

Participants

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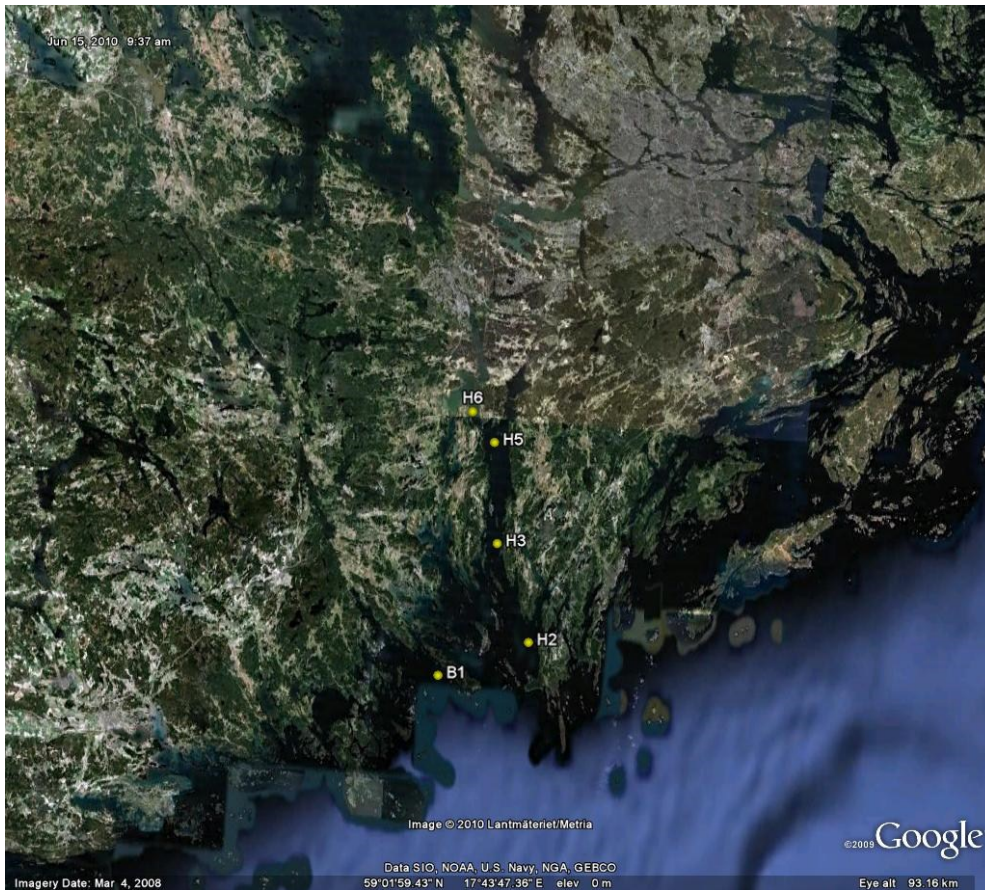


Figure 1. Sampling sites in Himmerfjärden.

Table 1. Askö June 2010 Campaign Stations:

B1: N 58° 48' 28, E 17° 37' 60  
Maximum water depth: 40 m  
H2: N 58° 50' 40, E 17° 47' 42  
Maximum sampling depth 30m  
H3: N 58° 56'04, E 17°43' 81  
Maximum sampling depth 50m  
H5: N 59° 02' 19, E 17° 43' 40  
Maximum depth 25m  
H6: N 59° 04' 08, E 17° 41' 05  
Maximum water depth: 38 m  
Askö Station: N 58°49'22.72"N, 17°38'10.98"E  
Water depth: 0.5m

Following the third Baltic Gas workshop from June 7 to June 9, 2010, two scientists, one PhD candidate and two B.Sc. students from Stockholm University, Sweden participated in the second field campaign in Himmerfjärden to determine methane concentrations in the water column and to continue the sediment coring program started in May 2009.

### Water column methane work

Stations B1, H2, H3, H5, and H6 were selected for water column profiling of dissolved methane. Water column sampling of dissolved methane was conducted with a standard Hydrobios water sampler in 5m depth intervals. 50 ml water samples were equilibrated with 10 ml air headspace and stored in sealed glass vials with saturated sodium chloride solution. The water column sampling was repeated on two days for Stations H5 and H6. At station H6, surface were strongly oversaturated with respect to methane (Figure 2). The source of this methane is likely discharge from the SYVAB sewage treatment. Since 2007, discharge from the sewage treatment plant occurs within the mixed surface layer rather at depth to enhance the immediate export of sewage derived nutrient out of the bay. A corollary is that surface waters contain sewage treatment-derived methane. The enhanced methane concentrations may therefore aid in tracing the dispersal of the nutrient plume from the sewage treatment plant. In the period 12-13 June, a light storm mixed the deeper layers of the water column at all stations raising oxygen concentrations significantly while decreasing the concentration of methane in the surface mixed layer. Following the storm, in the bottom water at Station H6, dissolved O<sub>2</sub> increased from 69  $\mu$ M to 180  $\mu$ M.

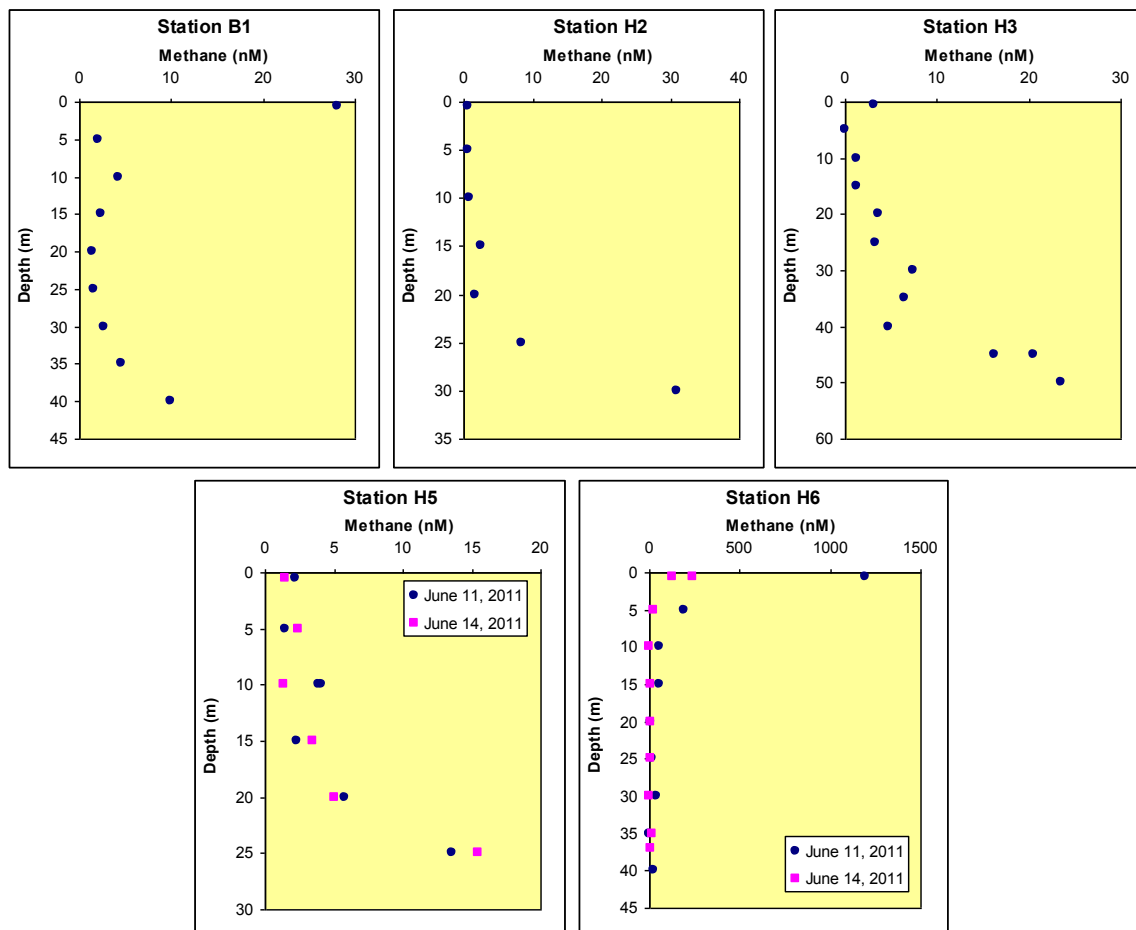


Figure 2. Water column methane concentrations at 5 stations of the Himmerfjärden/Trosa archipelago area.

## Continuous methane measurements by membrane inlet mass spectrometry

The underwater mass spectrometer INSPECTR-200 was deployed for continuous measurements on board to establish depth profiles of methane in the water column and to obtain a spatial pattern of methane distribution in the mixed layer by pumping water from the mixed layer on board during transfer between stations. At Station H6, bottom water concentrations exceeded 100 nM, which was significantly higher than the concentrations determined with the headspace syringe method. Due a temporary failure in a data transfer system, spatial data acquisition could not be completed. This work will be continued in the next Askö measuring campaign in 2011. A benthic chamber was deployed in 0.5m-deep water at the field station and the chamber water was continuously pumped through the mass spectrometer. Deployment of the benthic chamber and continuous UWMS methane monitoring indicated that the deployment itself can significantly raise methane concentrations in the benthic chamber, likely due to suspension or pressure effects and bubbling. In one deployment, methane exceeded the saturation concentration in the chamber from the release of bubbles from the sediment during the experiment. Careful deployment of the chamber yielded good results that demonstrate the usefulness of the system. Complete analysis of the UWMS data will be completed at AWI.

## Sediment sampling for $^{14}\text{C}$ -methanogenesis rates

Sediment sampling was conducted onboard the *R/V Limanda* using a Rumohr-type gravity core. Stations H2 and H5 were selected for sediment coring. The principal goals were to methanogenesis from  $^{14}\text{C}$ -bicarbonate sediment incubations. Gas samples for methane analysis were taken directly from a Rumohrlet core onboard within 15 minutes of sampling. The remaining cores were returned to the Askö Marine Lab, where we sampled pore waters using the Rhizone technique and sectioned sediment for  $^{14}\text{C}$  incubations. Analysis of methane, dissolved inorganic carbon, sulphide and sulphate porewater samples will be forthcoming.

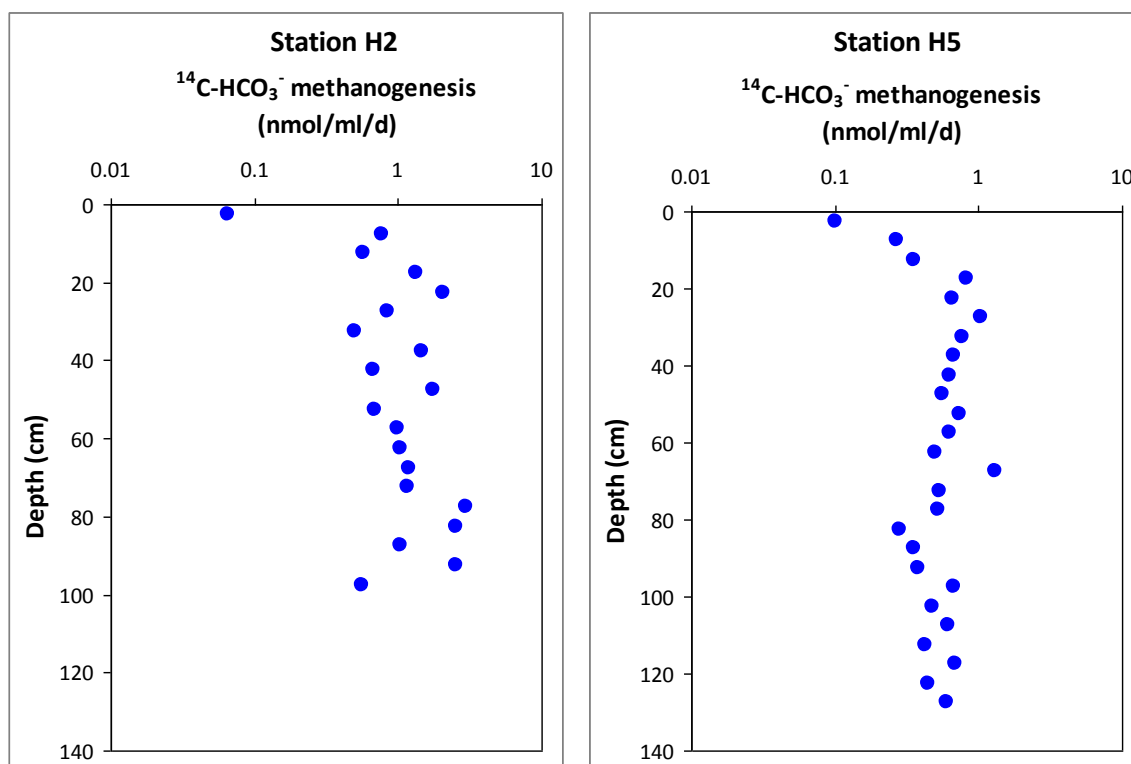


Figure 3.  $^{14}\text{C}$ -methanogenesis rates from  $^{14}\text{C}$ -bicarbonate at stations H2 and H5.

We would like to thank the Askö Marine Station staff for support during sampling.