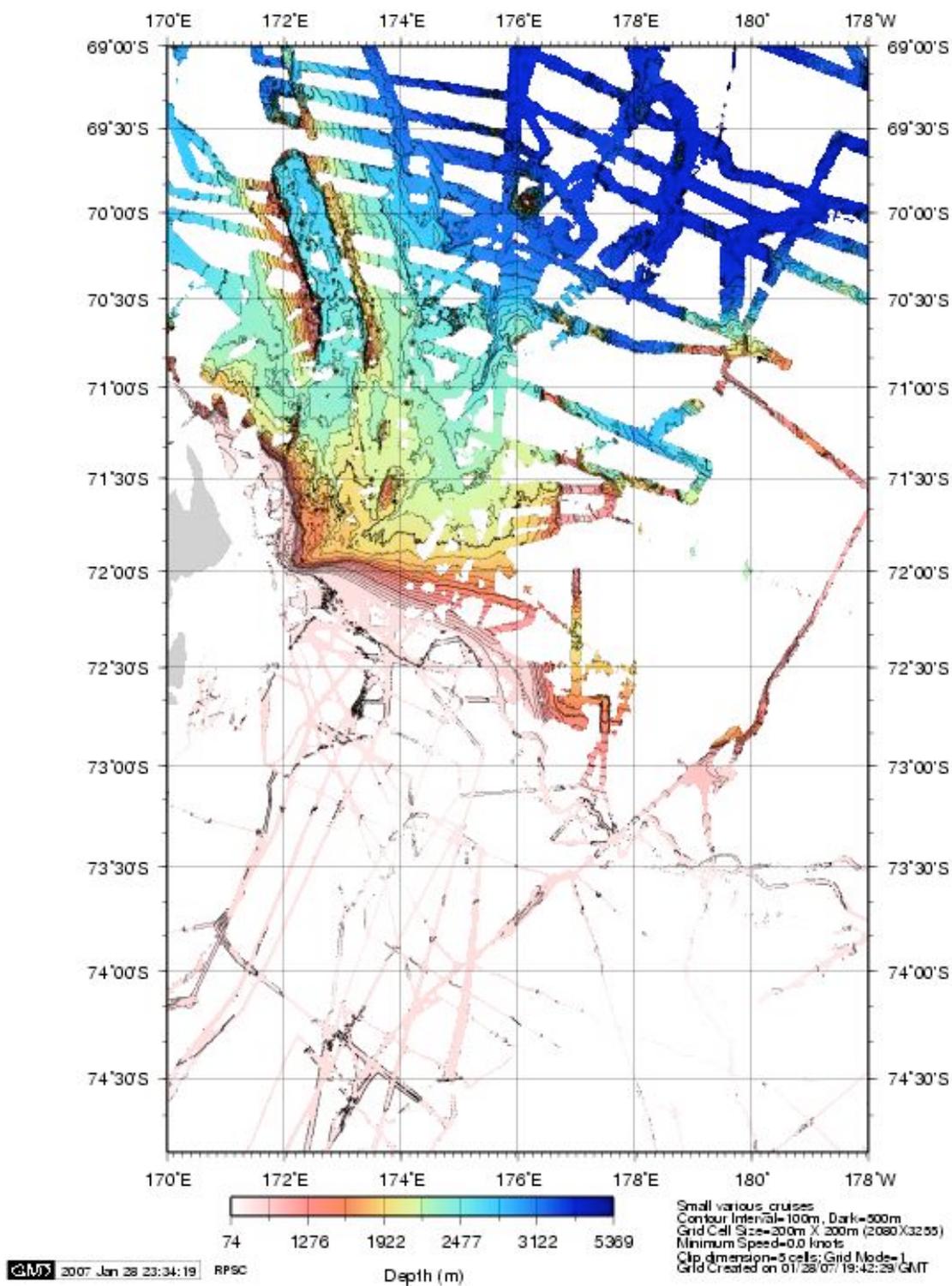


Figure 3 - MB Bathymetric Data Available in Study Area

NBP0701 Multibeam Description of Work

This report covers the Simrad EM120 Multibeam data collection and processing for the R/V Nathaniel B. Palmer cruise NBP0701. This cruise started at Lyttelton, New Zealand on December 22, 2006 (GMT) and ended at McMurdo, Antarctic on January 29, 2007. The principle investigators were Steve Cande, Joan Stock, Pat Castillo, Kurt Panter and Rob Clayton. Suzanne O'Hara (RPSC) was responsible for Multibeam data acquisition, processing, and ping editing quality control. Data was collected during the entire time the ship was operating.

The raw Multibeam data were logged in approximately one hour-long files in the Kongsberg-Simrad EM120 raw format. This is a complex format that is not described in this report. The MB-System¹ software package may be used to access the files if additional work is to be done with the data. MB-System version 5.0.7 was used for processing of data on this cruise. MBSYSTEM versions 5.0.9 and 5.1.0 are available, but these newer distributions do not correctly handle sidescan data for the EM120 system. It is recommended that users who are interested in this data continue to use MBSYSTEM 5.0.7 until a distribution that correctly handles the EM120 sidescan data is released. These raw data files are named xxxx_yyyymmdd_hhmmss_raw.all where xxxx is a consecutive line number within the survey, yyyy is the year, mm is the month, dd is the day, hh is the hour, mm is the minute, and ss is the seconds that the file was started.

The logged Multibeam data files were transferred from the data acquisition computer to a data storage area just after the end of each day. The raw hourly data files were converted from MB-System format 56 (the raw Simrad format) to format 57 using mbcopy and made available for manual editing. The format 57 files are named xxx_yyyymmdd_hhmmss.mb57 where the first part of the name is identical to the raw file. All data files were edited while at sea.

The science party was responsible for editing the Multibeam data. Mbclean was used to flag bad data points outside the valid depth range for each hour of data. Mbedit was used to manually remove bad data points from these files. Some data files were edited with mbnavedit to correct navigational problems. Navigation corrections were made after the files were edited. If the velocity was observed to be incorrect, a new sound velocity was generated using mbvelocitytool and was applied to the data.

The edited files were checked using mbedit, the statistics from mbinfo, and hourly contour plots. If these checks failed, the files were re-edited by Suzanne. When the data quality was judged acceptable, the edits were applied to the data using mbprocess. The edited files are named xxxx_yyyymmdd_hhmmssp.mb57 where the p in the dataset name denotes a processed file. Page size plots were produced of the edited data. Daily plots were also produced which showed one days worth of gridded data.

The UNIX tar command was used to write the digital data to DLT tapes at the end of the cruise. These tapes were checked before distribution. The tapes contain the raw and processed data for the entire cruise. The processing scripts and gridded data for each survey are included in the

¹ The MB-System software package was used for all Multibeam data handling. This package was developed at Lamont-Doherty Earth Observatory. This system is designed to manipulate, process, list and display many kinds of Multibeam bathymetry, amplitude, and sidescan data. IT has been successfully installed on many different computer platforms. To obtain more information about the MB-System programs or to obtain a copy of the current distribution, contact the authors David W. Caress (caress@mbari.org) and Dale N. Chayes (dale@lamont.ldeo.columbia.edu)

processed data directory. The contents of these tapes and an itemized distribution list are located on separate pages of this report.

Calibration Tests

While in Lyttelton the option of performing calibration tests for the EM120 system was discussed with the PIs. It was decided that we would continue to run with the current calibration settings and consider performing new tests during the cruise if we found an appropriate place when time allowed. The current offset settings in the system are all 0. Near the end of the cruise several of the seismic lines were run in such a way that this data could be used to calculate a roll bias. Due to other time constraints, the calculations had not been run to check the data at the time that this report was generated. If a roll bias check is desired, this data can be extracted and the calculations made in the future.

Speed of Sound Corrections

The travel time of sound in water was corrected at the surface by a sound velocity calculated from the Thermosalinograph (TSG). This value was supplied directly to the EM120 system serial port and the data was transmitted by the RVDAS program `rv_tsg`. Expendable BathyThermographs (XBTs) were used along with the levitus historical database to calculate a sound velocity profile. Forty one XBTs were used to calculate the sound velocity profile during this cruise. The XBTs used were Fast Deep (1000 meters), T4 (460 meters), T7 (760 meters) and T5 (1,830 meters) formats depending on the depth of the survey area. A single XSV-01 (850 meters) expendable sound velocity probe was also used. It was attempted to use at least one XBT in every twenty four hours, in every survey area and whenever the observed multibeam data showed evidence that a new sound velocity profile was required. Since there is a know problem with the EM120 and sound velocity profile calculations, adjusted sound velocity profiles were created as necessary. These files were `RossSlope.svp` and `RossShelf.svp`. The altered sound velocity files are included in the `svp` directory described below. Included here is a list of the XBT launch locations and times. The XBT data has been provided on the RVDAS data distribution. The calculated sound velocities files and plots are in the `process/svp` directory in this multibeam data distribution. A copy of the plots of the sound velocities was provided to the science party at the end of the cruise.

| File Prefix | GMT_Date | GMT_Time | Latitude | Longitude | Salinity | Type |
|-------------|------------|-------------|----------|-----------|----------|------|
| T4_00081 | 2006/12/22 | 05:41:03 am | -43.79 | 173.23 | 34.5 | T-4 |
| T5_00083 | 2006/12/22 | 11:37:09 pm | -45.57 | 171.44 | 34.3 | T-5 |
| TF_00084 | 2006/12/23 | 03:30:28 pm | -47.81 | 170.72 | 34.3 | Fast |
| T7_00085 | 2006/12/23 | 11:40:33 pm | -49.15 | 170.99 | 34.3 | T-7 |
| T5_00087 | 2006/12/25 | 04:27:03 am | -53.86 | 171.73 | 34.3 | T-5 |
| T5_00088 | 2006/12/25 | 05:58:06 am | -54.11 | 171.73 | 34.28 | T-5 |
| T5_00089 | 2006/12/25 | 06:01:06 am | -54.12 | 171.73 | 34.3 | T-5 |
| T5_00090 | 2006/12/25 | 05:56:41 pm | -55.98 | 171.73 | 34.3 | T-5 |
| T5_00092 | 2006/12/26 | 03:40:02 am | -57.54 | 171.72 | 33.9 | T-5 |
| T5_00093 | 2006/12/26 | 05:10:51 pm | -59.42 | 172.56 | 33.95 | T-5 |
| T5_00094 | 2006/12/27 | 03:35:00 am | -60.88 | 173.99 | 33.89 | T-5 |
| T5_00095 | 2006/12/27 | 05:05:00 pm | -62.67 | 176.19 | 33.78 | T-5 |

| File Prefix | GMT_Date | GMT_Time | Latitude | Longitude | Salinity | Type |
|-------------|------------|-------------|----------|-----------|----------|--------|
| T5_00096 | 2006/12/29 | 06:02:14 pm | -66.21 | 179.18 | 33.77 | T-5 |
| T5_00097 | 2006/12/30 | 07:50:00 pm | -68.08 | 179.81 | 33.8 | T-5 |
| T5_00099 | 2006/12/30 | 07:56:52 pm | -70.49 | 176.02 | 33.84 | T-5 |
| T5_00101 | 2006/12/31 | 03:13:55 pm | -70.7 | 172.35 | 34.11 | T-5 |
| T5_00104 | 2007/01/01 | 05:19:19 pm | -71.06 | 172.96 | 34.03 | T-5 |
| T5_00105 | 2007/01/02 | 09:30:22 pm | -70.42 | 172.99 | 34.12 | T-5 |
| T5_00106 | 2007/01/03 | 07:34:09 pm | -69.74 | 172.01 | 33.88 | T-5 |
| T5_00107 | 2007/01/04 | 03:55:00 pm | -69.92 | 176.18 | 33.6 | T-5 |
| T5_00112 | 2007/01/06 | 09:01:27 pm | -71.53 | 175.29 | 33.87 | T-5 |
| T4_00113 | 2007/01/07 | 11:18:53 am | -73.86 | 171.56 | 33.67 | T-4 |
| T4_00114 | 2007/01/08 | 05:41:08 pm | -74.14 | 171.37 | 33.83 | T-4 |
| TF_00115 | 2007/01/09 | 11:24:53 am | -72.11 | 173.89 | 34.06 | Fast |
| T5_00116 | 2007/01/10 | 04:43:10 pm | -70.89 | 171.82 | 34.07 | T-5 |
| T5_00117 | 2007/01/11 | 04:02:56 pm | -71.13 | 173.39 | 33.82 | T-5 |
| T5_00118 | 2007/01/11 | 11:35:02 pm | -71.4 | 171.93 | 34.32 | T-5 |
| T5_00119 | 2007/01/12 | 08:06:22 pm | -71.76 | 173.63 | 33.95 | T-5 |
| T5_00120 | 2007/01/15 | 01:26:28 pm | -70.45 | 174.19 | 33.85 | T-5 |
| T5_00121 | 2007/01/16 | 03:20:35 pm | -69.76 | 174 | 33.86 | T-5 |
| T5_00122 | 2007/01/16 | 03:38:40 pm | -69.78 | 174 | 33.89 | T-5 |
| T5_00123 | 2007/01/17 | 05:27:31 pm | -71.55 | 174.08 | 34.01 | T-5 |
| T5_00124 | 2007/01/18 | 09:54:27 pm | -71.72 | 177.28 | 33.84 | T-5 |
| T5_00125 | 2007/01/20 | 05:43:54 pm | -69.86 | 174.57 | 33.93 | T-5 |
| T7_00131 | 2007/01/22 | 03:43:42 pm | -71.81 | 173.67 | 34.06 | T-7 |
| T5_00133 | 2007/01/23 | 05:03:20 pm | -71.91 | 175.07 | 33.9 | T-5 |
| T4_00134 | 2007/01/24 | 12:48:31 pm | -72.92 | 172.66 | 34.16 | T-4 |
| T4_00135 | 2007/01/25 | 05:55:37 pm | -72.43 | 173.86 | 34 | T-4 |
| T4_00136 | 2007/01/26 | 04:26:18 pm | -72.52 | 173.35 | 33.94 | T-4 |
| S1_00137 | 2007/01/27 | 05:08:14 pm | -75.04 | 171.57 | NA | XSV-01 |

Figure 4 - XBT Listing

On January 4, 2007 GMT a problem was noticed in the times in the XBT headers. The time in the XBT header did not match the GMT time at which the XBT was launched. It was also noticed in the event time line plot that previous XBT times did not match up with the corresponding events. A list was made from the XBT launch times from the watch stander log and compared to the times in the XBT file headers. Only XBT launches that were used for creating sound velocity profiles were compared. The summary of this evaluation is described here.

- One file, T5_00090, was not included in the watchstander log sheet. This data was collected before we started noticing the problem in the time. The XBT time seems to fall correctly on the time line plot, so it was assumed that the time in the header was correct.
- Seven XBTs, probes 86, 91, 100, 102, 103, 108 and 109, were included in the watchstander log, but not used for calculating SVP values. These probe times were not compared or any attempt made to correct the data. These files usually contain data from poor quality XBT traces.
- Five XBT files were located with non-matching times. The probes 94, 95, 96, 97 and 107 all had incorrect dates or times according to the watchstander logs. No correction was made for times that were different by only a few minutes, so the noted errors are on the size of 12 hours or more. To correct the time in these files, the original EDF file in the /data/current_cruise/ocean/xbt directory was copied to EDF.org and then the EDF file was edited to insert the corrected time and date in the header. The raw RDF files were unchanged and continue to have the incorrect times in their header information. All files in the /data/current_cruise/MB/process/svp directory have the corrected times. The time problems were as follows:

| Probe | XBT File Time | Watchstander Log Time |
|-------|------------------|-----------------------|
| 94 | 2006/12/27 15:34 | 2006/12/27 03:35 |
| 95 | 2006/12/28 05:05 | 2006/12/27 17:05 |
| 96 | 2006/12/28 18:02 | 2006/12/29 18:02 |
| 97 | 2006/12/29 19:24 | 2006/12/30 19:50 |
| 107 | 2001/01/03 11:53 | 2007/01/04 15:55 |

Figure 5 - XBT File Time errors

It was found that the XBT computer internal clock that is used to time stamp the XBT files was drifting. The replacement computer for this system was setup, but turned out to be non-functioning. We continued the cruise by verifying that the computer time was close to the GMT realtime before each XBT launch and then re-verifying the time on the logged data file when it was received for processing into a sound velocity profile file. This prevented incorrect times on XBTdata files for the rest of the cruise.

NBP0701 Data Distribution

Multibeam data has been provided on either 2 DLT tapes and a DVD, or a single DLT and a DVD to the science party and RPSC. The tapes were created on UNIX or LINUX computers using the command tar and verified to be sound before they were distributed. The DVD contains a tar file and it is written in ISO format.

The contents of the tapes are described below. The processed data is in mbio format 57. The raw data is in mbio format 56 in the mblogger directory and in mbio format 57 in the Raw directory. The processed data includes gridded files, processing scripts and postscript plots divided into subdirectories for each day and map areas. The DVD contains all the survey areas, a copy of this report in microsoft word format and also a subdirectory, MBScripts, that includes the processing scripts and related documentation. In some cases the survey plots are provided in alternative jpeg, photoshop or pdf formats.

Each Full DDS4 Data Set Includes:

1. DDS4
 - a) **mblogger** has raw data for December 22, 2006 to January 23, 2007 in MB56 format
 - b) **Raw** has raw data converted to MB57 and ancillary files for December 22, 2006 to January 23, 2007. The files are divided into directories by days
 - c) **process** has the edited data and daily processing divided into directories by days for December 22 to 26, 2006
2. DDS4
 - a) **mblogger** has raw data for January 24 to 28, 2007 in MB56 format
 - b) **Raw** has raw data converted to MB57 and ancillary files for January 24 to 28, 2007. The files are divided into directories by days
 - c) **process** has the edited data and daily processing divided into directories by days for December 27, 2006 to January 28, 2007

Each Full DLT Data Set Includes:

1. DLT
 - d) **mblogger** has raw data for December 22, 2006 to January 28, 2007 in MB56 format
 - e) **Raw** has raw data converted to MB57 and ancillary files for December 22, 2006 to January 28, 2007. The files are divided into directories by days
 - f) **process** has the edited data and daily processing divided into directories by days for December 22, 2006 to January 28, 2007

All data full data distributions also includes:

- DVD – postscript, grids and scripts for all survey areas. Also includes all processing requests for the cruise, this report and the daily processing scripts with documentation. In some cases JPEG and photoshop plots are in the directories.
- Printed copy of this report

A copy of the full data distribution will be sent to the Antarctic Multibeam Synthesis at the MGDS (<http://www.marine-geo.org/>). You can locate the all information for and download data from this cruise at the web site by selecting your cruise name from the data link tool. You can also download and use the java application GeoMapApp to interactively access multibeam and other data sets. Data sent to the database will not be downloadable until you have released the proprietary hold. You can contact the MGDS at:

MGDS Data Manager
 Lamont-Doherty Earth Observatory
 61 Route 9W
 Palisades NY 10964 USA
 845-818-3745 Phone/Fax
info@marine-geo.org

| S/N | Who | Description | Type |
|-----|-------|---|------|
| 1 | Cande | mblogger 22/Dec/06-23/Jan/07,Raw 22/Dec/06-23/Jan/07, process 22/Dec/06-26/Dec/06 | DDS4 |
| 2 | Stock | mblogger 22/Dec/06-23/Jan/07,Raw 22/Dec/06-23/Jan/07, process 22/Dec/06-26/Dec/06 | DDS4 |
| 3 | NBP | mblogger 22/Dec/06-23/Jan/07,Raw 22/Dec/06-23/Jan/07, process 22/Dec/06-26/Dec/06 | DDS4 |
| 4 | RPSC | mblogger 22/Dec/06-23/Jan/07,Raw 22/Dec/06- | DDS4 |

| S/N | Who | Description | Type |
|-----|----------|--|------|
| | | 23/Jan/07, process 22/Dec/06-26/Dec/06 | |
| 5 | Cande | mblogger 24/Jan/07-28/Jan/07,Raw 24/Jan/07-28/Jan/07,process 27/Dec/06-28/Jan/07 | DDS4 |
| 6 | Stock | mblogger 24/Jan/07-28/Jan/07,Raw 24/Jan/07-28/Jan/07,process 27/Dec/06-28/Jan/07 | DDS4 |
| 7 | NBP | mblogger 24/Jan/07-28/Jan/07,Raw 24/Jan/07-28/Jan/07,process 27/Dec/06-28/Jan/07 | DDS4 |
| 8 | RPSC | mblogger 24/Jan/07-28/Jan/07,Raw 24/Jan/07-28/Jan/07,process 27/Dec/06-28/Jan/07 | DDS4 |
| 9 | Davey | mblogger 22/Dec/06-28/Jan/07,Raw 22/Dec/06-28/Jan/07,process 22/Dec/06-28/Jan/07 | DLT |
| 10 | Ishihara | mblogger 22/Dec/06-28/Jan/07,Raw 22/Dec/06-28/Jan/07,process 22/Dec/06-28/Jan/07 | DLT |

Figure 6 - Data Distribution Chart

Special Data Requests

Various special data requests were made during the cruise. All requests for extra grids, plots and data support were provided whenever possible.

EM120 Surveys

All scripts that were used to generate the above files were saved in the directory with the data files. The datalistp.mb-1 list files for each survey area are also located in this directory.

NBP0701 was primarily a seismic and geophysical cruise that took advantage of existing MB data, so completing bathymetric surveys was not a main concern. The cruise has been divided into several survey areas. The survey areas are identified in the chart below. Each of these areas was gridded as a survey and plots were generated. In addition, higher resolution plots of each survey area are included in the processed data directories. The surveys may include data from the past cruises NBP9501, NBP9602, NBP9605, NBP9702, NBP9801, NBP9802, NBP0007B, NBP0209, NBP0301A, NBP0302, NBP0305A, NBP0402, NBP0406, NBP0501 or NBP0602 as well as the current cruise NBP0701.

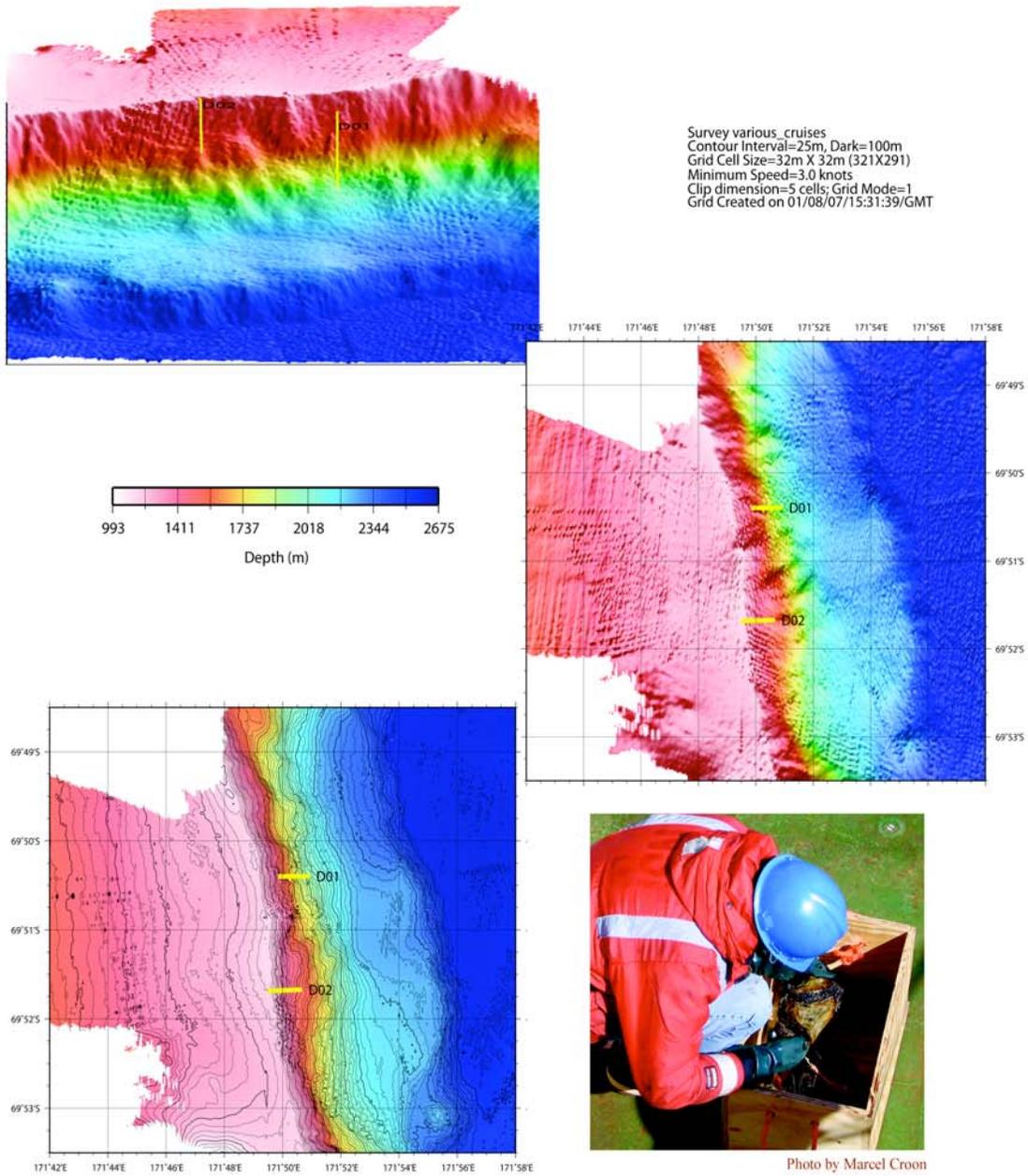
Many additional grids and plots were generated during the cruise for use during transits and for evaluating data. Only the final production surveys are listed here.

| Subdirectory | West | East | South | North | Survey Name |
|--------------------|--------------|--------------|-------------|-------------|--------------------------------|
| AdareDredgeD01_D02 | 171° 42.0' E | 171° 58.0' E | 69° 53.5' S | 69° 48.5' S | Adare Trough Dredges D01 & D02 |
| MarionSeamount | 175° 52.5' E | 176° 26.5' E | 70° 2.0' S | 69° 50.0' S | Marion Seamount |
| AdareDredgeD03 | 171° 51.0' E | 172° 7.0 E | 70° 2.5' S | 69° 57.5' S | Adare Trough Dredge D03 |
| AdareDredgeD04 | 172° 11.0' E | 172° 27.0' E | 70° 6.5' S | 70° 1.5' S | Adare Trough Dredge D04 |
| BountyHeadCanyons | 170° 26.0 E | 171° 50.0' E | 46° 33.0' S | 45° 12.0' S | Bounty Head Canyons |
| Volcano | 173° 59.0' E | 174° 14.0' E | 71° 8.0' S | 71° 2.75' S | Volcano |

| | | | | | |
|----------------------------|--------------|--------------|-------------|--------------|--|
| AdareDredgeD05 | 171° 46.5' E | 172° 2.0' E | 71° 55.8' S | 71° 51.5' S | Adare Trough Dredge D05 |
| AdareDredgeD06_D07 | 171° 46.0' E | 172° 2.0' E | 71° 51.5' S | 71° 47.25' S | Adare Trough Dredges D06 & D07 |
| AdareDredgeD08 | 172° 16.0' E | 172 31.6' E | 71° 37.5' S | 71° 32.8' S | Adare Trough Dredge D08 |
| AdareDredgeD09_D10_D11_D12 | 172° 26.0' E | 172° 48.0' E | 71° 41.5' S | 71° 36.8' S | Adare Trough Dredges D09, D10, D11 & D12 |
| AdareDredgeD13_D14_D15_D16 | 172° 40.0' E | 172° 54.0' E | 71° 39.5' S | 71° 33.75' S | Adare Trough Dredges D13, D14, D15 & D16 |
| AdareTrough | 171° 0.0' E | 175° 0.0' E | 71° 40.0' S | 69° 20.0' S | Adare Trough |
| AdareBasin | 171° 0.0' E | 176° 0.0' E | 72° 20.0' S | 70° 20.0' S | Adare Basin |
| | | | | | |

Figure 7 - Survey Names and Boundaries

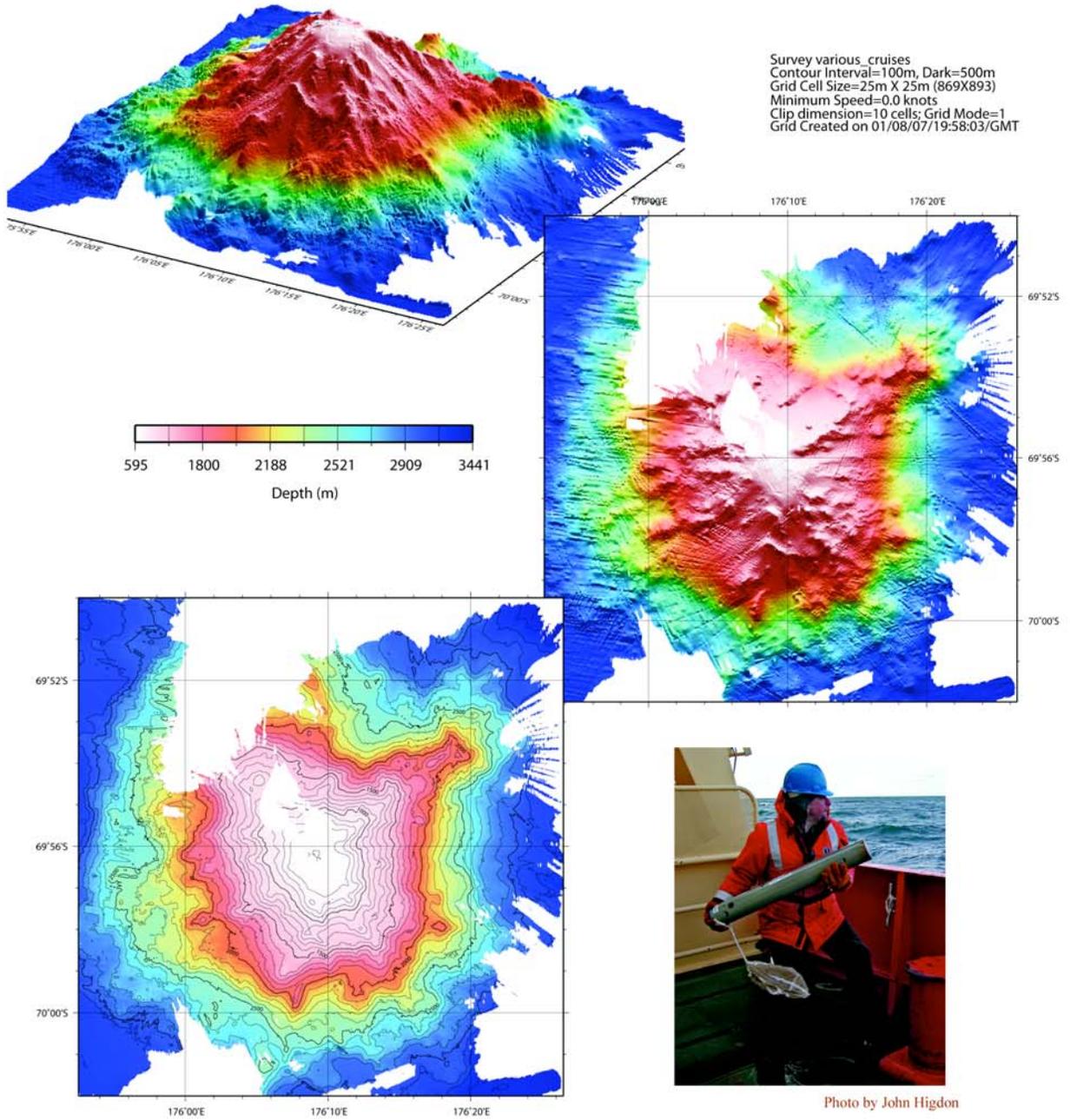
NBP0701 Adare Trough Dredges D01 & D02



S.O'Hara, RPSC

Figure 8 - Adare Trough Dredges D01 & D02

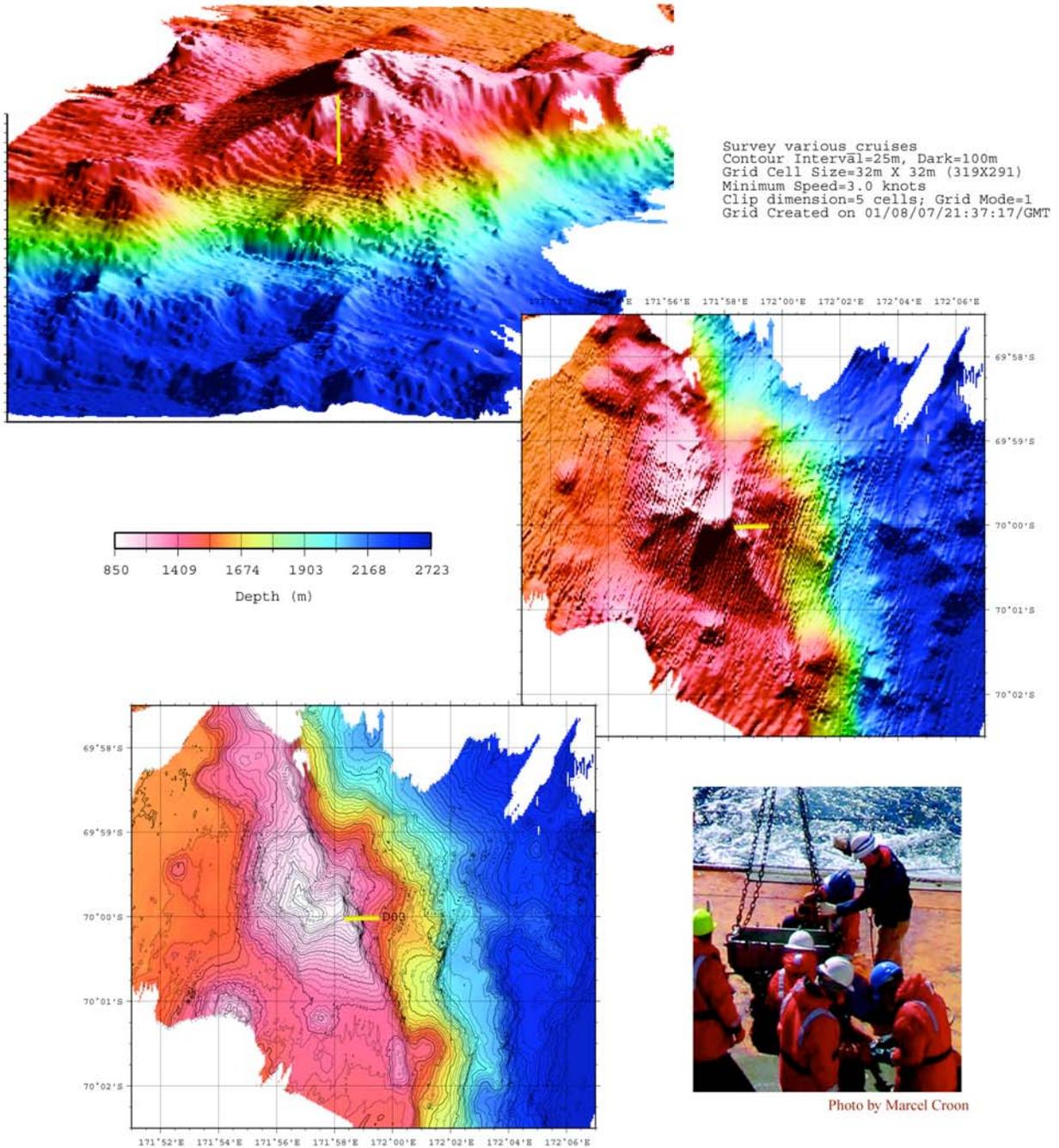
NBP0701 - Marion Seamount



S.O'Hara, RPSC

Figure 9 - Marion Seamount

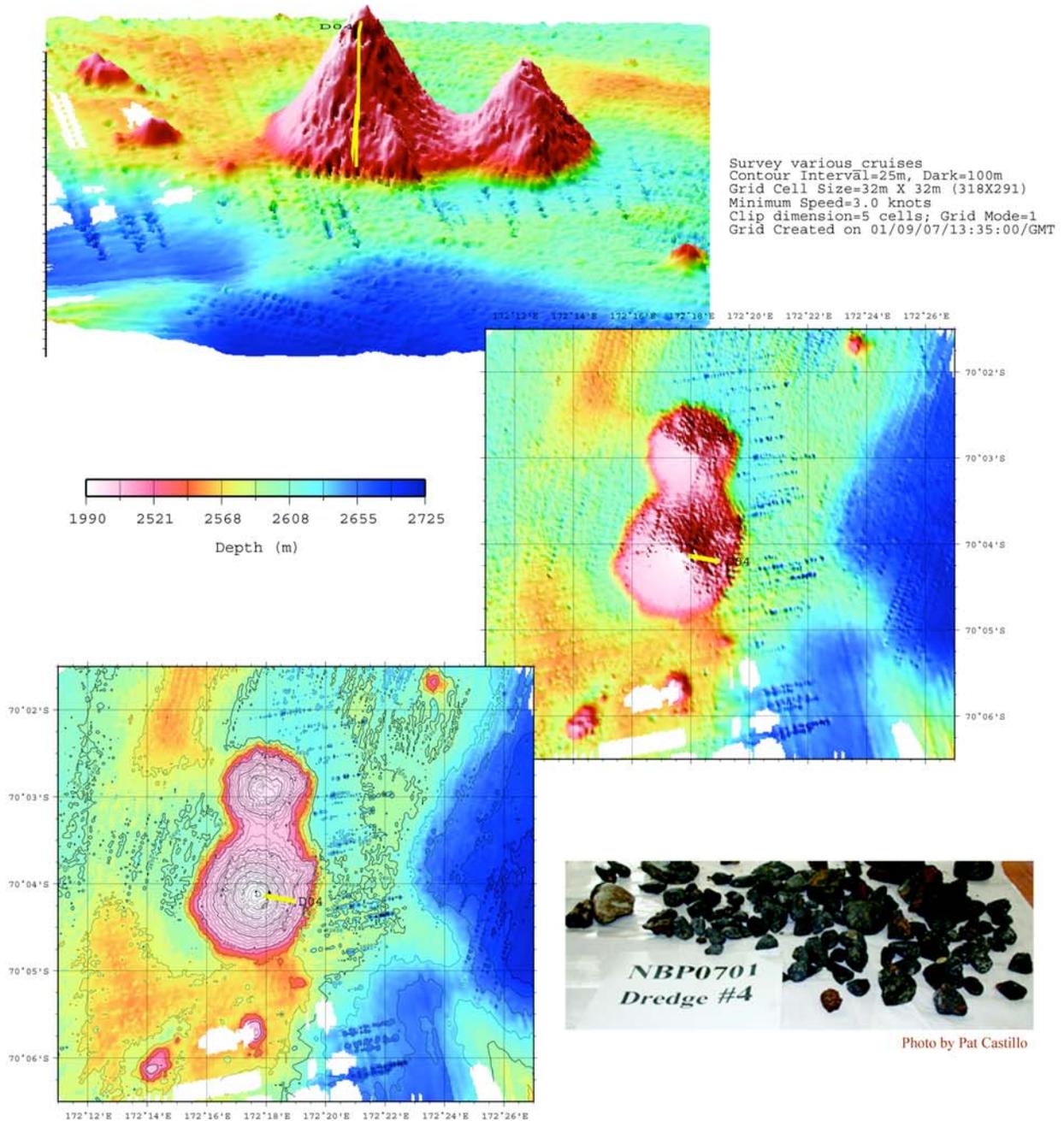
NBP0701 Adare Trough Dredge D03



S.O'Hara, RPSC

Figure 10 - Adare Trough Dredge D03

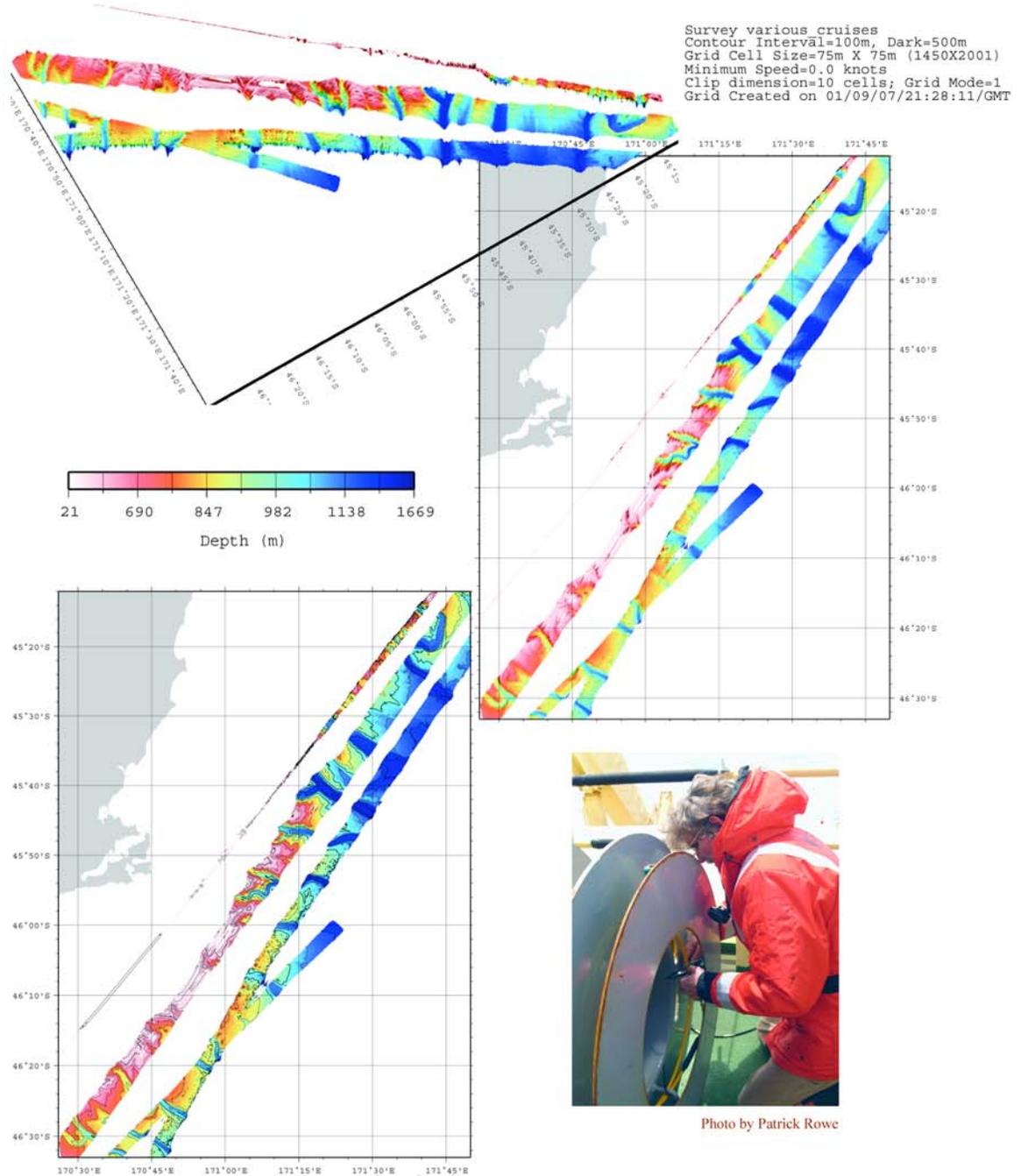
NBP0701 Adare Trough Dredge D04



S.O'Hara, RPSC

Figure 11 - Adare Trough Dredge D04

NBP0701 Bounty Head Canyons



S.O'Hara, RPSC

Figure 12 - Bounty Head Canyons

NBP0701 Volcano

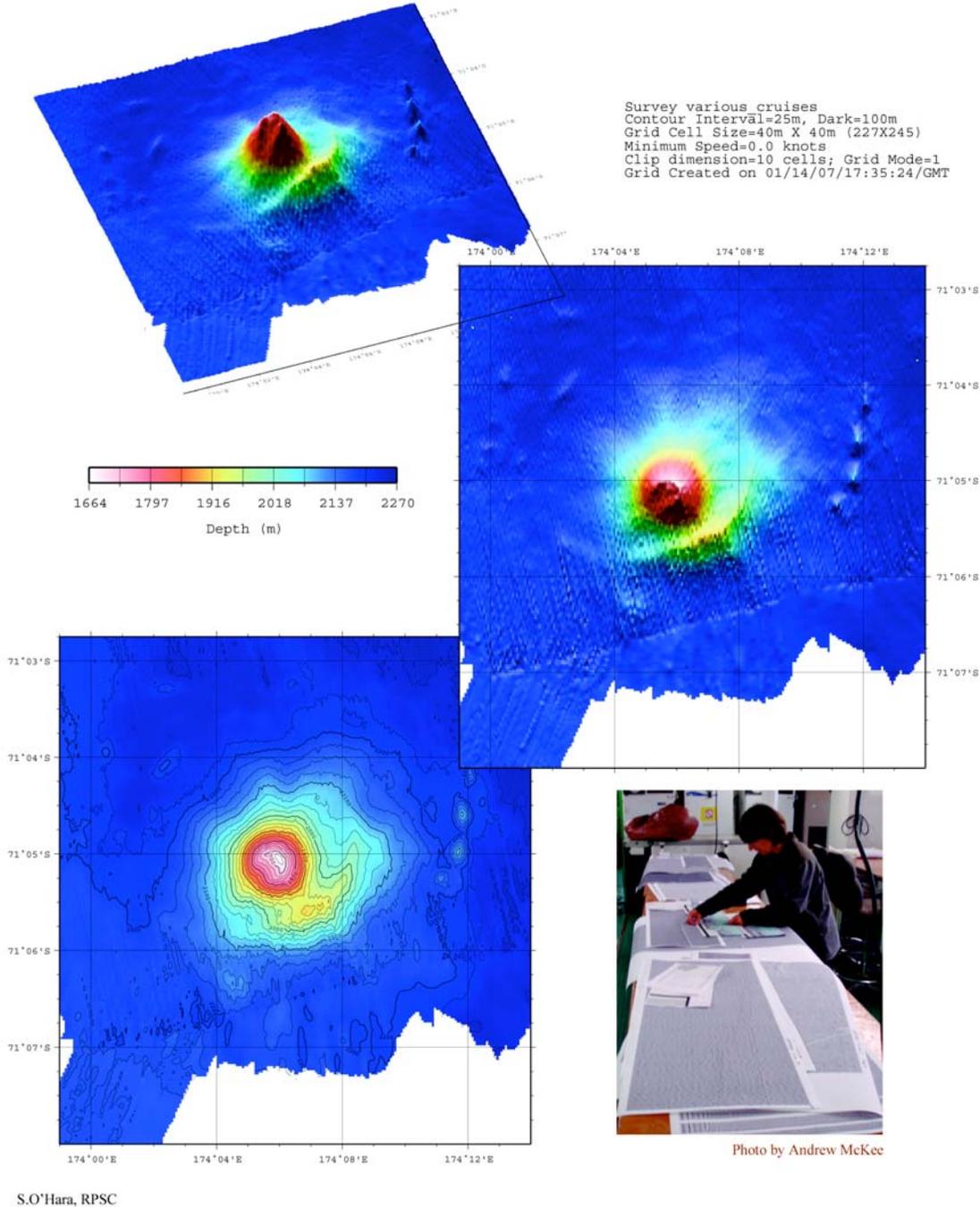
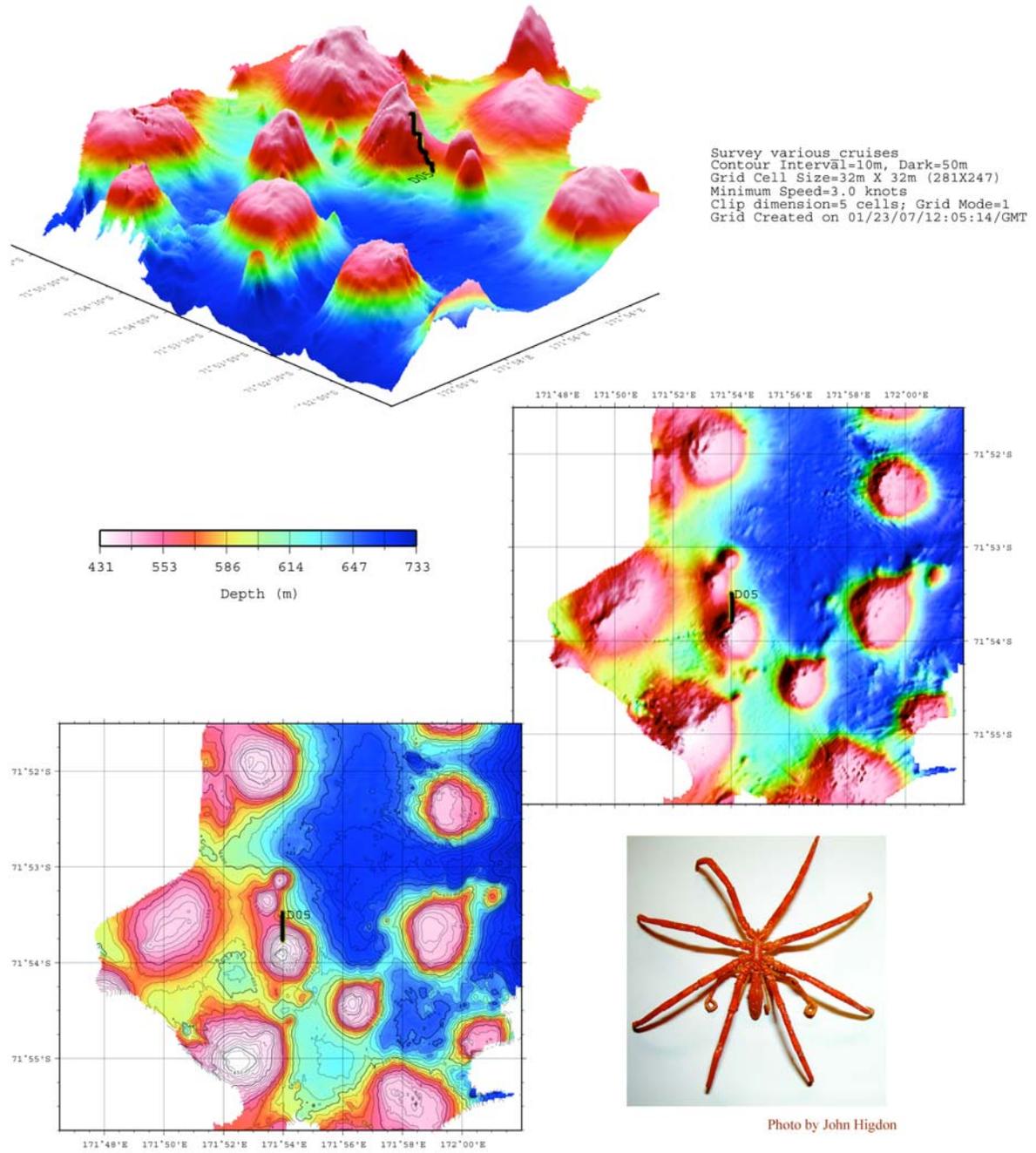


Figure 13 - Volcano

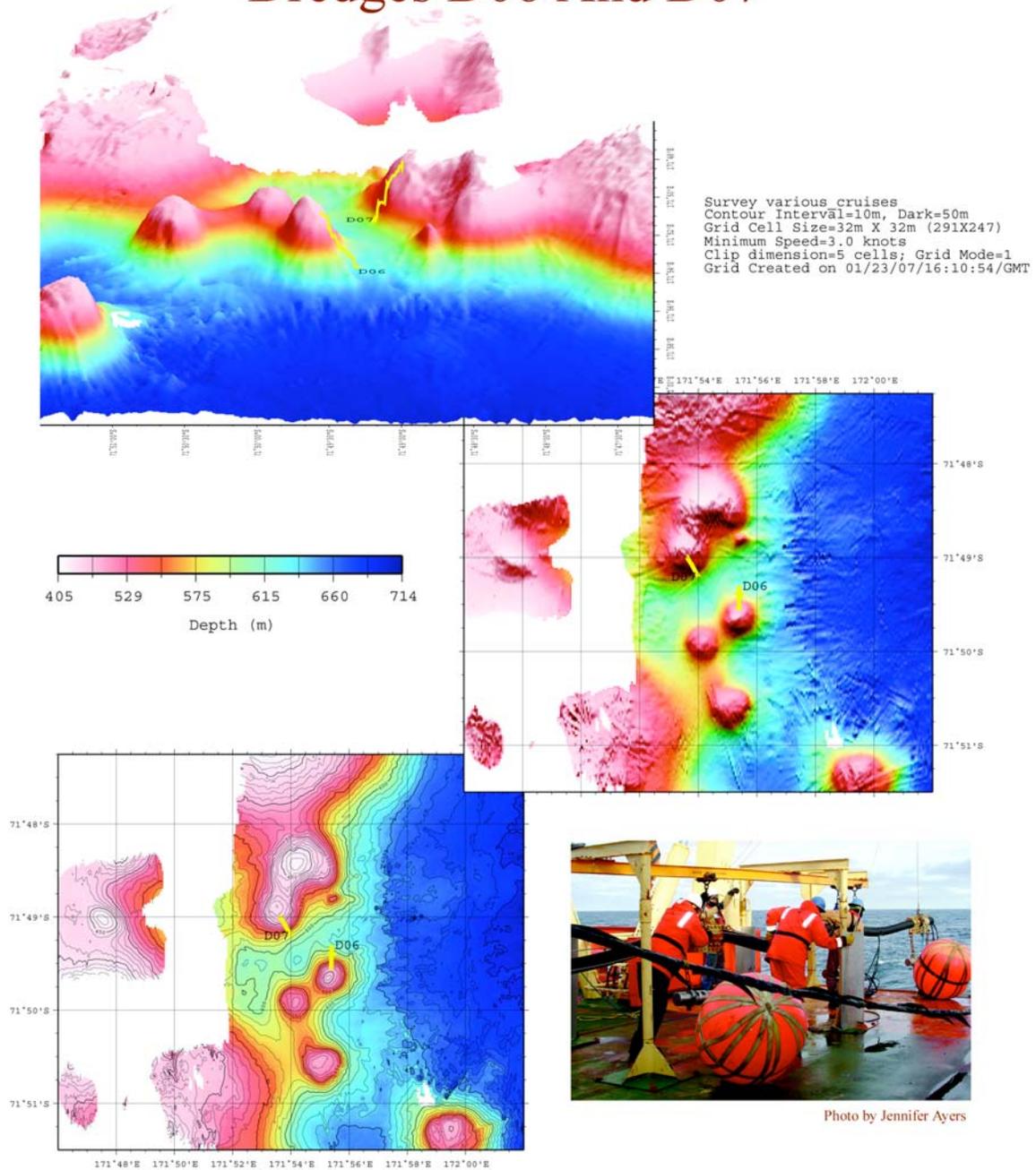
NBP0701 Adare Trough Dredge D05



S.O'Hara, RPSC

Figure 14 - Adare Dredge D05

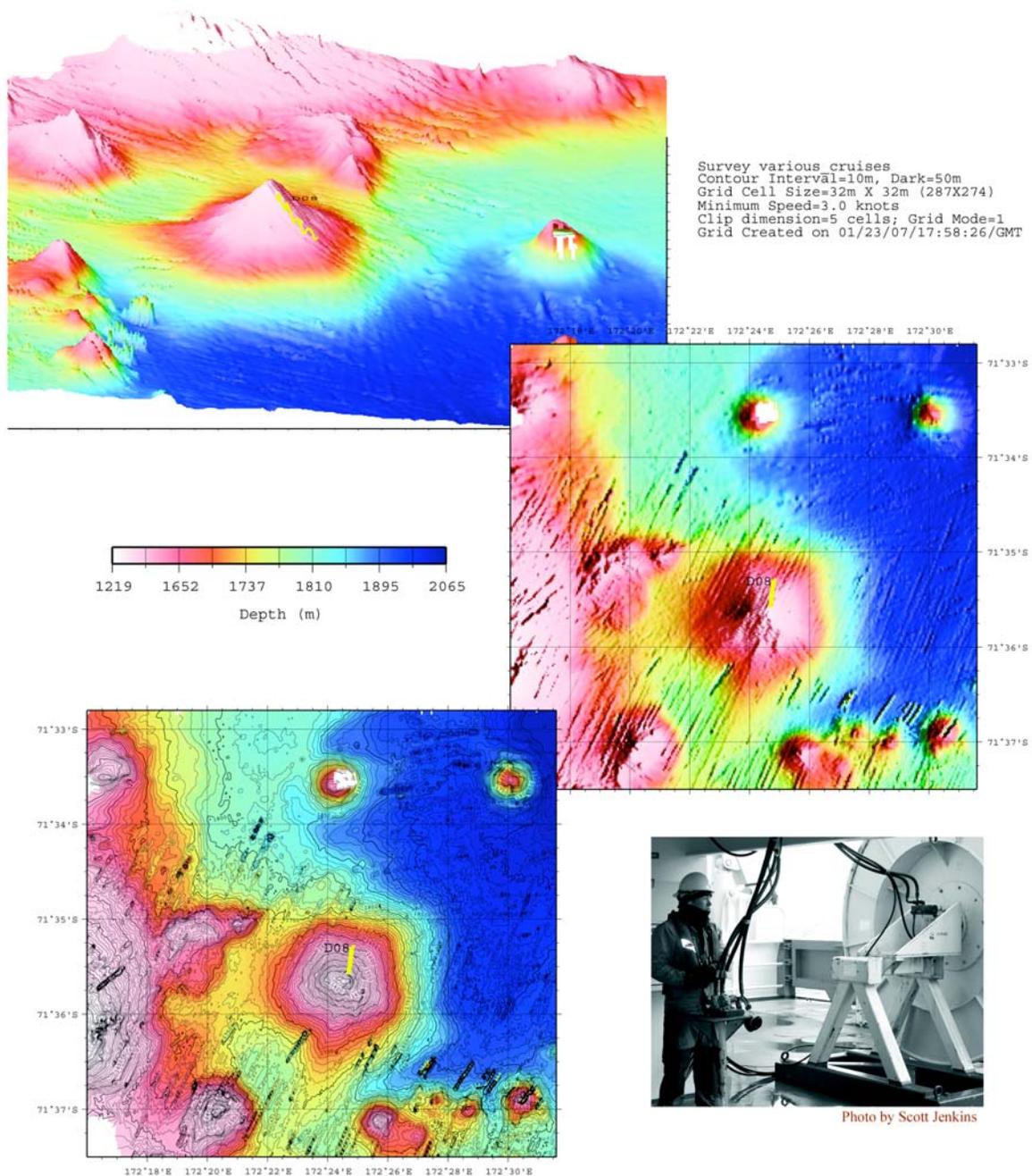
NBP0701 Adare Trough Dredges D06 And D07



S.O'Hara, RPSC

Figure 15 - Adare Dredges D06 And D07

NBP0701 Adare Trough Dredge D08

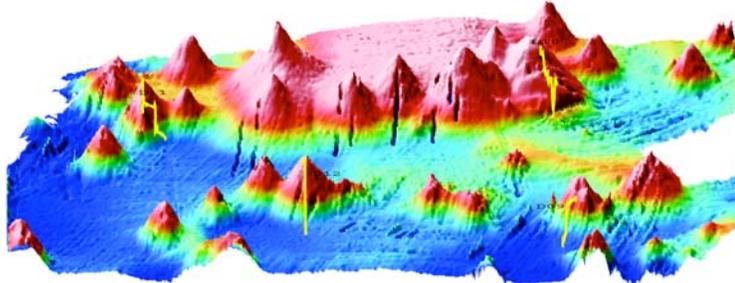


S.O'Hara, RPSC

Figure 16 - Adare Dredge D08

NBP0701 Adare Trough

Dredges D09, D10, D11 & D12



Survey various cruises
 Contour Interval=10m, Dark=50m
 Grid Cell Size=32m X 32m (403X274)
 Minimum Speed=3.0 knots
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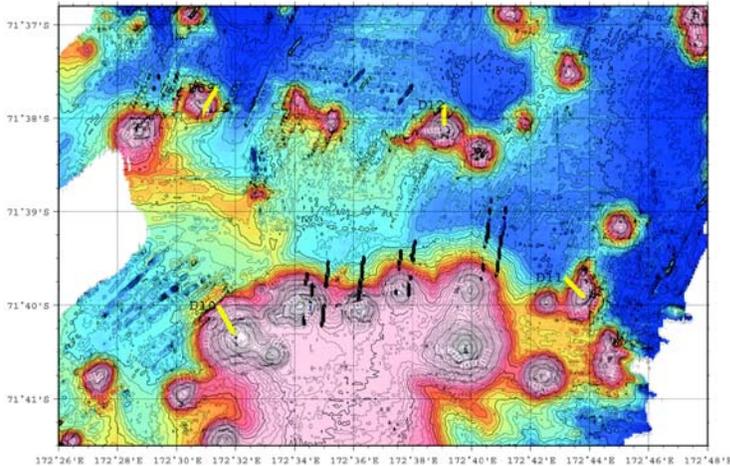
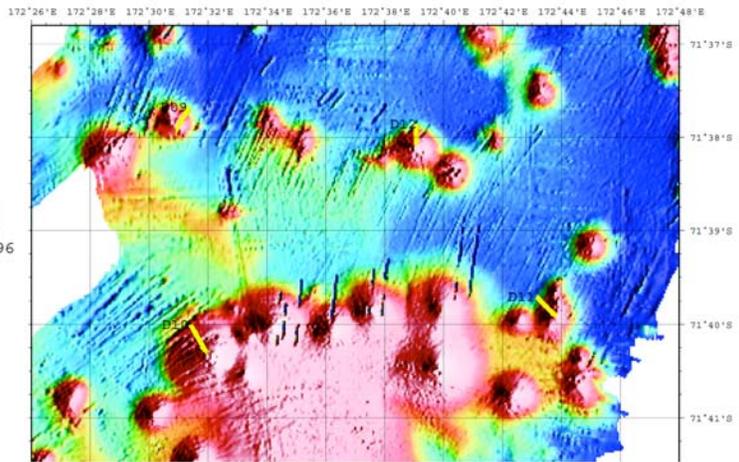
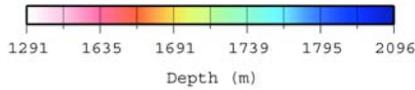
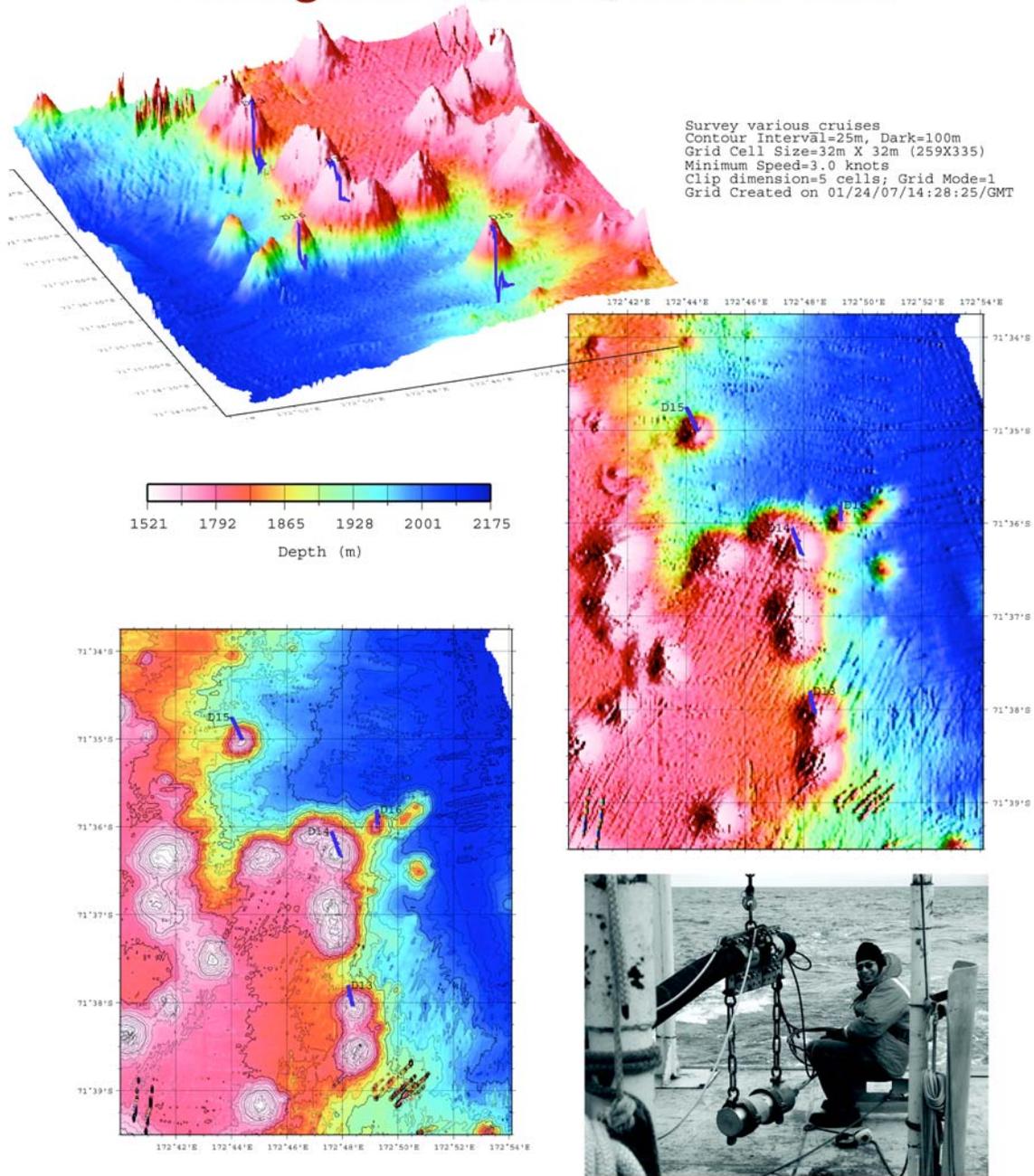


Photo by John Higdon

S.O'Hara, RPSC

Figure 17 - Adare Dredges D09, D10, D11 & D12

NBP0701 Adare Trough Dredges D13, D14, D15 & D16



S.O'Hara, RPSC

Figure 18 - Adare Dredges D13, D14, D15 And D16

NBP0701 Adare Trough Dredge D17

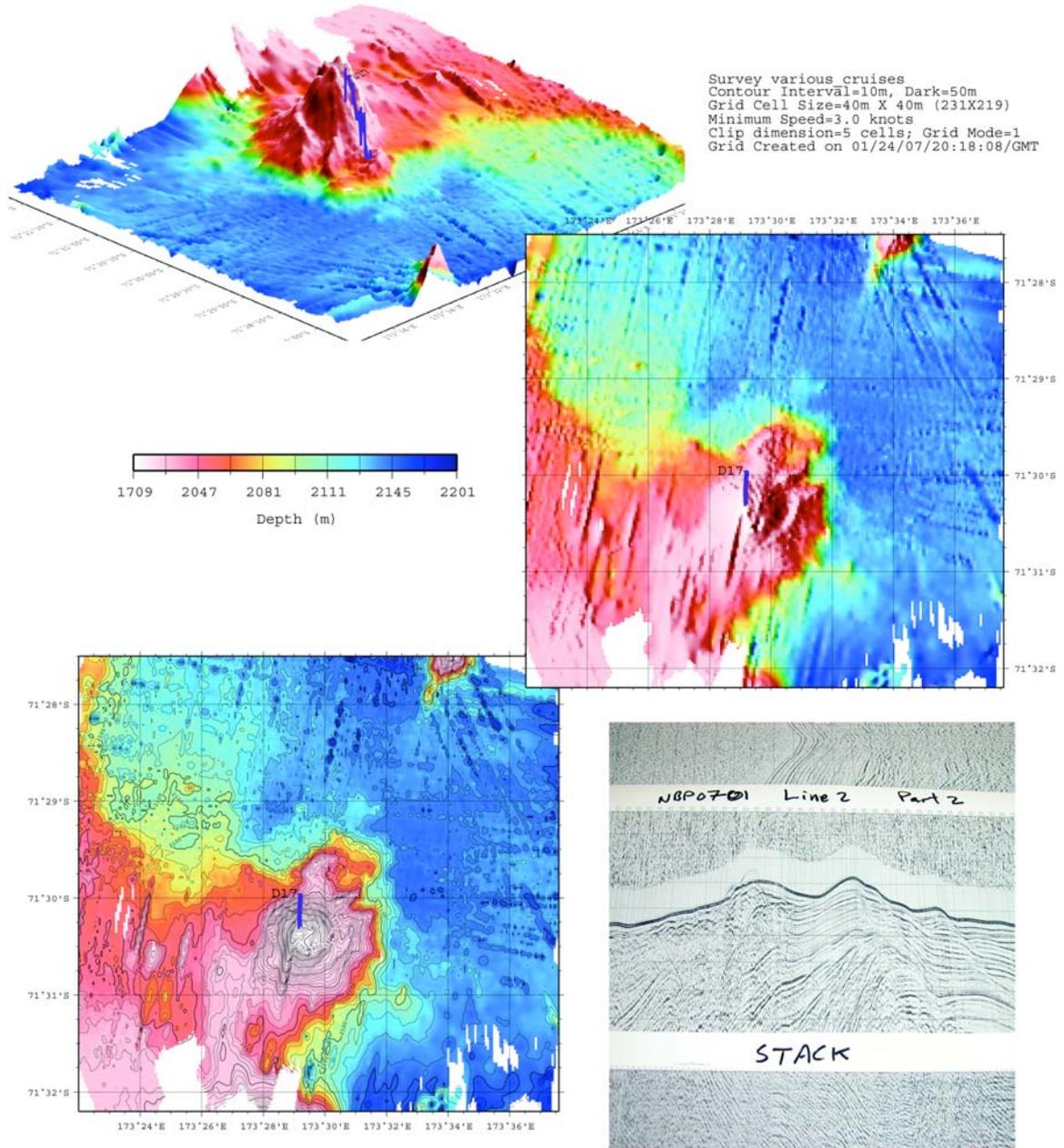


Photo by John Higdon

S.O'Hara, RPSC

Figure 19 - Adare Dredge D17

NBP0701 Adare Trough

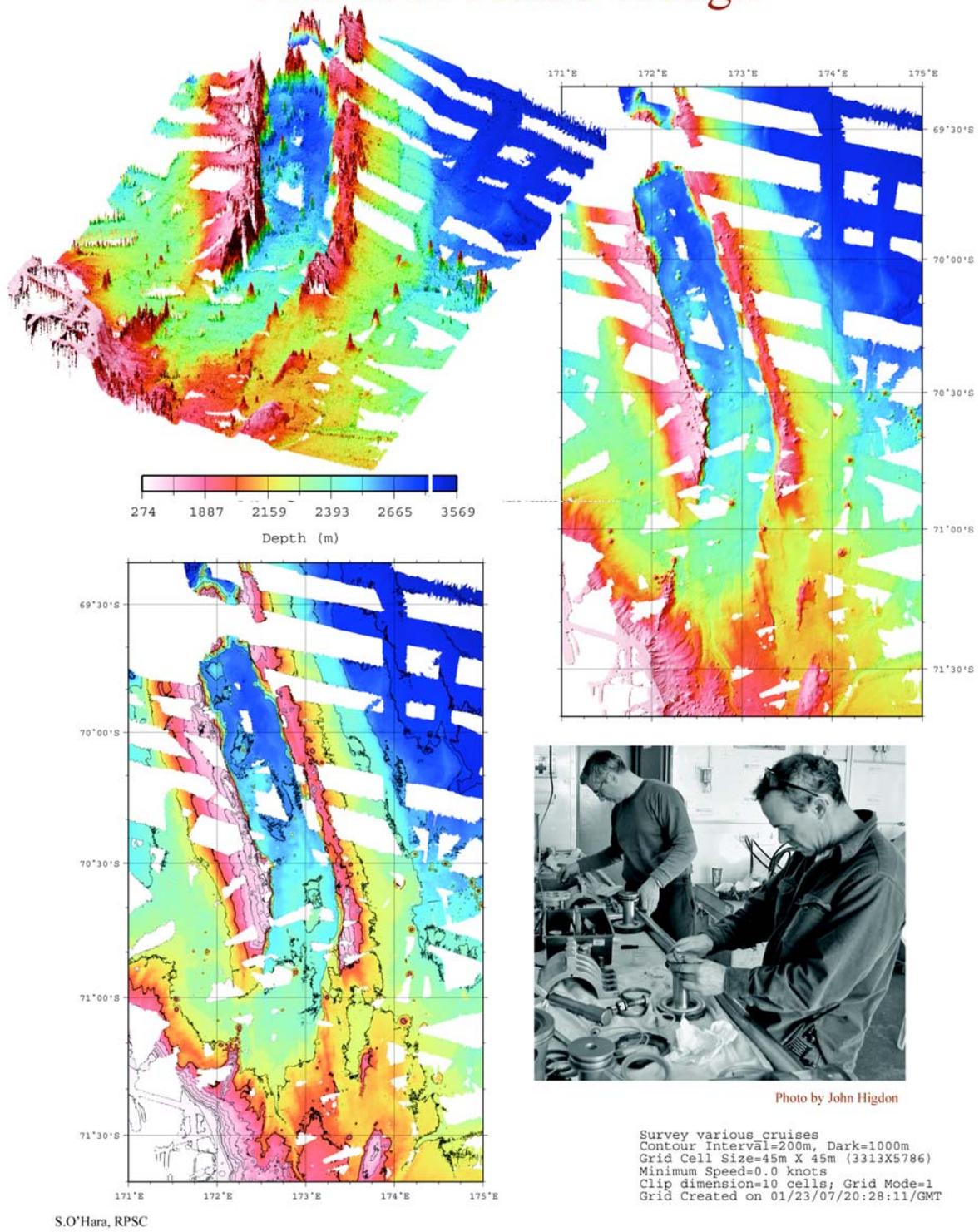
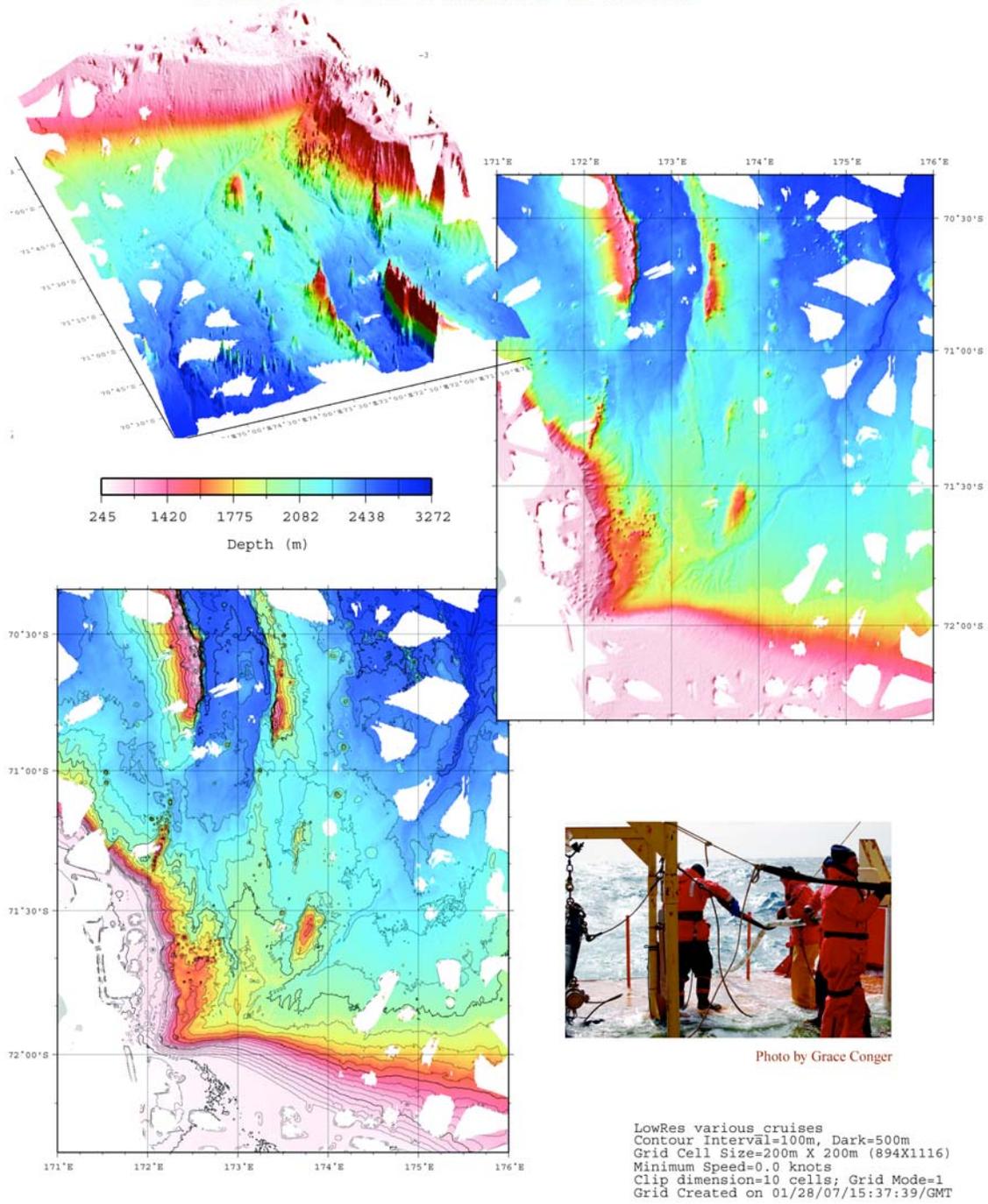


Figure 20 - Adare Trough

NBP0701 Adare Basin



S.O'Hara, RPSC

Figure 21 - Adare Basin

Acknowledgements

The collection of the multibeam survey data would not have been possible without the support of the crew of the RVIB Nathaniel B. Palmer. The bridge watch made every effort to monitor the real time display and to collect data outside of areas that had already been surveyed. The scientific watch standers also enabled this data to be collected by being the people in the lab that took on the responsibility to keep the EM120 system operating correctly and to keep the real time display in the lab up to date.

Most of the survey areas of this cruise benefited greatly by the inclusion of data from previous cruises. It is appreciated that the scientific and RPSC/ASA staff on those cruises took the effort to collect and clean these data sets. The prompt release of this data for public use allows it to be included in this and future surveys.

Thanks to all the ping editors for cleaning the raw swath files promptly each day on this and past cruises. Without their work, the quality of the survey maps would have suffered greatly. Thanks to everyone who contributed photographs that were included in the core site montages.