About the Black Sea expedition in 2009

Относно експедицията в Черно море през 2009 г.

Daniel Cohen[1], Krasimira Slavova[2], Petko Dimitrov[2], Veselin Peychev[2], Dimitar Dimitrov[2], Atanas Vasilev[2], Preslav Peev[2]
Даниел Коен[1], Красимира Славова[2], Петко Димитров[2], Веселин Пейчев[2], Димитър Димитров[2], Атанас Василев[2], Преслав Пеев[2]

[1] Columbia University, Department of Earth and Environmental Science, USA; E-mail: dmc2138@columbia.edu
[2] Institute of Oceanology-BAS, Department of Marine Geology and Archaelogy, Varna, P.O.Box 152;
E-mail: margeo@io-bas.bg

Key words: Black Sea, submerged coastline, Optically Stimulated Luminescence dating.

Introduction

On an expedition of the R/V Akademik, operated by the Institute of Oceanology, we had the opportunity to map and core the submerged shoreline and to test Optically Stimulated Luminescence dating on the submerged shorelines of the Black Sea off the coast of Bulgaria. We embarked on the R/V Akademik in Varna, Bulgaria on June 15-th. There were approximately 30 people on board including the crew and scientific party. The majority of the scientific party came from the Institute of Oceanology with exception of William Ryan, Daniel Cohen, and Kevin McLain, all representatives of the Lamont Doherty Earth Observatory.

Coring

Totally 22 cores were recovered during the cruise of the R/V Akademik (Fig.1). Initially cores were taken in deep water away from the submerged shoreline to sample cores for pollen and to test the coring devices. After a few cores we began to core into the submerged shorelines. In order to sample the coastal dunes we would have to core them. On board of the R/V Akademik we had two different gravity cores and a vibracorer. At first we used a 12 cm coring device. It had a 100 kg head on the end of a 4 meter metal tube 12 cm in diameter. At the bottom end of the corer there was a core catcher, a device that kept the recovered sediment in the corer while it was traveling from the sea floor to the surface. In order to core into the shoreline we used the vibracorer. During the expedition only core 27 was taken with a vibratory.

Sampling

Once recovered, the cores were taken to the wet lab mid ship. In the wet lab there was a table and sink that could accommodate 1 to 2 m sections of core for observation. The cores were cut into approximately 1 meter sections on the fantail immediately after recovery and brought to the wet lab. The sections were then cut, open and observed. Nearly all the cores were sampled every 10 cm for pollen. We would sample for mollusks using sieves, and when deemed appropriate, we would sample for Optically Stimulated Luminescence dating.

Mapping

We used Klein System 3000 with 100 kHz and 500 kHz frequencies. The device was 120 cm in length and it was towed about 200 m behind the ship. An operator used a hydraulic winch to keep the device about 20 m above the seafloor; at this height above the seafloor the system had the greatest resolution. The device had only high resolution out to 100 m on either side of the device. The device was towed at 3.5 to 4.5 knots and the survey was conducted in parallel lines 200 m apart, to provide a complete view of the survey area. The raw sonar data was then delivered to the sonar lab that was directly off the fantail. There was a computer using Sonarpro 11.0 rendered the raw sonar data so it could be viewed as a rendered mosaic immediately after collection. The maps showed clearly submerged coastal dunes oblique to the shore face. These dunes and shorelines were created by a Black Sea drawdown that brought the water level down to -90 to -95 m below the current sea level. The dunes we mapped were the dunes that we wanted to date using Optically Stimulated Luminescence. Dating the last time the submerged shorelines were exposed to light would tell us when the shorelines were submerged.

Conclusions

Despite there being no dates a few conclusions can be drawn from our expedition: *1)* Gravity cores were not

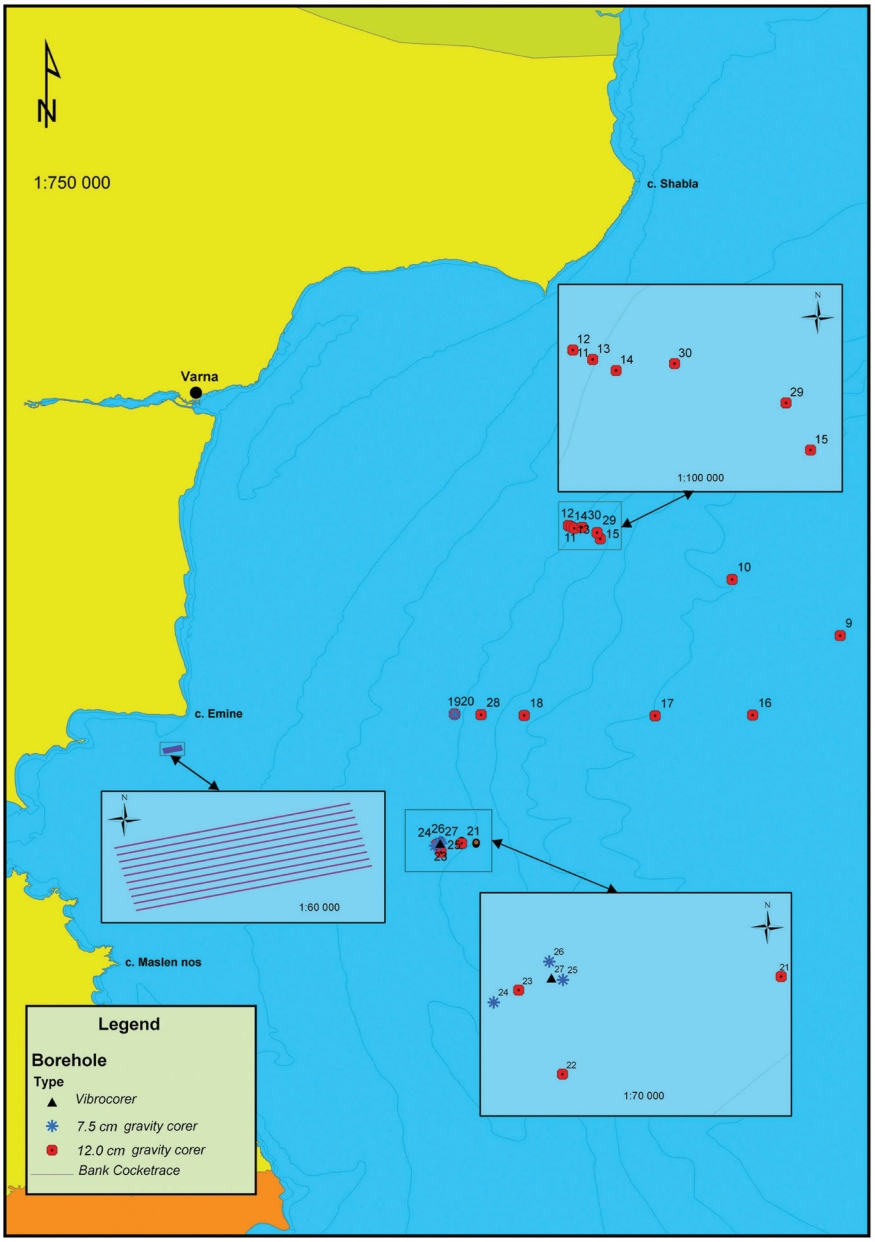

Fig. 1. 22 cores were recovered during the expedition of the R/V Akademik in 2009

capable of penetrating into the submerged coastline of the Black Sea. The sun hardened the submerged coastline when it was exposed. Now that it is submerged the transition between the marine mud drape and the submerged shoreline is difficult for gravity cores to core into. *2)* The submerged shoreline, that we cored, consisted of shelly gravel. Leading us to believe that the Black Sea once had a water level above these shorelines, which allowed the mollusks to thrive. Then there was a drawdown leaving these mollusks exposed. Their shells were weathered forming the shelly gravel observed in the core. Some anticipated conclusions could be drawn on the viability of Optically Stimulated Luminescence dating as a method for dating submerged coastlines. Optically Stimulated Luminescence dating is viable and accurate method for dating submerged shorelines if the age of the shorelines is slightly older than the age of the articulated *Dreissena* sent for radiocarbon dating. *3)* A series of reddish-brown clay layers were deposited at core 9, 10, 16 and core 18. We correlated the reddish-brown intervals to periods of warmer climatic conditions.

Acknowledgements: The expedition and research in 2009 were made with the financial support of the Project DO 02-337/2008. This report is due to the Project DO 02-35/2008. Thanks to Hristo Stanchev from Institute of Oceanology for making of expedition map.