Dr. Philipp A. Brandl GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel Wischhofstr. 1-3 24148 Kiel Germany

Tel.: +49 (0)431 600-1433 email: pbrandl@geomar.de



Short Cruise Report RV Sonne SO299

Townsville (Australia) – Singapore 6th June – 29th July 2023 Chief Scientist: Dr. Philipp A. Brandl Master: Tilo Birnbaum







Objectives

The major aims of SO299 DYNAMET were to identify the variation in the composition of primary melts and magmas in complex microplate mosaics associated with subduction reversals including the role of aqueous fluids from the slab, different degrees of mantle melting, crustal contamination and fractionation, the contribution of different melts to the evolution of metal-rich magmatic- hydrothermal fluids and the large-scale structural control on their rise through the crust. Specific aims that will be addressed include:

(1) What are the consequences of the most recent subduction reversal and the sharp bend in the New Britain Trench? The forearc region of the former Manus-Kilinailau trench has been affected by at least two slabs and is now subject to crustal deformation related to the oblique collision with the Ontong-Java Plateau. A major question is the extent to which some components, including metals, may have been inherited from the old island arc crust. A dominant feature of the region is crustal exhumation along the major fault systems of the New Ireland Basin and the Feni Deep. A major question is whether melt extraction in the region is related to the presence of a slab tear, typical of a number of tightly accurate trenches at the margins of the Pacific plate.

(2) How is the large-scale crustal structure linked to metallogeny? Although the Weitin and Tabar faults appear to control magma ascent and mineralization at a crustal scale, the local kinematics and near seafloor architecture have never been resolved. A complex intersecting fault pattern is evident in the corridor between New Ireland and Lihir, where the youngest volcanism is observed and the vast majority of the gold deposits in the region are located, but the details of that relationship are unknown. A major question was how the structure and magmatism are linked and whether this unique situation is responsible for the localization of metals in the Lihir group. A 3D OBMT array was deployed and a 3D resistivity model will be derived based on a 3D MT inversion algorithm. An OBS network has been deployed around Lihir to obtain a broad picture of fluid migration at depth and a higher-resolution picture of the active seismicity near the seafloor. We expected to record frequent microearthquakes in the region, and regular blasts from the nearby Ladolam mine site will provide active sources for the OBS survey.

(3) What is the nature of the magma plumbing system in the TLTF? An important objective is to determine the manner in which the unusual alkaline melts of the TLTF make their way through the crust. Spatial and temporal variability in melt compositions and magmatic-hydrothermal activity is much greater than originally thought. Understanding this variability requires comprehensive new sampling of the volcanic centers. The shape of the New World volcano east of Lihir shows several parasitic cones, and a possible young flank eruption indicate that there could be active volcanism North of Lihir.

(4) What is the process of enrichment of Au in the TLTF system? A fourth aim was to determine how melt evolution, recorded in fresh lavas, and degassing may have influenced metal and volatile behaviour in the subvolcanic magma systems. A major question was whether the Au enrichment is a result of exsolution of metal-bearing fluids from shallow magma chambers or only related to much deeper processes. Major advances in geochemical techniques have been made since the original studies on vein material in the xenoliths. High-resolution trace element analyses will be performed to establish trace metal distribution in the crustal rocks in vein material from xenoliths, and in the host lavas. The goal is a more complete picture of metal distribution from the mantle, through the crust, in the erupted lavas and gasses and fluids.

Narrative

The ROV Kiel 6000 team and a few scientists started preparing the ROV, gravimeter, heat flow probe and Ocean Bottom Seismometers (OBS) and Magnetotellurics (OBMT) on board RV Sonne during the port call in Townsville from the 2nd to 5th June. All scientists boarded the vessel on the 5th June 2023. We left the pier in Townsville 6th June at 6:05 pm local time, the pilot left 6:55 pm local time. R/V Sonne arrived at the anchorage ~7 nm east of Townsville at 7:30 pm. The observer arrived on the vessel on the 7th June, 12 pm. Following an ROV "harbour" test at 1 pm we left anchorage at 8 pm transiting towards the working area entering the EEZ of Papua New Guinea on the 10th June 2023. Waiting for our research permission from the Papua New Guinean authorities we slowed our speed towards the main working area preparing for the OBS and OBMT releaser test. On the 13th June 2023, we arrived in our working area southwest of Lihir island. After our research permit was officially confirmed, we started with a hydroacoustic profile at 2 pm local time and heading north to perform the releaser test and obtain a sound velocity profile. During the early morning hours of 14th June, we performed a hydroacoustic survey to the south of Lihir and started deploying the OBS and OBMT networks from 12 pm until the morning of the 15th June followed by a brief hydroacoustic survey and our first dive with ROV Kiel 6000 on Conical Seamount. After a very successful ROV dive (026 ROV) that led to the discovery of the Karambusel Vents we continued with a second releaser test prior to performing heat flow measurements SE of Conical Seamount until the early morning hours of the 16th June. A hydroacoustic and parasound survey east of Lihir was executed prior to a final series of OBS and OBMT deployments. In calm weather we performed another nightly hydroacoustic survey south of Tabar prior to starting our second ROV dive (046 ROV) at the south-eastern slope of Conical Seamount in the morning of 17th June followed by three additional heatflow measurements. During the morning of 18th June, we made another hydroacoustic survey followed by an ROV dive at Edison Seamount (051 ROV) surveying the seamount from the NW towards and around the crater rim. During the night, we made additional heat flow measurements east of Conical Seamount prior to traversing towards the island of Tabar performing a hydroacoustic survey in the morning of the 19th June. During the day we performed four TV-grab stations southwest of Tabar, followed by a gravity corer and two dredges in the area, before making a hydroacoustic survey towards Mussel Cliff where we started our fourth ROV dive (063_ROV) during the day of 20th June. In the evening, following two additional gravity corers, we performed a hydroacoustic survey on the 21st and during the early morning of the 22nd June towards the Weitin Fault area south of New Ireland. During 22nd June we performed a dredge, followed by another sound velocity profile and an additional dredge in the vicinity of the Weitin Fault, followed by an extensive hydroacoustic survey across the Weitin Fault area between the New Britain Trench and New Ireland. During the night of the 23rd June, we sampled the Weitin Fault by two dredges and an ROV dive followed starting at >5000 mbsl (073 ROV). During the ROV recovery we realised that the ROV cable was entangled with a long line, however, the crew managed to get the ROV (and long line) on board without any damage to the ROV or vessel. During the evening of the 24th June and the morning of the 25th June we lowered two dredges and performed hydroacoustic surveys followed by two additional dredges south of New Ireland during the day of the 25th June. During the 26th June and the morning of the 27th June we ran another hvdroacoustic survey towards the Karambusel Vents at Conical Seamount, followed by an ROV dive (081 ROV) targeting the north-western side and the Karambusel vent field. After a very successful dive, with fluid, gas and rock samples, two heat flow stations and a hydroacoustic profile were made during the evening and the morning hours of the 28th June. During the 28th June we performed four TV-grab stations in the vicinity of Tubaf Seamount. Followed by two heat flow stations, we performed hydroacoustic surveys east and south of Lihir during the night. Another ROV dive at Mussel Cliff (093 ROV) followed during the day

of 29th June followed by two additional heat flow measurements and a night of hydroacoustic surveying. Four TV-grabs were carried out east and north of Conical Seamount and targeting the Kinami mass wasting deposit on 30th June. During the night and morning of 1st July we transited towards the Lihir Deep in the north-eastern part of the working area, where we performed an ROV dive (102 ROV) to stratigraphically sample the northern escarpment of the deep. Two heat flow stations in the Lihir Deep and a multibeam survey followed overnight. On 2nd July we sampled sediments of the Lihir Deep by gravity corer and ran two dredge stations in the wider vicinity of the deep. A hydroacoustic survey followed through the night. On 3rd July we performed two deep dredges on the eastern side of the Manus-Kilinailau Trench prior to an extensive hydroacoustic survey during the night and until the afternoon of the 4th July when we sampled Pikinini Seamount north of New World Seamount by dredge. During the night, we ran a hydroacoustic survey east of Tabar prior to an ROV dive (116 ROV) at New World Seamount during the 5th July which recovered numerous rock samples. During the night, we performed two additional heat flow measurements towards the morning hours of the 6th July, when we started the recovery of the OBS and OBMT instruments around the island of Lihir. Until the evening of the 8th July we successfully recovered all 34 OBS and OBMT instruments from the seafloor prior to performing two gravity cores and a hydroacoustic survey during 9th July. In the morning of 9th July, we started a fourth dive at Conical Seamount (station 157) approaching the seamount from the northwestern rim sampling gases, fluids and mineralised samples. During the night we performed a hydroacoustic survey east of Lihir and during 10th July we performed four successful TVgrabs at Conical Seamount and Mussel Cliff prior to a dredge at Olpela Ples (Old World Seamount) and a hydroacoustic survey west of Lihir. A final ROV dive (166 ROV) in the Lihir working area was performed on Pikinini Seamount during 11th July 2023 prior to a dredge at the Mussau-Kilinailau Trench and a hydroacoustic survey towards the Mussau Trench in the northern working area during 12th July and the early morning hours of 13th July. We lowered a dredge at the southern section of the Mussau Ridge prior to further hydroacoustic surveys and a final ROV dive (172 ROV) on 14th July and a dredge in the night to the 15th July. The work program at the Mussau Ridge finished on 15th July 22:00 local time after another dredge station and a final hydroacoustic survey on the northern section of this structure. We started the transit towards Singapore on 15th July with an underway hydroacoustic survey in international waters transiting towards the Molucca Sea and finished the underway survey on 19th July 2023, 3 am local time before entering the EEZ of Indonesia. The southerly transit route was chosen to avoid a typhoon in the Philippine Sea. We arrived in Singapore at berth on 29th July 2023 at 9 am.

Acknowledgements

We gratefully acknowledge the help of the German Embassy in Canberra and the Coordination Center of the German Research Fleet (LDF) at the University of Hamburg in achieving the research permission and scheduling the cruise. The cruise and post-cruise research projects are financed by the German Federal Ministry of Education and Research (BMBF) through grants 03G0299A and 03G0299B as well as through a generous contribution from the GEOMAR Helmholtz Centre for Ocean Research Kiel. We thank Captain Tilo Birnbaum and his crew for their help in carrying out a successful cruise and for the pleasant and professional atmosphere on RV Sonne – as usual. We acknowledge the help and support of the captain and crew of SO299 during all scientific operations but particularly during complex operations such as ROV, OBS, OBMT and TV-grab deployment and recovery.

List of scientific participants

Name	Discipline	Institution
Brandl, Philipp A., Dr.	Chief Scientist, Geology	GEOMAR
Beier, Christoph, Prof. Dr.	Co-Chief Scientist, Petrology	UH, GZN/FAU
Petersen, Sven, Dr.	Economic Geology	GEOMAR
Hannington, Mark D., Prof. Dr.	Economic Geology	UOttawa
Hansteen, Thor, PD Dr.	Petrology	GEOMAR
Gautreau, Louis-Maxime	Petrology	GEOMAR, CAU
Falkenberg, Jan	Petrology	GZN/FAU
Wenske, Julia	Petrology	GZN/FAU
Riemer, Egor	Petrology	GZN/FAU
Waßmund, Leon	Petrology	CAU
Schenk, Johanna	Petrology	CAU
Maicher, Doris, Dr.	Curator	GEOMAR
Zitoun, Rebecca, Dr.	Fluid/Gas sampling	GEOMAR
Vahrenkamp, Sarima	Fluid/Gas sampling	GEOMAR, CAU
Ruth, William	Fluid/Gas sampling	GEOMAR, CAU
Lange, Sabine	Fluid/Gas sampling	GEOMAR
Klein, Johanna	OBS	GEOMAR, CAU
Panachi, Esther	OBS	GEOMAR, CAU
Reeck, Konstantin	OBMT	GEOMAR, CAU
Zimmer, Hannah	OBMT	GEOMAR, UM
Galerne, Christophe Y., Dr.	Hydroacoustics	UB
Acuña Avendaño, Octavio	Hydroacoustics	UToronto
Baxter, Alan T., Dr.	Hydroacoustics, Sediments	UOttawa
Heyde, Ingo, Dr.	Gravimetry/Heatflow	BGR
Hagedorn, Dennis	Heatflow	BGR
Abegg, Friedrich, Dr.	ROV Kiel 6000	GEOMAR
Taylor, James, Dr.	ROV Kiel 6000	GEOMAR
Suck, Inken, Dr.	ROV Kiel 6000	GEOMAR
Pieper, Martin	ROV Kiel 6000	GEOMAR
Cuno, Patrick	ROV Kiel 6000	GEOMAR
Matthiessen, Torge	ROV Kiel 6000	GEOMAR
Striewski, Peter	ROV Kiel 6000	GEOMAR
Genz, Jens	ROV Kiel 6000	GEOMAR
McInnes, Brent I.A., Prof. Dr.	Sedimentology, Observer	Curtin, Peak Oil
Kaufmann, Max	Observer	Odyssey
Konabe, Stanis	Observer, Sedimentology	UPNG

Participating Institutions

GEOMAR UH	GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel University of Helsinki, Finland
GZN/FAU	GeoZentrum Nordbayern, Friedrich-Alexander Universität Erlangen-Nürnberg
UOttawa	University of Ottawa, Canada
CAU	Christian-Albrechts-Universität zu Kiel
UB	Universität Bremen, Fachbereich Geowissenschaften
UM	Universität Münster
UToronto	University of Toronto, Canada
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover
Curtin	Curtin University, Perth, Australia
Peak Oil	Peak Oil (PNG) Pty. Ltd., Melbourne, Australia
Odyssey	Odyssey Marine Exploration Inc., Tampa, USA
UPNG	The University of Papua New Guinea, Port Moresby, Papua New Guinea

List of stations

Please note that the positions given in the list of stations of this short cruise report are of the vessel and not the position of the instrument/tool/vehicle at the seafloor. A detailed list of stations including these positions can be found in the full cruise repot.

#	Type/ID	Date & Time (UTC)	Action	Latitude	Longitude	Depth (m)
001	Releasertest	2023/06/13 08:26:35	max depth	02° 20,012' S	152° 30,960' E	2960.0
002	Releasertest	2023/06/13 11:59:04	max depth	02° 19,992' S	152° 30,975' E	2963.4
003	MB-01	2023/06/13 14:11:46	station start	02° 19,991' S	152° 30,969' E	2967.5
004	OBS-01	2023/06/14 01:52:31	OBS deployed	02° 54,217' S	152° 33,119' E	1702.7
005	OBMT-01	2023/06/14 02:41:33	OBMT deployed	02° 57,000' S	152° 33,338' E	1535.8
006	OBS-02	2023/06/14 03:38:28	OBS deployed	02° 59,732' S	152° 27,468' E	1703.4
007	OBMT-02	2023/06/14 04:17:30	OBMT deployed	03° 03,343' S	152° 25,044' E	1657.2
008	OBS-03	2023/06/14 04:54:03	OBS deployed	03° 05,903' S	152° 26,877' E	1462.6
009	OBS-04	2023/06/14 06:17:11	OBS deployed	03° 08,464' S	152° 15,432' E	1754.1
010	OBS-05	2023/06/14 07:33:19	OBS deployed	03° 10,307' S	152° 07,786' E	1137.2
011	OBS-06	2023/06/14 08:48:03	OBS deployed	03° 16,865' S	152° 12,275' E	957.0
012	OBS-07	2023/06/14 09:25:59	OBS deployed	03° 16,224' S	152° 16,563' E	1536.0
013	OBMT-03	2023/06/14 10:41:01	OBMT deployed	03° 13,483' S	152° 24,633' E	1573.9
014	OBS-08	2023/06/14 10:58:18	OBS deployed	03° 13,393' S	152° 25,338' E	1540.9
015	OBMT-04	2023/06/14 11:49:21	OBMT deployed	03° 12,447' S	152° 31,159' E	1238.3
016	OBS-09	2023/06/14 12:39:44	OBS deployed	03° 16,568' S	152° 33,310' E	1481.4
017	OBS-10	2023/06/14 13:18:20	OBS deployed	03° 20,030' S	152° 35,573' E	1631.6
018	OBMT-05	2023/06/14 13:46:48	OBMT deployed	03° 18,751' S	152° 37,150' E	1669.2
019	OBS-11	2023/06/14 14:21:49	OBS deployed	03° 17,481' S	152° 39,308' E	1559.8
020	OBMT-06	2023/06/14 15:02:45	OBMT deployed	03° 18,190' S	152° 42,432' E	1767.7
021	OBMT-07	2023/06/14 15:49:10	OBMT deployed	03° 21,299' S	152° 40,681' E	1867.9
022	OBS-12	2023/06/14 17:04:27	OBS deployed	03° 15,728' S	152° 46,677' E	1995.4
023	OBMT-08	2023/06/14 18:07:09	OBMT deployed	03° 21,835' S	152° 45,579' E	2150.9
024	OBS-13	2023/06/14 18:25:29	OBS deployed	03° 22,835' S	152° 45,989' E	2211.7
025	MB-02	2023/06/14 18:30:02	profile start	03° 22,898' S	152° 45,989' E	2209.4
026	ROV-01	2023/06/14 21:45:00	station start	03° 19,137' S	152° 39,152' E	1597.6
027	Releasertest	2023/06/15 10:52:57	max depth	03° 23,620' S	152° 45,233' E	2212.2
028	HF-01	2023/06/15 14:18:17	on ground	03° 23,630' S	152° 45,257' E	2217.8
029	HF-02	2023/06/15 16:55:39	on ground	03° 22,118' S	152° 43,355' E	2048.5
030	HF-03	2023/06/15 19:16:04	on ground	03° 20,790' S	152° 41,910' E	1856.0
031	MB-04	2023/06/15 20:52:17	station start	03° 20,793' S	152° 41,908' E	1854.9
032	OBMT-09	2023/06/16 00:27:07	OBMT deployed	03° 23,437' S	152° 38,781' E	1745.0
033	OBS-14	2023/06/16 00:39:46	OBS deployed	03° 23,960' S	152° 38,363' E	1790.8
034	OBS-15	2023/06/16 01:41:28	OBS deployed	03° 19,039' S	152° 31,322' E	1620.1
035	OBMT-10	2023/06/16 02:11:06	OBMT deployed	03° 19,008' S	152° 29,370' E	1690.4
036	OBMT-11	2023/06/16 03:02:40	OBMT deployed	03° 19,430' S	152° 23,576' E	1568.0
037	OBS-16	2023/06/16 03:27:54	OBS deployed	03° 21,008' S	152° 23,849' E	1528.7
038	OBMT-12	2023/06/16 04:28:31	OBMT deployed	03° 22,107' S	152° 17,188' E	956.7

039	OBMT-13	2023/06/16 05:52:52	OBMT deployed	03° 27,980' S	152° 24,764' E	966.0
040	OBMT-14	2023/06/16 07:17:24	OBMT deployed	03° 33,663' S	152° 33,601' E	917.3
041	OBS-17	2023/06/16 08:15:37	OBS deployed	03° 31,778' S	152° 39,933' E	1767.3
042	OBMT-16	2023/06/16 08:47:20	OBMT deployed	03° 28,073' S	152° 39,183' E	1920.2
043	OBS-18	2023/06/16 09:36:26	OBS deployed	03° 26,978' S	152° 32,750' E	1620.0
044	OBMT-17	2023/06/16 10:19:57	OBMT deployed	03° 24,520' S	152° 32,336' E	1746.9
045	MB-03	2023/06/16 10:29:51	station start	03° 24,353' S	152° 32,224' E	1743.6
046	ROV-02	2023/06/16 22:18:09	lowering	03° 19,455' S	152° 40,109' E	1654.7
047	HF-04	2023/06/17 08:34:09	on ground	03° 19,491' S	152° 40,388' E	1664.6
048	HF-05	2023/06/17 10:40:27	on ground	03° 18,057' S	152° 38,809' E	1609.3
049	HF-06	2023/06/17 13:23:03	on ground	03° 17,036' S	152° 37,558' E	1526.2
050	MB-06	2023/06/17 14:41:26	station start	03° 17,021' S	152° 37,534' E	1526.5
051	ROV-03	2023/06/17 22:09:10	lowering	03° 18,410' S	152° 35,103' E	1558.1
052	HF-07	2023/06/18 09:44:39	on ground	03° 17,041' S	152° 35,184' E	1488.8
053	HF-08	2023/06/18 12:19:02	on ground	03° 16,982' S	152° 32,337' E	1507.0
054	HF-09	2023/06/18 14:39:44	on ground	03° 16,990' S	152° 29,642' E	1576.5
055	MB-07	2023/06/18 16:13:45	station start	03° 16,993' S	152° 29,617' E	1575.2
056	TVG-01	2023/06/18 23:58:27	on ground	03° 01,927' S	151° 55,461' E	1165.4
057	TVG-02	2023/06/19 02:58:10	on ground	03° 01,657' S	151° 56,523' E	1220.1
058	TVG-03	2023/06/19 05:38:06	on ground	03° 02,890' S	151° 58,745' E	1137.5
059	TVG-04	2023/06/19 07:44:38	on ground	03° 01,635' S	151° 55,475' E	1269.1
060	GC-01	2023/06/19 09:53:33	on ground	03° 02,603' S	151° 57,205' E	1243.8
061	DR-01	2023/06/19 12:24:12	off the ground	03° 02,878' S	151° 58,792' E	1161.3
061	DR-02	2023/06/19 14:37:36	off the ground	03° 02,830' S	151° 58,769' E	1186.3
062	MB-07	2023/06/19 15:12:46	station start	03° 02,860' S	151° 58,814' E	1187.4
063	ROV-04	2023/06/19 22:10:29	lowering	03° 19,144' S	152° 35,441' E	1565.7
064	GC-02	2023/06/20 08:41:28	on ground	03° 17,041' S	152° 35,188' E	1489.5
065	GC-03	2023/06/20 10:35:38	on ground	03° 16,965' S	152° 32,321' E	1503.9
066	MB-07	2023/06/20 11:24:23	station start	03° 16,973' S	152° 32,336' E	1504.8
067	DR-03	2023/06/21 23:28:15	off the ground	05° 27,328' S	153° 33,524' E	4771.8
068	CTD-01	2023/06/22 02:56:59	max depth	05° 27,792' S	153° 33,045' E	5260.7
069	DR-04	2023/06/22 08:06:53	off the ground	05° 31,864' S	153° 27,046' E	3667.8
070	MB-10	2023/06/22 09:55:02	station start	05° 29,785' S	153° 26,901' E	4174.1
071	DR-05	2023/06/23 12:55:28	off the ground	05° 10,008' S	153° 24,919' E	3294.2
072	DR-06	2023/06/23 16:59:42	off the ground	05° 09,972' S	153° 24,975' E	3277.9
073	ROV-05	2023/06/23 22:05:23	lowering	05° 26,572' S	153° 33,014' E	4957.8
074	MB-11	2023/06/24 09:09:47	station start	05° 26,324' S	153° 25,626' E	3828.6
075	DR-07	2023/06/24 14:11:41	off the ground	05° 19,136' S	153° 18,271' E	3237.8
076	DR-08	2023/06/24 19:47:49	off the ground	05° 09,991' S	153° 26,665' E	4284.5
077	DR-09	2023/06/25 04:52:54	off the ground	05° 28,943' S	153° 07,998' E	3009.0
078	DR-10	2023/06/25 10:33:15	off the ground	05° 38,334' S	153° 15,601' E	3362.9
079	MB-12	2023/06/25 14:15:25	station start	05° 28,548' S	153° 01,123' E	2913.9
080	MB-13	2023/06/26 20:11:44	station start	03° 18,810' S	152° 38,948' E	1442.1
081	ROV-06	2023/06/26 22:14:09	lowering	03° 18,707' S	152° 38,716' E	1641.2

082	HF-10	2023/06/27 09:49:10	on ground	03° 17,884' S	152° 40,209' E	1608.6
083	HF-11	2023/06/27 12:18:45	on ground	03° 18,420' S	152° 42,067' E	1771.4
084	HF-12	2023/06/27 14:38:09	on ground	03° 19,076' S	152° 44,161' E	1932.2
085	MB-14	2023/06/27 16:41:22	station start	03° 19,244' S	152° 41,009' E	1689.6
086	TVG-05	2023/06/27 23:20:02	on ground	03° 18,030' S	152° 36,366' E	1546.0
087	TVG-06	2023/06/28 01:39:22	on ground	03° 16,215' S	152° 37,567' E	1204.0
088	TVG-07	2023/06/28 03:36:46	on ground	03° 14,587' S	152° 32,770' E	1317.6
089	TVG-08	2023/06/28 07:18:31	on ground	03° 15,138' S	152° 32,459' E	1274.2
090	HF-13	2023/06/28 10:03:10	ground	03° 19,196' S	152° 35,417' E	1575.3
091	HF-14	2023/06/28 13:13:58	on ground	03° 20,643' S	152° 35,536' E	1653.6
092	MB-15	2023/06/28 15:27:46	station start	03° 13,149' S	152° 44,026' E	1552.0
093	ROV-07	2023/06/28 22:21:08	lowering	03° 19,174' S	152° 35,458' E	1553.8
094	HF-15	2023/06/29 10:14:39	on ground	03° 19,186' S	152° 28,609' E	1687.1
095	HF-16	2023/06/29 12:26:38	on ground	03° 21,732' S	152° 27,068' E	1621.7
096	MB-16	2023/06/29 14:36:06	station start	03° 18,021' S	152° 25,197' E	1602.0
097	TVG-09	2023/06/29 23:04:06	on ground	03° 20,304' S	152° 42,355' E	1681.3
098	TVG-10	2023/06/30 02:09:55	on ground	03° 18,113' S	152° 41,058' E	1607.9
099	TVG-11	2023/06/30 04:31:41	on ground	03° 16,405' S	152° 44,709' E	1778.7
100	TVG-12	2023/06/30 06:45:41	on ground	03° 15,048' S	152° 43,452' E	1509.0
101	MB-17	2023/06/30 07:51:06	station start	03° 15,046' S	152° 43,454' E	1508.6
102	ROV-08	2023/06/30 22:06:56	lowering	02° 48,211' S	153° 05,920' E	3240.3
103	HF-17	2023/07/01 08:29:32	on ground	02° 48,404' S	153° 06,255' E	3254.3
104	HF-18	01.07.23 12:18	on ground	02° 49,882' S	153° 10,735' E	3438.5
105	MB-18	01.07.23 14:30	station start	02° 49,969' S	153° 10,753' E	3440.5
106	GC-04	02.07.23 00:24	on ground	02° 49,876' S	153° 10,738' E	3440.3
107	DR-11	02.07.23 05:26	off the ground	02° 44,492' S	153° 19,162' E	2948.5
108	DR-12	02.07.23 10:03	off the ground	02° 34,486' S	153° 05,484' E	1615.2
109	MB-19	02.07.23 11:03	station start	02° 34,486' S	153° 05,487' E	1613.3
110	DR-13	03.07.23 00:33	off the ground	01° 57,611' S	152° 51,617' E	4847.6
111	DR-14	03.07.23 05:48	off the ground	01° 59,644' S	152° 55,310' E	4427.3
112	MB-20	03.07.23 07:23	station start	01° 59,645' S	152° 55,304' E	4425.2
113	DR-15	04.07.23 07:42	off the ground	02° 36,862' S	152° 36,462' E	2001.5
114	HF-19	04.07.23 11:43	failed/aborted	02° 46,203' S	152° 26,282' E	2142.0
115	MB-21	04.07.23 12:34	station start	02° 46,208' S	152° 26,306' E	2141.8
116	ROV-09	04.07.23 22:21	lowering	02° 51,728' S	152° 33,333' E	1804.6
117	HF-20	05.07.23 09:37	on ground	02° 50,950' S	152° 30,422' E	1936.6
118	HF-21	05.07.23 15:25	on ground	02° 57,230' S	152° 57,329' E	2283.6
119	OBS-01R	05.07.23 21:27	on deck	02° 54,205' S	152° 32,821' E	
120	OBMT-01R	05.07.23 22:48	on deck	02° 56,901' S	152° 33,111' E	1559.4
121	OBS-02R	06.07.23 00:24	on deck	02° 59,755' S	152° 27,305' E	1718.0
122	OBMT-02R	06.07.23 01:52	on deck	03° 03,096' S	152° 25,190' E	
123	OBS-03R	06.07.23 03:08	on deck	03° 05,671' S	152° 26,819' E	1485.5
124	OBS-04R	06.07.23 05:35	on deck	03° 07,774' S	152° 14,831' E	
125	OBS-05R	06.07.23 07:07	on deck	03° 09,936' S	152° 07,298' E	

126	OBS-06R	06.07.23 08:43	on deck	03° 16,449' S	152° 11,834' E	
127	OBS-07R	06.07.23 10:09	on deck	03° 15,627' S	152° 15,954' E	
128	OBMT-03R	06.07.23 12:12	on deck	03° 13,005' S	152° 24,125' E	1588.3
129	OBS-08R	06.07.23 12:53	on deck	03° 13,092' S	152° 24,920' E	
130	OBMT-04R	06.07.23 15:48	on deck	03° 12,098' S	152° 30,939' E	
131	OBS_09R	06.07.23 17:55	on deck	03° 16,351' S	152° 32,730' E	
132	OBS-10R	06.07.23 19:19	on deck	03° 19,771' S	152° 35,176' E	
133	OBMT-05R	06.07.23 21:26	on deck	03° 18,709' S	152° 36,534' E	
134	OBMT-06R	07.07.23 01:00	on deck	03° 17,946' S	152° 41,998' E	1732.4
135	OBS-11R	07.07.23 02:29	on deck	03° 17,127' S	152° 38,737' E	
136	OBMT-07R	07.07.23 05:21	on deck	03° 21,006' S	152° 40,476' E	1826.2
137	OBS-12R	07.07.23 07:09	on deck	03° 15,558' S	152° 46,518' E	1980.9
138	OBMT-08R	07.07.23 09:12	on deck	03° 22,032' S	152° 45,219' E	2138.1
139	OBS-13R	07.07.23 09:58	on deck	03° 22,680' S	152° 45,696' E	2190.5
140	OBMT-09R	07.07.23 13:25	on deck	03° 22,775' S	152° 38,327' E	1697.7
141	OBS-14R	07.07.23 14:22	on deck	03° 23,016' S	152° 37,554' E	1702.1
142	OBS-15R	07.07.23 16:57	on deck	03° 17,653' S	152° 30,054' E	1607.1
143	OBMT-10R	07.07.23 18:27	on deck	03° 18,277' S	152° 28,293' E	
144	OBMT-11R	07.07.23 20:12	on deck	03° 18,779' S	152° 22,823' E	1578.3
145	OBS-16R	07.07.23 21:05	on deck	03° 20,309' S	152° 23,042' E	
146	OBMT-12R	07.07.23 22:43	on deck	03° 21,524' S	152° 16,681' E	
147	OBMT-13R	08.07.23 00:48	on deck	03° 27,455' S	152° 24,233' E	
148	OBMT-14R	08.07.23 03:04	on deck	03° 33,435' S	152° 32,654' E	
149	OBS-17R	08.07.23 05:05	on deck	03° 31,435' S	152° 39,036' E	
150	OBMT-16R	08.07.23 05:52	on deck	03° 27,717' S	152° 38,288' E	
151	OBS-18R	08.07.23 08:16	on deck	03° 26,713' S	152° 32,031' E	
152	OBMT-17R	08.07.23 09:44	on deck	03° 24,153' S	152° 31,591' E	
153	GC-05	08.07.23 11:24	on ground	03° 20,644' S	152° 35,525' E	1653.6
154	MB-22	08.07.23 12:17	station start	03° 20,625' S	152° 35,511' E	1654.2
155	GC-06	08.07.23 13:53	on ground	03° 19,200' S	152° 35,398' E	1594.0
156	MB-23	08.07.23 14:35	station start	03° 19,187' S	152° 35,426' E	1567.5
157	ROV-10	08.07.23 22:09	lowering	03° 19,039' S	152° 38,838' E	1640.4
158	MB-24	09.07.23 10:32	station start	03° 16,584' S	152° 48,502' E	2145.3
159	TVG-13	09.07.23 22:35	on ground	03° 18,832' S	152° 39,135' E	1313.1
160	TVG-14	10.07.23 00:04	on ground	03° 18,874' S	152° 39,061' E	1374.9
161	TVG-15	10.07.23 02:29	on ground	03° 19,865' S	152° 36,674' E	1520.4
162	TVG-16	10.07.23 05:20	on ground	03° 19,589' S	152° 35,446' E	1610.8
163	GC-7	10.07.23 07:26	on ground	03° 18,966' S	152° 34,820' E	1478.6
164	DR-16	10.07.23 14:16	off the ground	02° 47,133' S	152° 29,210' E	1743.6
165	MB-25	10.07.23 15:26	station start	02° 47,139' S	152° 29,267' E	1763.1
166	ROV-11	10.07.23 22:17	lowering	02° 37,135' S	152° 36,359' E	2205.0
167	MB-26	11.07.23 05:43	station start	02° 35,507' S	152° 37,679' E	2166.7
168	DR-17	11.07.23 13:29	off the ground	02° 00,087' S	152° 46,941' E	5401.4
169	MB-27	11.07.23 16:00	station start	01° 59,243' S	152° 44,306' E	5315.4

SO299 - DYNAMET

Short Cruise Report

170	DR-18	13.07.23 02:49	off the ground	00° 04,592' N	149° 25,038' E	2060.7
171	MB-28	13.07.23 04:40	station start	00° 05,166' N	149° 17,844' E	4509.5
172	ROV-12	13.07.23 22:13	lowering	00° 38,558' N	149° 14,253' E	3711.4
173	MB-29	14.07.23 09:39	station start	00° 42,284' N	149° 17,354' E	2559.1
174	DR-19	14.07.23 14:29	off the ground	01° 02,211' N	149° 08,289' E	2769.5
175	MB-30	14.07.23 16:32	station start	01° 01,505' N	149° 00,125' E	5348.4
176	DR-20	15.07.23 05:29	off the ground	02° 07,342' N	149° 02,091' E	1299.7
177	MB-31	15.07.23 06:43	station start	02° 07,604' N	148° 59,118' E	3044.4