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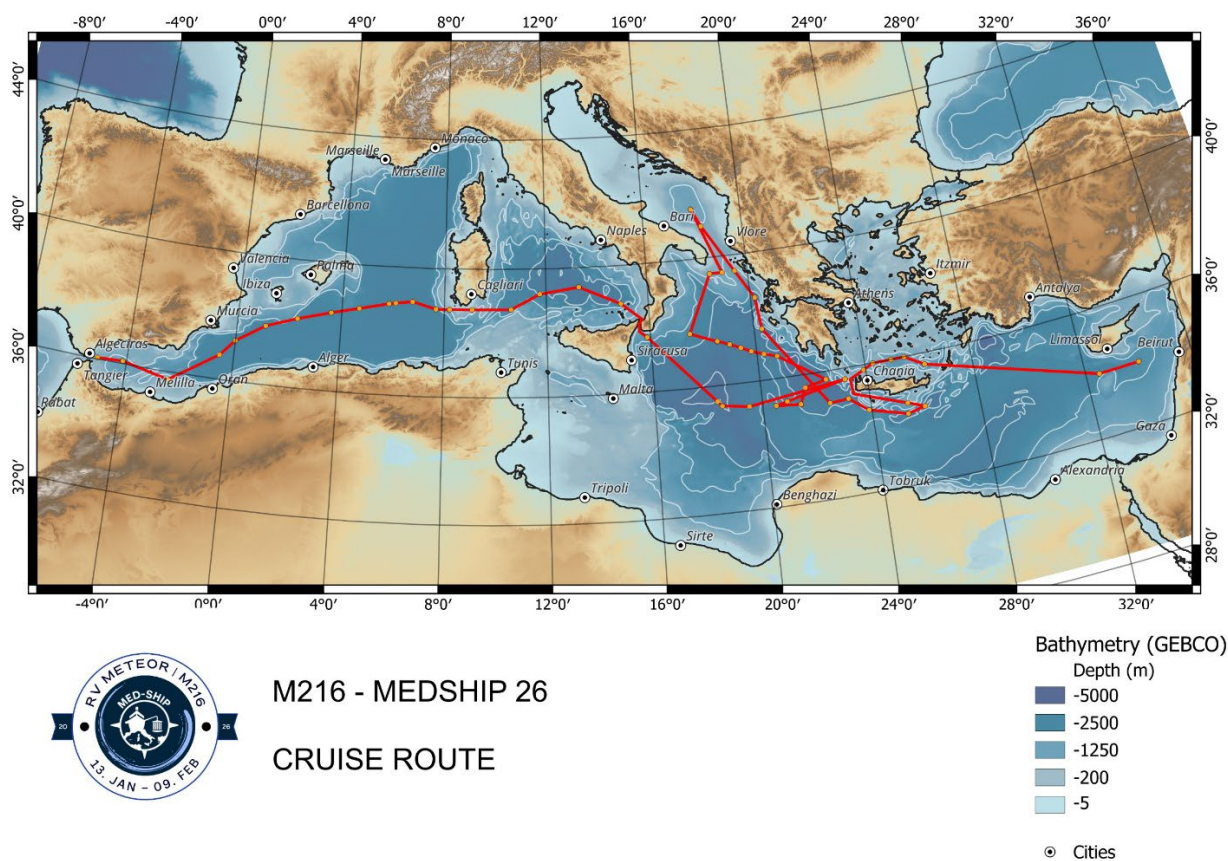
Short Cruise Report Meteor 216

Limassol – Las Palmas

January 13 – February 9, 2026

Chief Scientist: Toste Tanhua / Katrin Schroeder

Captain: Detlef Korte



Objectives

The objective of the M216 cruise was to repeat the zonal Med-SHIP01 line, 8 years after its last repeat (2018), and 15 years after its first implementation in 2011 in order to add knowledge on the scales and magnitudes of variability and trends in circulation, hydrography, biogeochemistry and biology of the Mediterranean Sea. This line is part of the global ocean observing network GO-SHIP, i.e. the repeat hydrography program of the Global Ocean Observing System (GOOS).

The primary goals of the cruise were: 1) Obtain comprehensive data to establish a nearly synoptic view of property distributions throughout the entire Mediterranean Sea, encompassing all major sub-basins. 2) Utilize the collected physical and chemical data to analyse changes in circulation and ventilation patterns, as well as to assess variations in the inventory and distribution of properties, with a specific focus on inorganic carbon and the uptake of anthropogenic carbon. 3) Address knowledge gaps in the understanding of the carbonate system in the Mediterranean Sea, including its sub-basins. This involves generating more accurate estimates of anthropogenic carbon and quantifying the rate of carbon storage and acidification levels. 4) Incorporate the measurement of new EOVs that are not routinely observed in the Mediterranean Sea, bringing new insights. 5) Provide a first basin-wide estimate of biological observations according to Bio-GO-SHIP.

The scientific work program of M216 was designed to follow the quasi-zonal GO-SHIP MED-01 reference section from the Levantine Basin to the western Mediterranean, covering all major sub-basins. The cruise combined full-depth hydrographic stations, tracer sampling, biological observations, and selected super-stations with extended sampling and sensor intercomparison.

The operational plan included:

- Full-depth CTD/Rosette stations along the MED-01 section
- Tracer-stations and Super-stations with repeated casts and high-volume sampling for tracers
- Mini-CTD casts during sampling to test additional BGC sensors
- Deployment of Argo floats and drifters at selected stations
- Continuous surface measurements (TSG)
- LADCP velocity profiles at all stations
- Underway vessel mounted ADCP data

Narrative

The scientific crew arrived at Limassol well in time for the cruise and preparatory work began on 11–12 January 2026 in Limassol where the instrumentation, such as the CTD and lab equipment for the labs were set-up before leaving port. METEOR left port at noon on January 13 heading to a station SE of the port, for the first CTD. On the day of departure, January 13, 2026, there was a strong low northeast of Cyprus, while at the same time a high was located over Libya. Despite relatively rough conditions, the first station was successfully completed, and we were happy to have a station in the eastern Levantine Basin. The cruise now started the general westward direction. Already the second station was a so-called “super-station”, which implies a CTD cast, followed by a cast by a smaller CTD that tests different BGC sensors, and followed by a second CTD cast to allow for the larger water volumes needed for some of the tracer analysis that the team is conducted.

Research work on January 16, 2026, north of Crete was characterized by weak winds, and we were able to conduct several stations along a short section. From here we proceeded to the Cretan Passage, and on January 17, 2026, the region around Crete was experiencing northerly winds. However, from

January 19, 2026, onwards, a significant weather situation developed and a secondary low, named “Harry,” became a severe low near Tunisia and formed a long trough of low pressure southeastward. This resulted in prolonged, gale-force southeasterly winds in the Ionian Sea resulting in waves of 14 meters recorded off Malta. In fact, southern Italy was badly affected by this storm, with significant damage to infrastructure. Luckily for METEOR, we had several routing options in the Ionian Sea, and chose to start with the section northward towards the Adriatic Sea, well protected from the worst of the storm. The cruise thus continued northwards on January 19, 2026, along the Strait of Kythira with individual research stops in the sea area south of Crete. Two research stations had to be cancelled on the evening of January 19, 2026, due to weather conditions, as wind speeds of up to 9 Beaufort and waves of around 4.5 meters prevailed, particularly in the Strait of Kythira and near the Peloponnese. The journey northward along the Greek mainland on January 20, 2026, continued to be affected by jet effects from the Greek mountains with wind from the east between 4 and 8 Beaufort, but comparatively low waves between 3 and 4 meters due to the proximity to the mainland. On the journey towards the Adriatic Sea, a research station near the Strait of Otranto was postponed to a later date due the weather conditions. On January 21, we reached our northernmost station in the Adriatic Sea, where we conducted a super-station in the deepest part, close to a long-term mooring array. By now, storm Harry had started to weaken, so that we could enjoy mostly stable conditions, and on January 24 we were able to conduct one of the stations we had to skip about a week before. On January 26, 2026, a medical emergency occurred on board, prompting the research vessel METEOR to sail quickly toward Chania (Crete). Leaving Chania, the wind increased to 6 Beaufort with waves between 2 and 2.5 meters while METEOR returned to the Ionian Sea to resume the scientific program, where the “super-station”, CTD30, that was completed on the evening of January 28, 2026. At this station we also released two drifters that will follow the currents and gyres over the next months or even years.

Due to the delay accumulated in the previous days, all planned stations in the Sicily Channel had to be skipped, and the ship steamed directly towards the Tyrrhenian Sea, crossing the narrow and dynamically complex Strait of Messina. The increased speed of the research vessel METEOR also made it possible to pass through the Strait of Messina in the last light of day on January 29, 2026 and with suitable tidal currents.

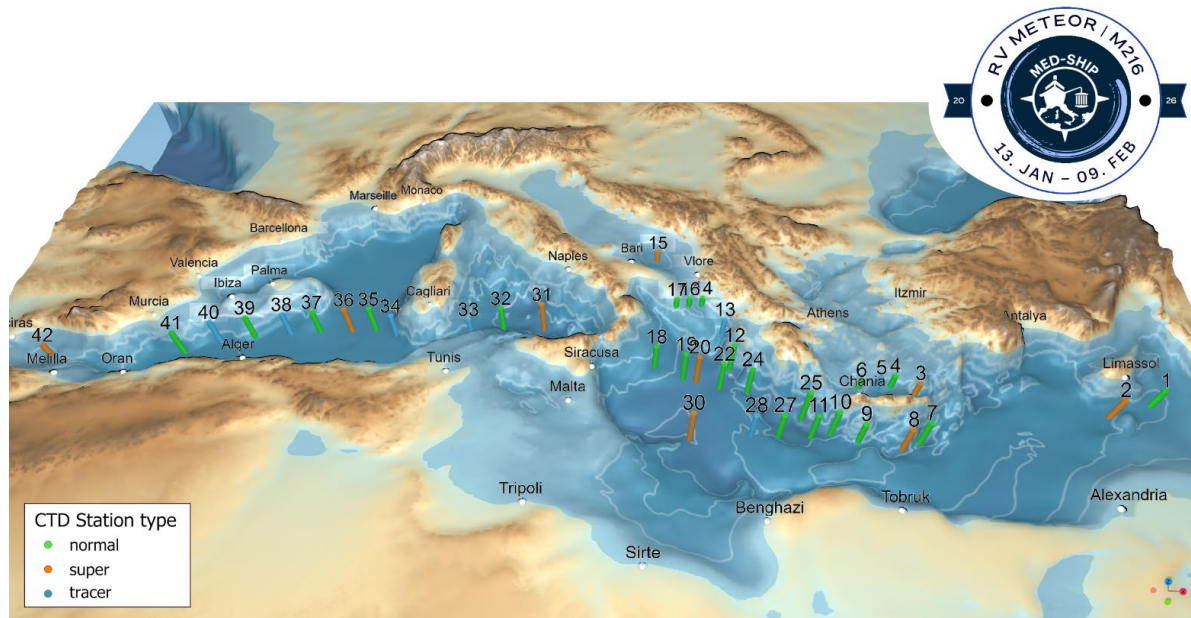
In the Tyrrhenian Sea, the weather calmed down on January 30, 2026. A weak low near Genoa caused westerly winds of around 4 Beaufort. The “super-station” CTD31, the first station in the Tyrrhenian Sea and, also, the first station of the Western Mediterranean during this cruise was completed in the afternoon on January 30, 2026. A second station was completed by the evening, followed by two more stations on January 31, 2026, when a new low formed east of the Pyrenees and moved towards Sicily, intensifying over Sardinia. During the night to February 1, 2026, when the research vessel METEOR was southwest of Sardinia, the wind temporarily increased to 9 Beaufort and the waves reached 4.5 meters, it was therefore decided to skip one station at the center of the Sardinia Channel, between Sardinia and Tunisia, and to move further west.

As the cruise continued westward toward Gibraltar, the research vessel METEOR was increasingly affected by an extensive deep low over the North Atlantic. This low was almost stationary far west of the Bay of Biscay. At noon on February 2, 2026, the first trough reached the research vessel METEOR, the wind increased to 7 Beaufort, and the waves increased to up to 3 meters during the following night. The vessel continued operations in the western Mediterranean, successfully completing a substantial number of planned hydrographic stations, including standard CTD stations, tracer stations, and super-stations.

However, persistent high waves and strong winds in the Alboran Sea imposed significant operational constraints. As a result, the route of the research vessel METEOR was changed and the voyage continued through the southern Alboran Sea towards Gibraltar, which meant that a number of research stations had to be omitted. The adverse sea state also slowed down station work and transit times considerably. In the Alboran Sea, the last three Argo Floats (one BGC and 2 standard ones) were deployed. The last scientific station of the cruise, a super-station (CTD42), was completed in the afternoon on February 5, 2026, a few nautical miles east of the Strait of Gibraltar. On the way west

towards the Strait of Gibraltar, the cruise was slowed down considerably at times by a sea current of around 3 knots from the west.

During the transit to Las Palmas, the weather calmed down significantly, and only a secondary low caused temporarily higher wind speeds of around 7 Beaufort from the southwest on February 7, 2026. The scientific crew used the transit time to clean up all laboratories, prepare the containers and the pallets to be disembarked upon arrival. On the morning of February 9, 2026, the research vessel METEOR entered the port of Las Palmas in fair weather.



Acknowledgements

We sincerely thank the crew and the captain for their excellent and professional work, and for the constructive and pleasant working conditions. This made the work possible also during sometimes challenging weather conditions. We also thank the Leitstelle Deutsche Forschungsschiffe and Briesse Research for their critical support, also during the medical evacuation process. We also acknowledge the Gutachterpanel Forschungsschiffe (GPF) for their evaluation and the assistance provided by the GPF Geschäftsstelle.

List of participants

No	Name	Discipline	Institution
1	Tanhua, Toste, Dr.	Chief Scientist	GEOMAR
2	Schroeder, Katrin, Dr.	Co-Chief Scientist	CNR/ISMAR
3	Acerbi, Rubén	Chemical Oceanography	IEO/CSIC
4	Álvarez, Marta, Dr.	Chemical Oceanography	IEO/CSIC
5	De Marco, Rocco, Dr.	Physical Oceanography	CNR/IRBIM
6	Cardin, Vanessa, Dr.	Physical Oceanography	OGS
7	Carloni, Marco	Chemical Oceanography	CNR/IBF
8	Clauwers, Christian	Photographer	
9	Dall'Olmo, Giorgio, Dr.	Chemical Oceanography	OGS
10	Dentico, Carlotta	Chemical Oceanography	OGS
11	Douss, Nessim, Dr.	Chemical Oceanography	OGS
12	Falcieri, Francesco, Dr.	Physical Oceanography	CNR/ISMAR
13	Gassol I Moreno, Guillem	Chemical Oceanography	IEO/CSIC
14	Guerrazzi, Mirco	Chemical Oceanography	CNR/IBF
15	Hanker, Simon	Chemical Oceanography	GEOMAR
16	Leist, Lisa	Chemical Oceanography	ETHZ
17	Leuzinger, Arne	Chemical Oceanography	UH
18	Retelletti Brogi, Simona, Dr.	Physical Oceanography	OGS
19	Savonitto, Gilda, Dr.	Chemical Oceanography	OGS
20	Schroeder, Anna, Dr.	Biological Oceanography	CNR/ISMAR
21	Scott, Stanley	Tracer Oceanography	UH
22	Tommasi, Azzurra	Biological Oceanography	UniTS
23	Tropea, Claudia	Chemical Oceanography	CNR/IBF
24	Wagener, Thibaut, Dr.	Chemical Oceanography	MIO/CNRS/AMU/IRD
25	Beckebanze, Lutz, Dr.	Meteorology	DWD
26	Rohleder, Christian	Meteorology	DWD

GEOMAR	GEOMAR Helmholtz Centre for Ocean Research Kiel
CNR/ISMAR	National Research Council of Italy, Institute of Marine Sciences
CNR/IRBIM	National Research Council of Italy, Institute for Marine Biological Resources and Biotechnology
CNR/IBF	National Research Council of Italy, Institute of Biophysics
ETHZ	ETH Zurich, Laboratory of Ion Beam Physics
IEO/CSIC	The Spanish Institute of Oceanography, The Spanish National Research Council
UniTS	University of Trieste
UH	University of Heidelberg, Institute of Environmental Physics
OGS	The National Institute of Oceanography and Applied Geophysics
MIO/CNRS/AMU/IR	Mediterranean Institute of Oceanography, CNRS, Aix-Marseille University,
DLOV/CNRS/SU	IRD, Villefranche Oceanographic Laboratory, CNRS, Sorbonne University
DWD	Germany's National Meteorological Service

List of Stations

Station	Latitude	Longitude	Depth (m)
M216_1	33° 59,996' N	034° 00,812' E	2126
M216_2	33° 59,997' N	032° 30,001' E	2624
M216_3	35° 39,011' N	026° 13,215' E	2298
M216_4	36° 00,002' N	025° 29,993' E	1551
M216_5	35° 59,998' N	025° 00,028' E	1524
M216_6	36° 00,005' N	024° 18,002' E	970
M216_7	34° 22,207' N	025° 57,560' E	4194
M216_8	34° 14,399' N	025° 17,994' E	3773
M216_9	34° 34,839' N	023° 53,944' E	2766
M216_10	35° 02,393' N	023° 11,999' E	3190
M216_11	35° 00,075' N	022° 29,794' E	3344
M216_12	37° 35,974' N	020° 18,004' E	3294
M216_13	38° 35,999' N	020° 10,025' E	2611
M216_14	39° 30,010' N	019° 29,985' E	1257
M216_15	41° 32,992' N	018° 00,010' E	1191
M216_16	39° 29,982' N	019° 00,004' E	894
M216_17	39° 29,990' N	018° 29,995' E	777
M216_18	37° 42,023' N	017° 31,031' E	2903
M216_19	37° 22,992' N	018° 31,976' E	3293
M216_20	37° 14,997' N	019° 00,000' E	3278
M216_21	37° 06,116' N	019° 24,683' E	3459
M216_22	36° 57,012' N	019° 48,003' E	3473
M216_23	36° 49,021' N	020° 16,012' E	2995
M216_24	36° 42,007' N	020° 45,006' E	3157
M216_25	35° 45,024' N	022° 28,019' E	4556
M216_26	35° 35,768' N	021° 39,430' E	3643
M216_27	35° 06,003' N	021° 25,018' E	5954
M216_28	35° 10,022' N	020° 30,007' E	2944
M216_29	35° 15,004' N	019° 30,015' E	3155
M216_30	35° 21,972' N	018° 30,312' E	3953
M216_31	39° 23,993' N	013° 18,017' E	2477
M216_32	39° 13,179' N	011° 45,018' E	3246
M216_33	38° 45,002' N	010° 36,554' E	2477
M216_34	38° 44,410' N	007° 40,267' E	2844
M216_35	38° 56,976' N	006° 44,988' E	2846
M216_36	38° 51,011' N	005° 49,802' E	2845
M216_37	38° 38,989' N	004° 40,189' E	2650
M216_38	38° 26,995' N	003° 35,419' E	2616
M216_39	38° 10,211' N	002° 18,025' E	2741
M216_40	37° 50,458' N	001° 06,125' E	2639
M216_41	37° 16,248' N	000° 00,025' W	2717
M216_42	36° 05,395' N	004° 08,572' W	1332