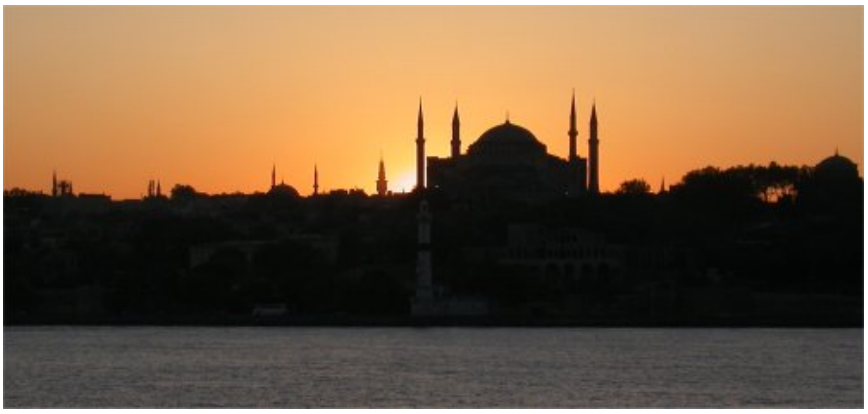
Meteor cruise M 72/5
First Weekly Report, period 14th – 21st May

On the 14th of May the German research vessel Meteor set out from Istanbul to the final cruise leg of Expedition M 72 in the Black Sea. Leg 5 is dedicated to investigations of microbiological, biogeochemical and paleo-climatological processes in the stratified water column and in the sediments. The scientific team is composed of 12 working groups from various institutions including the Max Planck Institute for Marine Microbiology in Bremen, Institute for Baltic Research in Rostock, University of Munich, BGR Hannover, RCOM Bremen, ICBM-Oldenburg, Geoforschungszentrum Potsdam, University of California, Riverside, Institute of Biology of the Southern Seas (IBSS), Sevastopol, GeoEcoMar Bucharest and TPAO, Ankara.

In the morning of the 14th, RV Meteor first headed a few miles into the Marmara Sea in order to calibrate the Multibeam echosounders that had been maintananced in the harbor. The test was successful and so we started our cruise by entering the Bosporus in the evening and passing Istanbul during sunset which presented to us a fabulous golden illuminated silhouette of the city. After the Bosporus passage we entered the Black Sea in the middle of the night and reached our first station in the next morning.

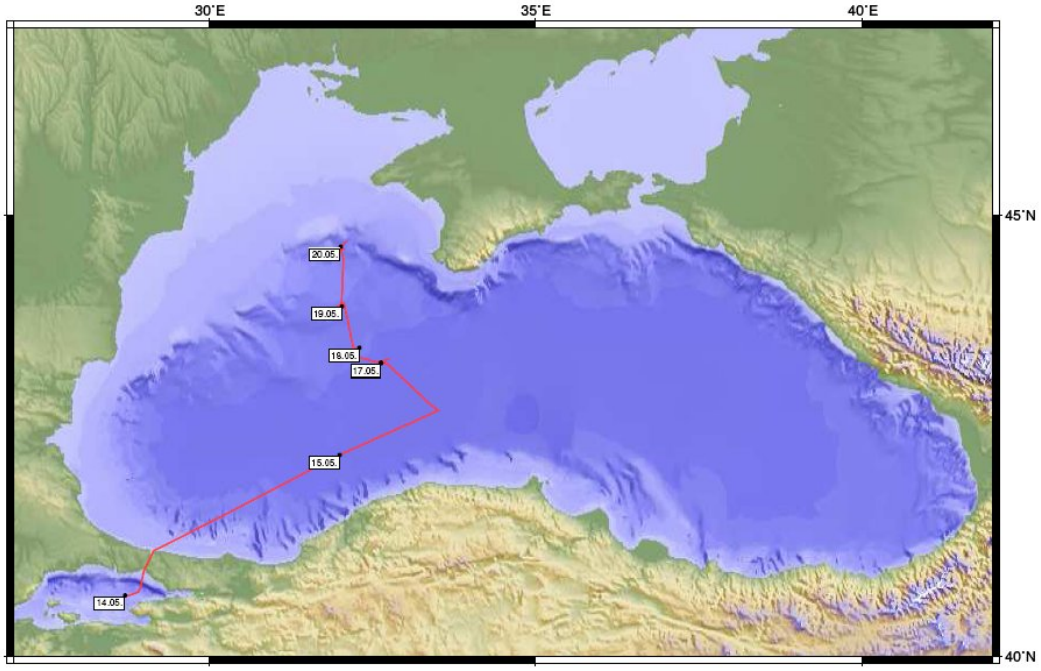


Istanbul in the sunset of 14. May 2007

A tight program of extensive water sampling, sediment coring and occasional Parasound profiling began, interrupted only by short transits between working areas. In the following three weeks, the cruise will lead us from southern central Black-Sea waters northwards into the Ukrainian sector west of Crimea, then to the eastern side of Crimea, and finally into Turkish waters between roughly 34° and 38°E.

One of the main objectives for the water-column work in this Meteor cruise is to investigate the effect of the Mediterranean waters entering the Black Sea by overflowing via the Bosporus strait. Due to the high salinity, these warm oxic Mediterranean waters sink into the anoxic layer of the water column where high concentrations of reduced compounds occur (e.g. sulphide, manganese, iron and ammonium). This intrusion into the generally well stratified water column of the Black Sea and thereby might stimulate microbial processes which usually do not occur in

the same layer elsewhere in the basin. As a result, a shift in the microbial community therefore is likely to occur.



M72/5 cruise track during week 1

The Bosporus overflow water is carried eastward with the circum-basin rim current. To track the effect of this water, we sampled the water column along a transect from east of the Bosporus strait into the central Black Sea. We use a pump-CTD system, with which we recover water in high resolution depth profiles from and around the oxic/anoxic interface which is also referred to as chemocline. Using the CTD sensors we precisely define layers from which we pump a continuous water flow that is analyzed on board in almost realtime with an autoanalzer and several electrochemical microsensors such as for oxygen and hydrogen sulfide. We started working on the central Black Sea portion of this transect between at 32°E and 34°E and obtained some promising preliminary results. As far as 33° E, we detected a clear second oxygen maximum that is probably related to the saline Mediterranean waters. However, towards the eastern edge of western basin at 33.5° E, this second oxygen maximum was less pronounced. Unexpectedly, oxygen and hydrogen sulphide showed overlapping profiles across the chemocline at 33°E, but not further

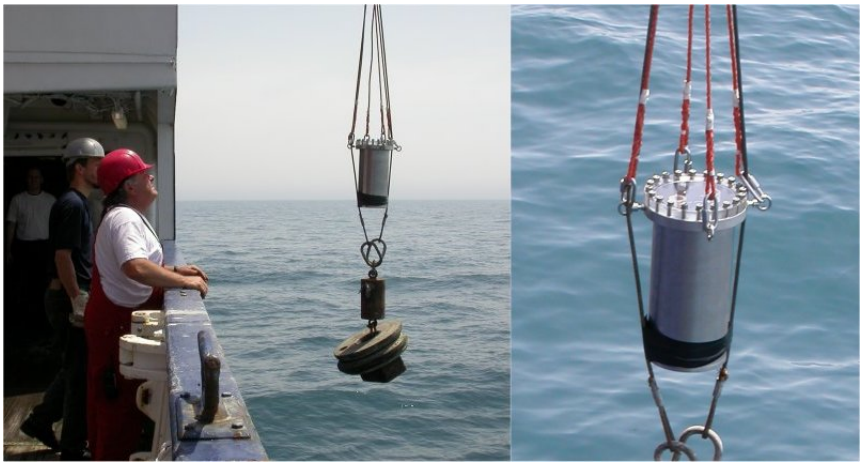
Deployment of the pump CTD. The cable is combined with a 300 m long hose through which the water is pumped on board.

west. We will complete this work by sampling the western part of this transect before we leave the Black Sea at the end of the cruise.

After this promising start, we moved to our second working area that stretches from the western central Black Sea basin up to the shelf in the paleo Dnepr area west of the Crimea Peninsula. Beginning in the central basin, we worked our way up the slope into the oxic zone by gravity and multi-coring, water sampling by CTDs and pump casts and by enriching microorganisms and particulate material from specific water depths around the chemocline with in situ pumps. Microbiological investigations in the water column revealed high morphological diversity below the chemocline.

The depth of the chemocline increases from the central Black Sea to its periphery, and we could observe along-going changes in the microbial activity. For example, one focus of the cruise lies on the investigation of photoautrophic bacteria that are known to persist in the chemocline. This population probably represents the most low-light-adapted phototrophic community worldwide. The in-situ light intensities in the chemocline environment are very low and the occurrence of anaerobic photoautotrophic bacteria is therefore limited to central Black Sea areas where the chemocline is shallow enough to obtain sufficient sunlight energy.

Measurements of the light quantum flux available to these microorganisms are thus far very scarce; only measurements at two stations in the western Black Sea measured at a single date in December 2001 are available. We now performed a series of measurements with an integrating type of quantum meter in order to obtain a better insight into the horizontal variations of the underwater light field of the oxic/anoxic transition zone. A LI-190SZ quantum sensor connected to a LI-1400 data logger was used which permits a highly sensitive detection of very low light intensities (detection limit (3.9 ± 2.3) 10^{-4} mol quanta m^{-2} s^{-1}). Using this setup, light could be detected down to a depth of 140 m, reaching well into the sulphidic zone. Pronounced horizontal changes of the underwater light field were found: near the center of the western basin, the light intensities reaching the anoxic water layers were found to be two orders of magnitude higher than the intensities determined towards the shelf areas.



Deployment of the Luminometer.

Calm weather and air temperatures that are slowly but continuously rising since we entered the Black Sea support the success of our work. All sampling equipment and instruments are working fine and the progress of our program corresponds very well to our plans. The cooperation between ship's crew and scientists is excellent and we are all in a very good mood and are looking forward to two more weeks of successful work.

We are in good health and send our best wishes.
Christian Borowski and the M 72/5 shipboard party.
21. May 2007