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Short Cruise Report

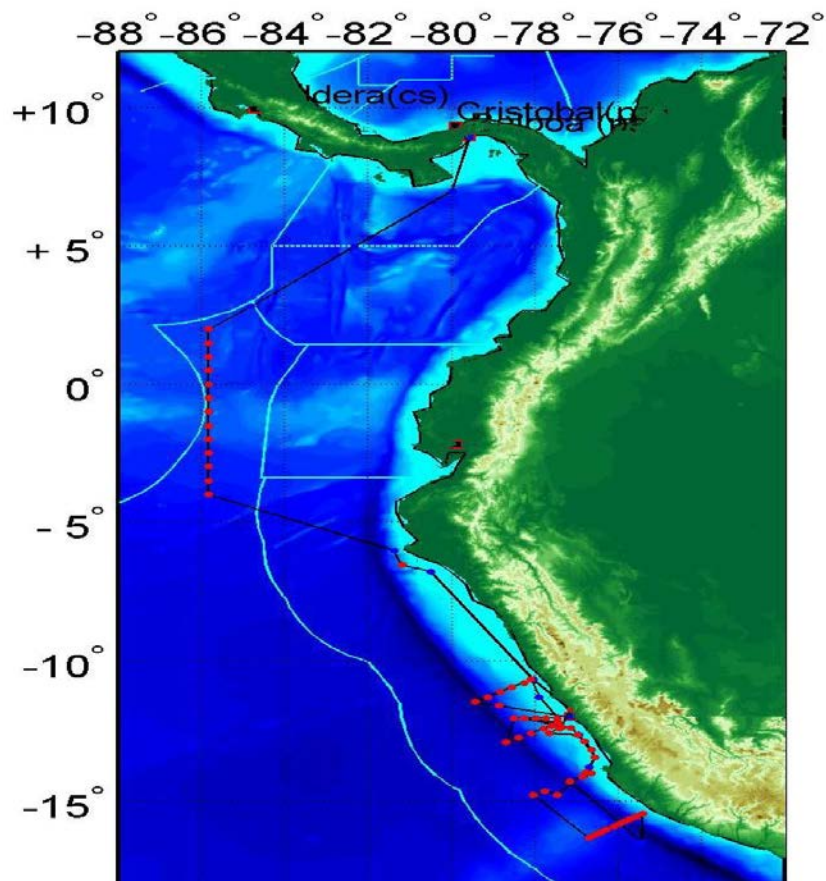
R/V METEOR M138

Callao, Peru – Bahia Las Minas, Panama

01 June 2017 – 04 July 2017

Chief Scientist: Prof. Dr. Hermann W. Bange

Captain: Rainer Hammacher



Cruise track of M138.

(Filled red circles indicate locations of sampling stations. Filled blue circles indicate waypoints without sampling; white lines indicate EEZs)

Objectives

The work performed during the cruise M138 covered the major aspects of organic matter cycling and their links to the nitrogen and carbon cycle processes in the water column off Peru. To this end the major objectives of M138 were:

- (i) to assess the particle distribution and organic matter in the OMZ off Peru,
- (ii) to quantify the particle/organic matter fluxes through the OMZ and to decipher the role of zooplankton therein,
- (iii) to investigate the role of particles/organic matter availability for N₂ fixation, N loss, N₂O formation, microbiological diversity and activity,
- (iv) to assess the role of anoxia on particle remineralisation rates and elemental stoichiometry and
- (v) to investigate the variability of the hydrodynamical forcing relevant for nutrient turnover.

The work in the OMZ off Peru was complemented by a CTD section from 4°S to 2°N along 85°50'W in order to investigate the eastward flowing Equatorial Undercurrent (EUC) which feeds the OMZ in the eastern tropical South Pacific Ocean (ETSP) with oxygen (O₂).

Narrative

The scientific team of M138 (29 scientists from GEOMAR Kiel, Univ. Kiel, MPI Bremen, SDU Odense, DK, and Princeton Univ., USA) embarked on Meteor on 31 May 2017.

Unfortunately, customs clearance of both the outgoing containers from M137 and the containers for M138 was delayed considerably. To this end, R/V Meteor left the port of Callao with a delay of about 10 hours on 01 June at 18:00h (LT). R/V Meteor headed northwest for a test station at 11°36'S 78°53'W on 2 June 14.00h (LT). This was followed by the Transect A towards the coast from 11°28'S 79°26'W to 10°40'S 78°5'W which consisted of four regular CTD/RO stations (#879 - #882) and two 24h stations (#883 and #884). At station #882 we deployed a first drifting sediment trap array (which was unfortunately caught by fishermen after two days. The buoy of the trap was brought to Ancon by the fishermen). Transect A was followed by a transit to the south along the coast. Transect B (i.e., the so-called IMARPE transect along 12°S from 77°28'W to 78°30'W) consisting of CTD/RO stations #885 - #888 was started on 08 June. At station #888 we also deployed a second drifting sediment trap array. Transect B was followed by a transit to Transect C. This transect (from 12°55'S 78°42'W to 12°13'S to 77°26'W) consisted of four regular CTD/RO stations (#889 - #891, #894) and two 24h stations (#892 and #897). At station #893 we recovered Glider IFM07. At station #895 and #896 we recovered Glider IFM09 and mooring KPO1180, respectively. From station #897 we went northwest to station #898 to recover the second drifting sediment trap array at 12°3'S 78°17'W on 13 June. The regular CTD/RO stations #899 to #903 formed Transect D on the shelf parallel to the coast south of Callao/Lima (14/15 June). This was followed by Transect E (#904 - #906, from 14°S 76°40'W to 14°17'S 77°10'W). Stations #904 and #906 were 24h stations. At station #906 we deployed a third drifting sediment trap array. From #906 we performed an ADCP transect to survey a mesoscale eddy structure (18/19 June). This was followed by the Transect F ('eddy transect', stations #907 - #916; from 15°26'S 75°26'W to 16°15'S 76°43'W). Stations #907 and #912 were 24h stations. This was followed by a transit to stations #917 and #918 which complement Transect E. At station #919 (on 23 June) we recovered the third drifting sediment trap array. The mooring KPO1183 was recovered at station #920 on 23 June). This was followed by a northward transit along coast. The moorings KPO1182 and KPO1183 were recovered at stations #921 (24 June) and #922 respectively (24 June). From station #922 we went to the Bay of Ancon to pick up the lost buoy of the first drifting sediment array. The last station off Peru was #923 (CTD calibration station) which was performed on 26 June during the northward transit to the Equator transect. Regular CTD/RO stations #924 - #936 formed the Equator transect from 4°S to

2°N along 85°50'W. The Equator transect was finished on 30 June and was followed by the transit to Balboa. We arrived in Balboa in the morning of 03 July. The passage through the Panama Canal started on 03 July at 20:00h (LT). We arrived in the Port of Bahia Las Minas in the morning of 04 July. The scientific team of M138 disembarked from Meteor on 05 July 2017 at 12:00h (LT).

Acknowledgements

M138 was funded by the German Science Foundation (DFG) via the Collaborative Research Center (*Sonderforschungsbereich*) 754 at Kiel University/GEOMAR, Kiel, Germany. We backnowledge the local fishermen of Ancon, Gino Passalacqua (UCSD, San Diego, USA), the German Embassy in Lima and the Meteor's ship agent for their invaluable help with the handover of the 'lost' sediment trap buoy in Ancon.

Moerover we thank Cpt. Rainer Hammaner and the crew of Meteor for their never ending support during M138 which made M138 such a success.

Last but not least, we thank the Peruvian authorities for their generous permission to work in their territorial waters.

List of participants

1	Arévalo-Martínez	Damian	Chem. Oceanogr.	GEOMAR
2	Bange	Hermann	CHIEF SCIENTIST	GEOMAR
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5	Cisternas-Novoa	Carolina	Biol. Oceanogrphy	GEOMAR
6	Eck	Lucas	Nutrients, O ₂	GEOMAR
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8	Fischer	Tim	CTD	GEOMAR
9	Frey	Claudia	Microbiology	Princeton Univ.
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14	Laursen	Erik	Microbiology	SDU
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18	Löscher	Carolin	Microbiology	SDU
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29	Xie	Ruifang	Chem. Oceanogr	GEOMAR

Institutes

GEOMAR – GEOMAR Helmholtz Institute for Ocean Research, Kiel, Germany MPI – Max Planck Institute for Marine Microbiology, Bremen, Germany
SDU – University of Southern Denmark, Odense, Denmark Univ. Kiel – University of Kiel, Kiel, Germany
Princeton Univ. – Princeton University, Princeton, NJ, USA

List of stations

Station	Date	Time UTC	PositionLat	PositionLon
ME1380/879	03.06.2017	04:24	11° 28.11' S	079° 26.33' W
ME1380/880	03.06.2017	19:51	11° 17.69' S	079° 08.54' W
ME1380/881	04.06.2017	03:46	11° 07.97' S	078° 51.47' W
ME1380/882	04.06.2017	09:25	10° 57.03' S	078° 33.59' W
ME1380/883	05.06.2017	15:30	10° 46.75' S	078° 16.24' W
ME1380/884	06.06.2017	15:31	10° 40.18' S	078° 05.39' W
ME1380/885	07.06.2017	13:25	12° 02.38' S	077° 27.61' W
ME1380/886	07.06.2017	19:02	12° 02.40' S	077° 45.01' W
ME1380/887	08.06.2017	01:05	12° 02.38' S	078° 00.00' W
ME1380/888	08.06.2017	08:07	12° 02.39' S	078° 29.99' W
ME1380/889	09.06.2017	02:01	12° 54.99' S	078° 41.97' W
ME1380/890	09.06.2017	08:06	12° 45.02' S	078° 24.23' W
ME1380/891	09.06.2017	12:32	12° 36.08' S	078° 06.49' W
ME1380/892	09.06.2017	18:52	12° 25.08' S	077° 48.74' W
ME1380/893	10.06.2017	16:14	12° 32.44' S	077° 53.90' W
ME1380/894	11.06.2017	05:23	12° 18.40' S	077° 37.27' W
ME1380/895	11.06.2017	13:29	12° 26.06' S	077° 24.78' W
ME1380/896	11.06.2017	15:46	12° 26.19' S	077° 25.18' W
ME1380/897	11.06.2017	18:20	12° 12.60' S	077° 26.40' W
ME1380/898	13.06.2017	02:06	12° 03.48' S	078° 16.40' W
ME1380/899	13.06.2017	23:58	12° 23.97' S	077° 09.03' W
ME1380/900	14.06.2017	04:06	12° 38.39' S	076° 58.19' W
ME1380/901	14.06.2017	08:11	12° 53.41' S	076° 49.17' W
ME1380/902	14.06.2017	13:11	13° 10.76' S	076° 38.46' W
ME1380/903	14.06.2017	21:24	13° 25.80' S	076° 33.60' W
ME1380/904	15.06.2017	02:38	14° 00.01' S	076° 39.60' W
ME1380/905	16.06.2017	06:14	14° 07.11' S	076° 52.17' W
ME1380/906	16.06.2017	11:05	14° 17.06' S	077° 10.03' W
ME1380/907	18.06.2017	14:18	15° 25.75' S	075° 26.03' W
ME1380/908	19.06.2017	16:22	15° 31.48' S	075° 35.87' W
ME1380/909	19.06.2017	21:28	15° 36.24' S	075° 43.15' W
ME1380/910	20.06.2017	00:33	15° 41.47' S	075° 51.22' W
ME1380/911	20.06.2017	05:11	15° 46.64' S	075° 59.12' W
ME1380/912	20.06.2017	09:02	15° 51.60' S	076° 06.60' W
ME1380/913	21.06.2017	10:32	15° 58.41' S	076° 17.10' W
ME1380/914	21.06.2017	14:30	16° 04.01' S	076° 25.65' W
ME1380/915	21.06.2017	19:27	16° 09.70' S	076° 34.36' W
ME1380/916	22.06.2017	04:02	16° 15.38' S	076° 42.85' W
ME1380/917	22.06.2017	21:16	14° 46.82' S	078° 02.53' W
ME1380/918	23.06.2017	00:01	14° 36.96' S	077° 45.76' W
ME1380/919	23.06.2017	03:00	14° 45.59' S	077° 28.98' W
ME1380/920	23.06.2017	20:33	13° 57.90' S	076° 48.03' W

ME1380/921	24.06.2017	11:14	12° 34.25' S	077° 39.59' W
ME1380/922	24.06.2017	15:40	12° 21.82' S	077° 21.79' W
ME1380/923	26.06.2017	18:53	06° 33.42' S	081° 11.45' W
ME1380/924	28.06.2017	03:26	03° 59.98' S	085° 49.84' W
ME1380/925	28.06.2017	09:26	03° 29.99' S	085° 50.04' W
ME1380/926	28.06.2017	13:04	02° 59.97' S	085° 50.01' W
ME1380/927	28.06.2017	16:52	02° 29.98' S	085° 49.99' W
ME1380/928	28.06.2017	20:46	01° 59.98' S	085° 50.00' W
ME1380/929	29.06.2017	00:17	01° 29.95' S	085° 50.05' W
ME1380/930	29.06.2017	03:54	00° 59.99' S	085° 50.01' W
ME1380/931	29.06.2017	08:02	00° 29.99' S	085° 50.00' W
ME1380/932	29.06.2017	11:47	00° 00.00' N	085° 50.00' W
ME1380/933	29.06.2017	15:25	00° 30.01' N	085° 50.09' W
ME1380/934	29.06.2017	19:18	01° 00.01' N	085° 49.99' W
ME1380/935	29.06.2017	23:14	01° 30.02' N	085° 49.98' W
ME1380/936	30.06.2017	03:13	02° 00.02' N	085° 49.98' W