Radiometric Survey of Vromos Bay

Vromos Bay is a small bay at the southern end of the Gulf of Bourgas, situated between two rocky capes (Atia and Akin) while the area of 203 944 sq. m stretching between them is occupied by a nearly 3 km long sand beach of Vromos. The bay was used as a landfill for the tailings from the flotation factory for copper concentrate of the near mine Rosen.

The mineral paragenesis of the copper ore in the hydrothermal deposits consists over 100 minerals including copper, nickel, molybdenum, cobalt-nickel and iron sulfides, mineralized uranium, iron oxides and rock-forming minerals (quartz, feldspar and zeolites) etc.

From 1954 to 1977 the total amount of flotation tailings discharged there was about 8 000 000 t extending the coast about 150 m into the sea. Most of the refuse (about 6 000 000 t) have been carried far into the sea building a thick layer of slime that covers the bottom of the bay.

In 1998, after the closure of the mine, the Vromos beach went through recultivation financed by EU Phare-Ecology Program. The layer of contaminated sand on the beach was removed and replaced but the contaminated sediments in the deeper parts of the bay remained there.

Phase I - Evaluating the current state of radioactivity of Vromos Beach

The survey was performed with scintillation counters used as radiometers measuring the beach on profiles parallel to the coast line indented from the sea to the shore. According to the results of the radiometric survey there are no indications for dangerous gamma radiation in the beach area. The values of the ionizing radiation dose do not exceed the norm and varies between 0.12 and 0.39 μSv/h. The highest values are concentrated in the western part of the beach. This feature of the observed values distribution probably is related to the local marine currents of Vromos bay. This leads to the conclusion that in the western area of the beach it will be appropriate to carry out periodic measurements.

Phase II - Evaluating the current state of radioactivity of Vromos Bay

The monitoring of the deep sediments was made on profiles with sensor device connected to a radiometer boarded on a boat. For every measurement the sensor was stuck about 10-15 cm into the bottom slim, the points were localized with differential GPS and the relative depth of the investigation was recorded. The values of the ionizing radiation dose range from 0.12 to 1.4 μSv/h, the latter exceeding the norm over three times and may pose an eventual health risk. The obtained results clearly localize a deep zone with higher gamma radiation when the highest value of 1.4 μSv/h is measured at a depth of 19 m in the central part of the bay. The map of the radioactivity distribution also confirms the conclusion of the phase I.

Remote Underwater Survey

Trying to perform an underwater survey on a small scale, the participants of the Field Camp “Sozopol 2017” investigated the seabed in the bay of Chernomoretz remotely through the use of sonar and a mini sea diving ROV in search of intact shipwrecks. Remains of a recently discovered sunk ship in the central part of the bay about 200 m from the beach at a depth of 4 m were detected on the radar. The wooden construction was clearly visible on the radar while its cargo of bricks was identified during the video inspection. Based on the type and construction the ship was dated back to the 19th century. The same ship has been thoroughly investigated and filmed by National Geographic Channel.

Student Chapter Activities

UGM Student Chapter participated in the Black Sea Maritime Archeology Project initially looking for clues about the respond of the prehistoric humans to sea levels rising but actually found 41 well-preserved shipwrecks dispersed across roughly 2 000 sq. km spanning over a thousand years of history, from the 9th to the 18th century.

The international team of sailors and scientists made the discovery while mapping the sea floor with sonar and remotely operated vehicles (ROVs) for taking high-resolution photos, videos, and laser measurements of the remains and then creating complete digital models that can be studied and manipulated.

The Black Sea is considered to be one of the world’s finest under water laboratories due to the anoxic (un-oxygenated) layer which preserves artefacts better than any other marine environment.

Archaeologists can tell roughly when and from a ship sailed by analyzing the styles of clay pots in its cargo, the type of anchor, and the arrangement of its mast and rigging. The majority of the wrecks were merchant transports carrying wine, grain, metals, timber, and other commodities. However, tantalizing the hints of piracy, all the ships seem to have been sunk by storms, not by battles or buccaneers.