SEMSEEP – South East Mediterranean Seep Carbonates

Project Acronym & Title: SEMSEEP – Seafloor methane seeps, carbonate buildups and deep-sea corals in an oligotrophic marginal sea – the case of the southeast Mediterranean Eratosthenes Seamount and offshore Israel

Area: Levantine Basin, Palmahim Disturbance, offshore Israel

Research Vessel: RV AEGAEO, Hellenic Centre for Marine Research, Greece

Project coordinator: Andres Rüggeberg, University of Fribourg, Switzerland

Chief scientist: Yizhaq Makovsky, University of Haifa, Israel

Other project partners: Ben Gurion University, Israel; Hellenic Centre of Marine Research, Athens/Heraklion, Greece; Hebrew University, Jerusalem, Israel; Geological Survey of Israel, Jerusalem, Israel; Goethe-University, Frankfurt, Germany; Israel Oceanographic and Limnological Research, Haifa, Israel; University of Milan-Bicocca, Milan, Italy
Date: 19.09.–01.10.2016

RV AEGAEO at harbor of Ashdod (© A. Rüggeberg)

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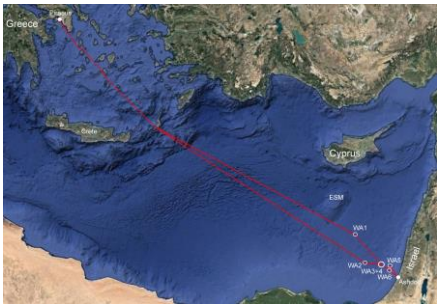

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Dr. Yizhaq Makovsky
Chief scientist of the SEMSEEP cruise

Dr. Yizhaq Makovsky, University of Haifa, Israel

All in all we feel that in spite the wealth of permit limitations, and weather and technical issues, the SEMSEEP cruise was a success. We achieved a first of its kind surface water oceanographic traverse between Greece and Israel. Nine successful ROV dives in Israeli waters totaling >30 hours of video data, unique samples of carbonate crusts, and related fauna, twelve box-core sediment samples and eleven full water depth CTD and water sampling casts were performed. Most importantly, SEMSEEP cruise was marked by the combined operation of the ROV and directed onboard sampling techniques, and by the relatively large scope of sampling procedures utilized in conjunction onboard. The scope of activities was exceptional for a medium-sized vessel such as RV AEGAEO. We thank HCMR and the captain and crew for their willingness and flexibility, which compensated on the various issues encountered, as well as the scientific team, particularly the students, for their around the clock dedication.

Main objectives

The EUROFLEETS2 SEMSEEP Cruise aimed to exploit the environmental differences between the active and inactive seep areas at the Eratosthenes Seamount and the Palmahim Disturbance offshore Israel, constraining the controls and impacts of both systems now and in the recent past. Unfortunately, we had to focus only on the Palmahim disturbance at the Israeli continental margin as we were not granted any permit to work in the Eratosthenes Seamount area.

Our research focused therefore on the study of (i) the setting and environmental impact of gas seepages, and particularly their relation to the possible current and past presence of methane hydrates, (ii) the particular environmental conditions allowing the growth of deep-sea corals, and (iii) the relations between the two phenomena in the context of recent global and local environmental changes. For this purpose the SEMSEEP cruise carried out methodical comparative sampling of sediments, carbonate crusts and associated fauna at active seep systems, areas with authigenic carbonate crusts witnessing past seepage, which are occasionally inhabited by some specimens of deep-water corals (DWC), e.g. antipatharians, gorgonians and solitary scleractinians. We concentrated our research on a transect from the deeper Pelagic Basin within the EEZ of Israel to the shallower areas at the Palmahim disturbance at the Israeli continental margin.
Four overarching objectives have been identified: (1) **Habitat mapping and discrete sampling of seep-related features, carbonate mounds and DWC sites at Eratosthenes Seamount and Palmahim Disturbance**, (2) **Determination of the physical and chemical environment at active seeps and inactive, deep-water coral sites**, (3) **Geochemical characterization of carbonate crusts, mounds, sediments and waters**, (4) **Characterization of seep and deep-water coral-related (micro- and macro-) fauna**. For these objectives sampling was mainly based on the use of the ROV Max Rover and its equipment (manipulator, push cores, water sampler, sample boxes, CTD), of the CTD with water sampler for recording important environmental parameters and of the box corer for collecting surface sediments of the active and inactive seep areas.

Work progress and main achievements

EUROFLEETS2 Expedition SEMSEEP with R/V AEGAEO and ROV Max Rover is an important component of a multi-disciplinary investigation of the recently discovered but until now poorly investigated or sampled seafloor gas seeps, associated carbonate structures and deep-sea corals at the Palmahim Disturbance at the Mediterranean continental slope of Israel. The recent discovery of proximate seafloor methane seeps and deep-sea corals in the southeastern Mediterranean Sea provided an exceptional opportunity to investigate their underlying environmental mechanisms.
The observations combined active seeps with no coral growth and now inactive sites with evidence of past seepage inhabiting a thriving community of corals and associated fauna. The distance between the two sites at the Palmahim Disturbance is only ~20 km and they presumably experience the same oceanographic conditions, but the authigenic carbonates are aragonitic in the area of active seepage and calcitic-dolomitic in the area of past seepage but with corals.
The SEMSEEP cruise provides new indications for additional presence of these phenomena and carried out detailed controlled sampling of geologic, biologic and sediment samples through the operation of ROV Max Rover and targeted box corer and CTD sampling. Ten ROV dives at five different working areas resulted into a total of 33h39m video data across 50 km dive transects. Additionally to the collected carbonate crust, push cores and water samples and hydrographic data by the ROV, twelve box corer and eleven CTD stations complete the station work at the active and inactive seep sites at the Palmahim disturbance and at deeper channel sites.
The huge set of samples collected will be processed in the home labs for a variety of geochemical analyses on pore waters and sea waters, identification of internal sediment structures and composition using computer tomography and core logging on the box corer cores, micro and macro fauna investigation on and in the sediments, biogeochemical characterization of bottom and surface waters, and many more.

Carbonate crusts and living fauna indicating active seepage at Palmahim pock mark area (copyright Y. Makovsky).

Carbonate crusts and living corals indicating non-active seepage at Palmahim coral area (copyright Y. Makovsky).

Pore water sampling from sediment cores taken with the box corer at active seep sites and deep-water coral sites (copyright A. Foubert)

For more information: *http://blog.unifr.ch/carbonatelab/*