

Sampling Report of AMBER sub-projects B 4-5 from 30.09.-08.10.2010

1. **Geographical area:** Puck Bay/Poland, southern Baltic Sea (Figure 1a) and b))

2. **Purpose of the sampling campaign:** quantification of submarine groundwater discharge (SGD), impact of groundwater on geochemical cycles of a coastal ecosystem in the southern Baltic Sea, information about groundwater origin

(a)

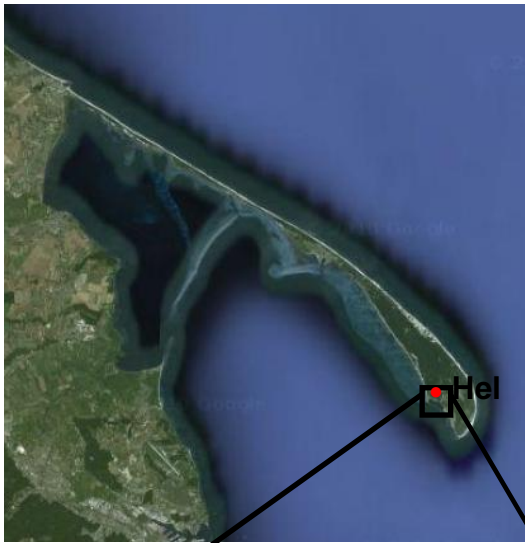
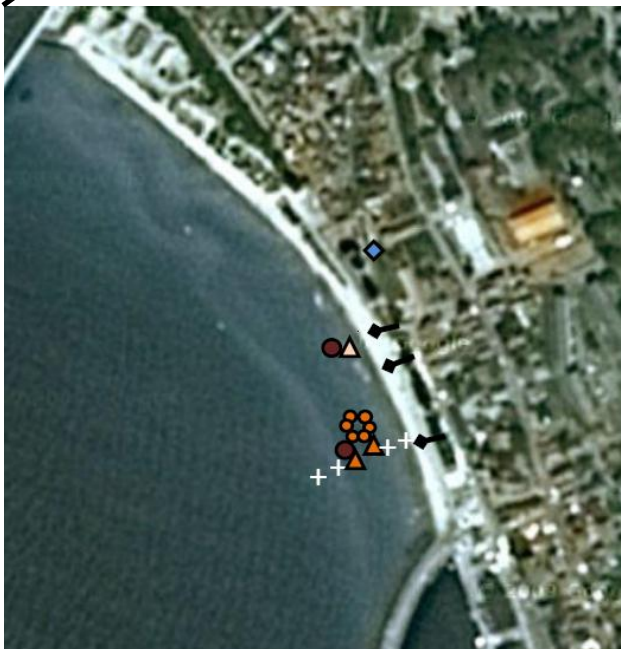


Figure 1: Hel Peninsula with Hel Town (a) and Sampling Area (b)

(<http://www.birdtheme.org/useful/googletool.html>)



(b)

- ◆ Well
- ⊕ Transect (4 stations, with push-pull-lance)
- ↙ Stairs
- Benthic chamber
- △ Groundwater lance (less impacted area)
- ▲ Groundwater lance (most impacted area)
- Temperature lance

3. Co-operating institutions:

Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany (AWI)
Institute of Oceanology, Polish Academy of Sciences, Sopot, Poland (IO-PAN)
Max-Planck-Institute for Marine Microbiology, Bremen, Germany (MPI)

4. Scientific equipment:

Two pore water lances (length: 40 cm) with 8 ports (0; 4; 8; 12; 16; 20; 24 and 32 cm), six benthic chambers (designed by MPI; with conductivity sensor, port for effluent groundwater, Lee-type seepage meter); two temperature lances to identify temperature anomalies, push-point-lance to sample pore water at different sites, equipment to sample radium isotopes (1-10 L canister)

5. Preliminary results:

The major goal of these sampling campaign was to install six benthic chambers for quantification of submarine groundwater discharge (SGD) in the coastal environment of the Puck Bay in Hel (Figure 1a) and b). Suitable sites were discovered during sampling campaigns in September, November 2009 and May 2010. During this campaign precise locations of less and more groundwater impacted areas were determined by sampling pore water in transects via push-point lance in 25 cm depth (salinity profile, Figure 2). We found one spot with low salinity. There the benthic chambers were put into the sediment (Figure 1b). Beside the benthic chambers groundwater lances for sampling pore water in different depths and two temperature lances were brought into the sediment. Geochemical data and temperature profiles (Figure 3 and 4) are needed later for thermodynamically modeling with PHREEQC. We planned to quantify SGD by measuring the volume which penetrated into the plastic bags of the benthic chambers after a definite time. Flow rates can also be calculated by measuring activity of radium isotopes. Therefore several bottles and canisters of pore (1L) and sea water (30 L) were taken at sites, which were most impacted. Perpendicular to the beach four stations were sampled in a transect via push-point lance to get pore water from 0-40 cm depth (Figure 1 b). Furthermore two sediment cores were taken (from an impacted and less impacted area). This time we could not identify location with no groundwater impact. Additionally two well waters (1. 2 m depth and 2. 170 m depth, N 54.6128, E 18.8004) were sampled (Figure 1b) for isotopic composition (δD and δO , Tritium) to assign origin and age of groundwater.

During this sampling campaign decreasing salinities were measured in pore water on both sites (less impacted area: 8 down to 5 PSU; most impacted area: 7 down to 0.5 PSU). At these sites pore water samples for determination of major elements, nutrients, trace metals, radium, oxygen, hydrogen and nitrogen isotopes were taken. Furthermore, sediments (one from more, the other one from less impacted place) were retained by using a 20 cm long plastic tube with a diameter of 5 cm. These cores will be analysed for their geochemical composition (e.g. major and trace elements, S species, S-isotopes). Because of the strong wind and high waves during sampling no water went into the plastic bags of the benthic chambers. So we were not able to measure the volume for quantification of SGD. The mixing water in the benthic chambers was sampled for the geochemical composition, too. Sampling took place on two days for every eight hours by direct withdrawal via syringe. Temperature profiles show differences between impacted and less impacted area (Figure 3 and 4).

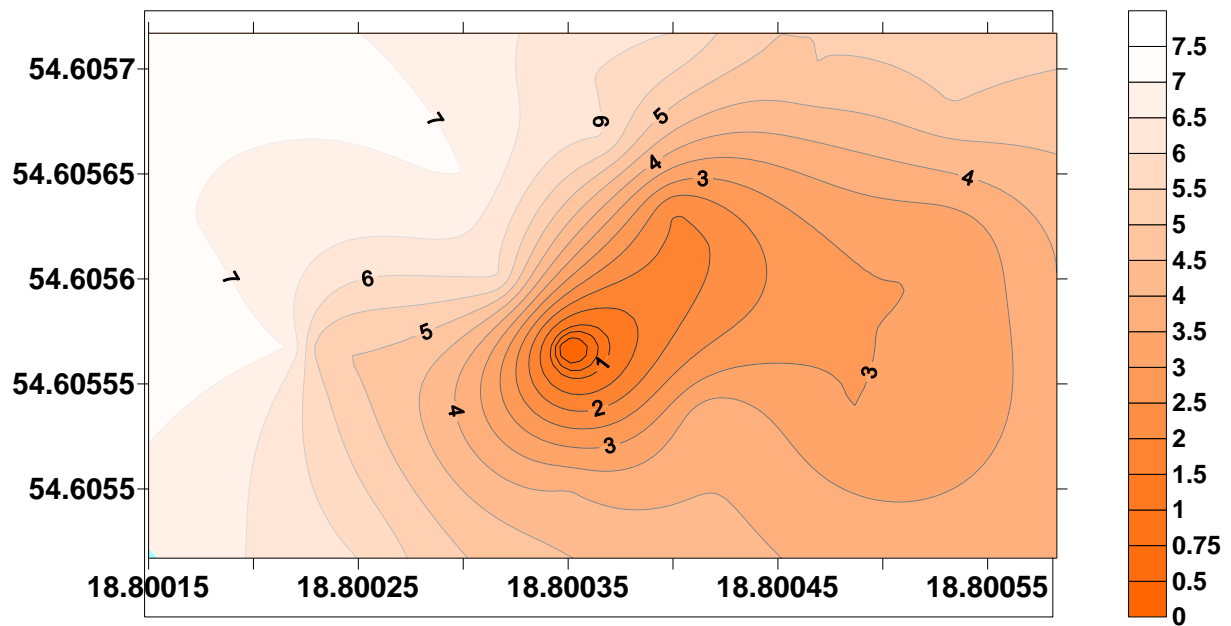


Figure 2: Salinity measurements (in PSU) Hel Beach in an area of 20 x 30 m.

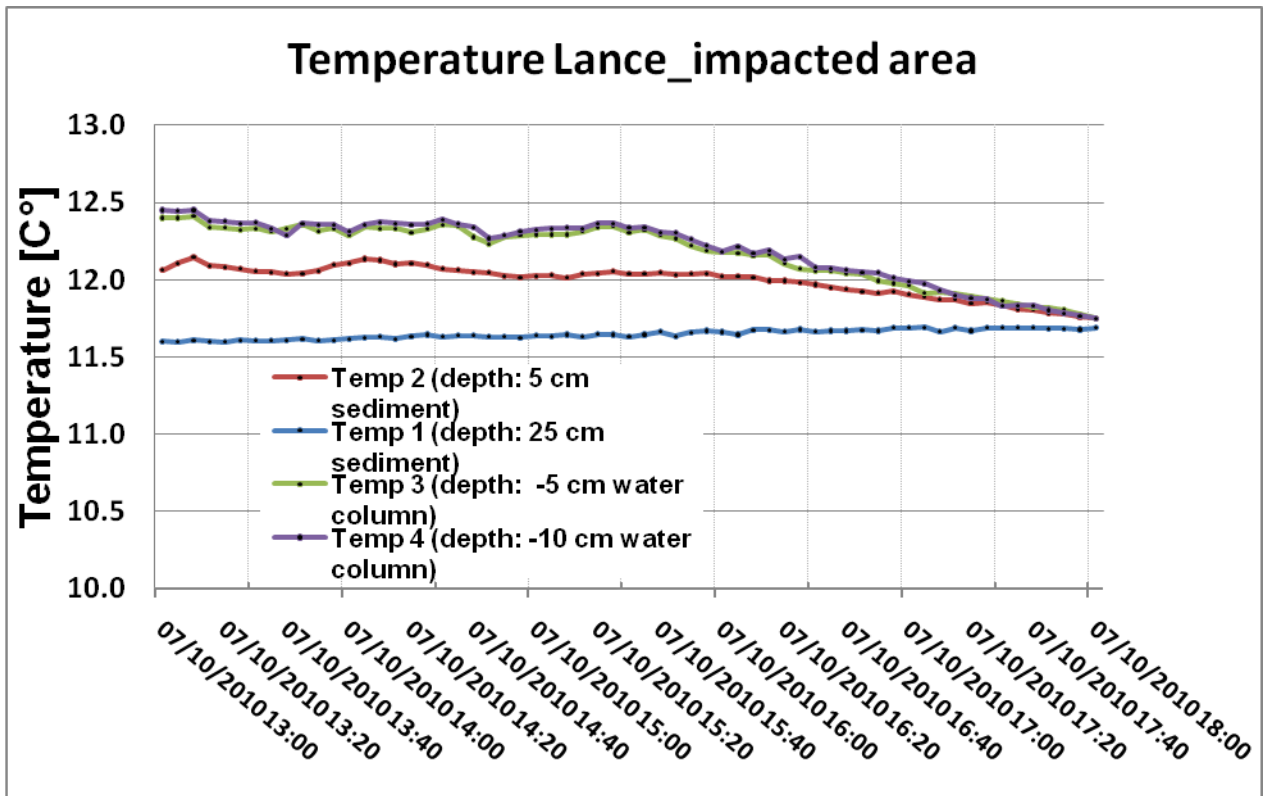


Figure 3: Temperature profile of impacted area.

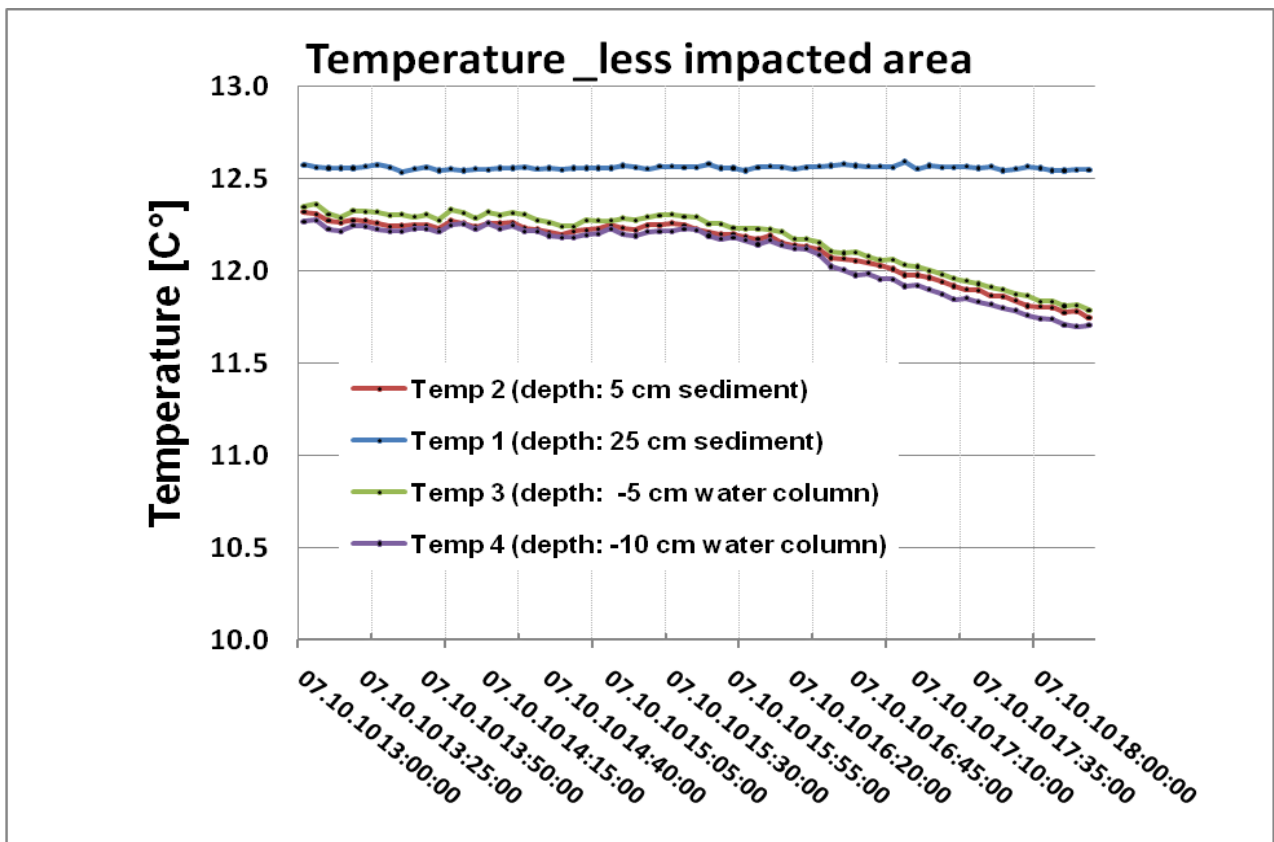


Figure 4: Temperature profile of not impacted area.