Submarine Groundwater Discharge to the Gulf of Gdańsk

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Introduction

Besides typically large point sources of surface water inputs, the submarine groundwater discharge (SGD) is an important process influencing coastal zone. Groundwater contamination in many areas has became a source of nutrients, trace metals, organic compounds and radionuclides. The biogeochemical cycle alterations may cause an environmental deterioration of the coastal zones. Flows of groundwater are usually temporally and spatially variable, making efforts to characterize site-specific flow regimes more complex (Burnett i in., 2006). However, within the Puck Bay (the Gulf of Gdańsk), which is a region of drainage for the groundwater (Fig.1), the SGD has been investigated.

Methods

SGD was identified by salinity measurements and then confirmed by other chemical analysis (e.g. pH, temp., redox potential). The study sites were located within the Puck Bay (Fig.2). Water samples were collected using bathometers, seepage meters and piezometers (Fig.3) from SGD-impacted and SGD-unimpacted areas.

Fig. 2 SGD study sites a) Hel Peninsula, b) Puck Bay.

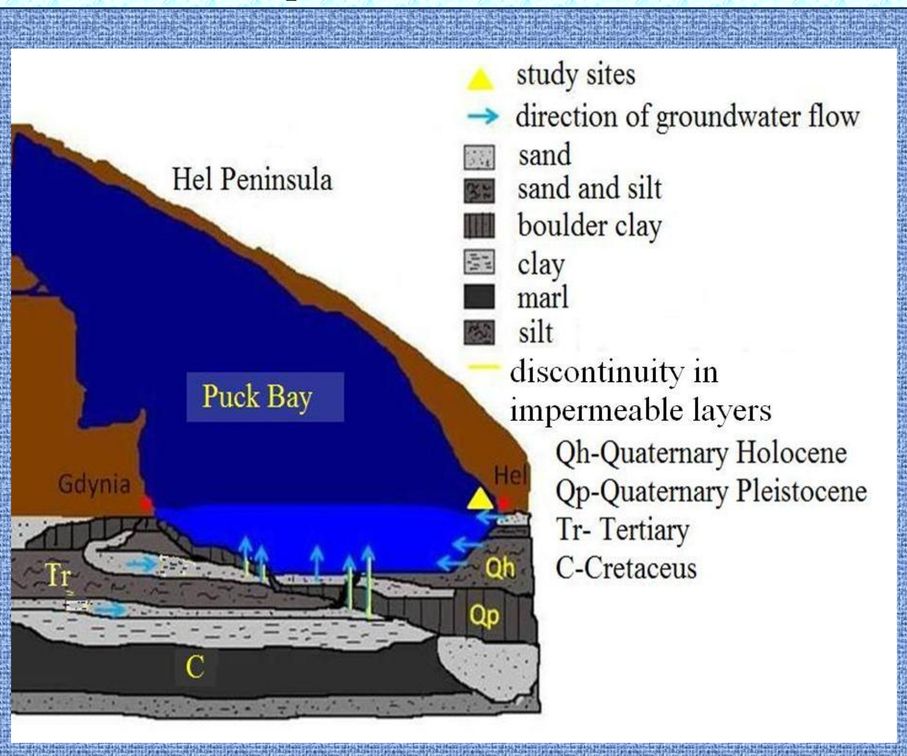


Fig. 1 Hydrogeological layers of the study.

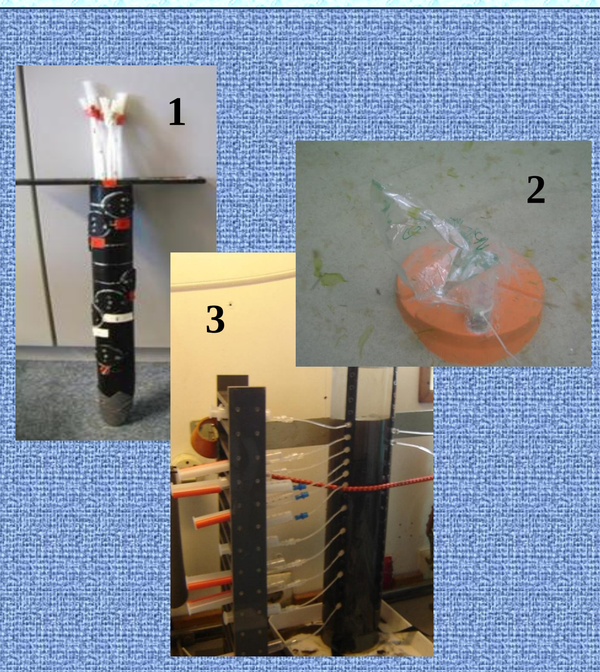
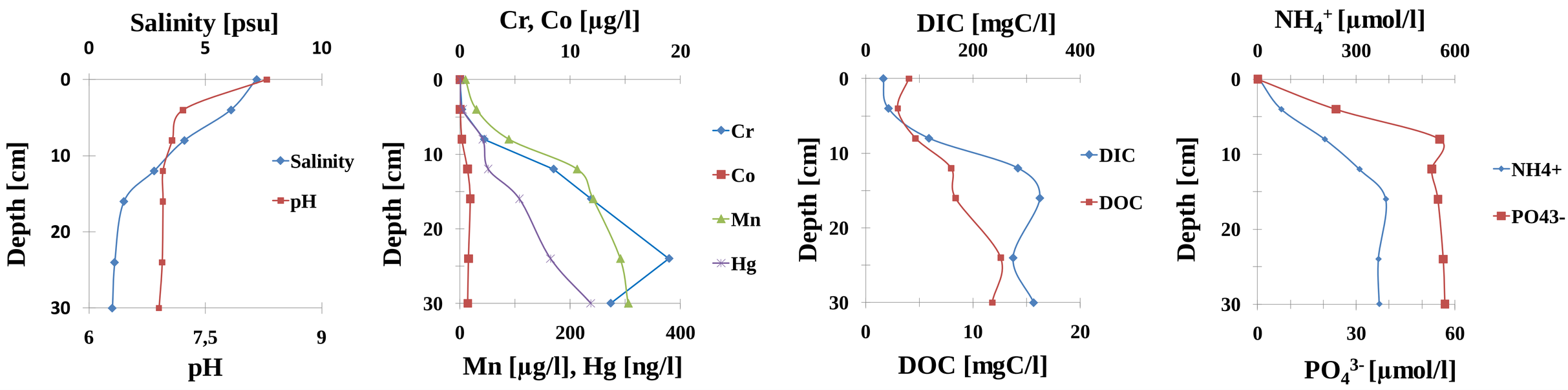


Fig 3. Groundwater sampling via 1) piezometers, 2) seepage meter, 3) rhizons.

Results and discussion

In the collected water samples following concentrations ranges were observed: NH_4^+ (5,41-367,01 µmol/l), NO_2^- (0,09-1,24 µmol/l), NO_3^- (0,12-4,79 µmol/l), PO_4^{3-} (0,01-55,63 µmol/l), DIC (21,02-324,01 mgC/l), DOC (3,31-8,32 mgC/l), Cr (0,001-13,671 µg/l), Co (0,001-0,731 µg/l), Mn (0,65 do 149,73 µg/l), Hg (1,31-313,01 ng/l). Concentrations of measured constituents were determined mostly by salinity (Fig.4), redox potential and pH. The phosphates and ammonium ions levels were higher in SGD impacted area than in rivers flowing to the Puck Bay. Nitrites and nitrates ions concentrations showed the opposite trend.



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Literature

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