

Nitrate, N-total, sulphate and chlorine in surface water - Odder stream



NiCA Technical Note

September 2013

Vibeke Ernstsén
Geological Survey of Denmark and Greenland

Referencing this report:

Ernstsen, V (2013) Nitrate, N-total, sulphate and chlorine in surface water – Odder stream. NiCA Technical Note, September 2013. Available at www.nitrat.dk

NiCA (Nitrate reduction in geologically heterogeneous catchments)
is supported by the Danish Strategic Research Council.



The NiCA project is led by GEUS (contact: Jens Christian Refsgaard, mail: jcr@geus.dk) and comprise the following partners:

Geological Survey of Denmark and Greenland (GEUS)
Department of Geography and Geology, University of Copenhagen
Institute of Food and Resources Economics, University of Copenhagen
Department of Earth Sciences, Aarhus University
Knowledge Centre for Agriculture
Laval University, Quebec, Canada
Aarhus Geophysics
Alectia A/S
DHI
SkyTEM
Municipality of Aarhus
Municipality of Odder

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Content

Introduction	2
Sampling site	3
Water sampling	5
Nitrate, N-total, chlorine, and sulphate	7
References	9
Acknowledgement	9

Introduction

The concentration of nitrate in tributary streams and creeks to the Odder-Rævså stream has been reported in a NiCA technical note by Nilsson (2013). This note describes the content of nitrate in stream - and creek water collected in August 2011 (summer) and December 2011 (winter).

In addition to these snap shot measurements of nitrate, equipment for continuous water sampling was established at the site where Odder stream passes the farm Sander Enggård to meet the need for long-term records of the concentration of nitrate. In addition to the measurements of nitrate, the water samples were also analyzed for N-total, sulphate and chlorine.

This technical note describes the location and establishment of the water sampling equipment, the frequency of collection of water samples, laboratory methods and the results obtained from 10th November 2011 to 13th August 2013.

Sampling site

Equipment that has been used for collecting water samples from Odder stream was established northeast of Odder by Sander Enggård, Figure 1. The site was chosen because a diver for monitoring of the water level was already established here and long term records were available. Monitoring of the water level makes it possible to calculate the flux of nitrate out of the catchment.

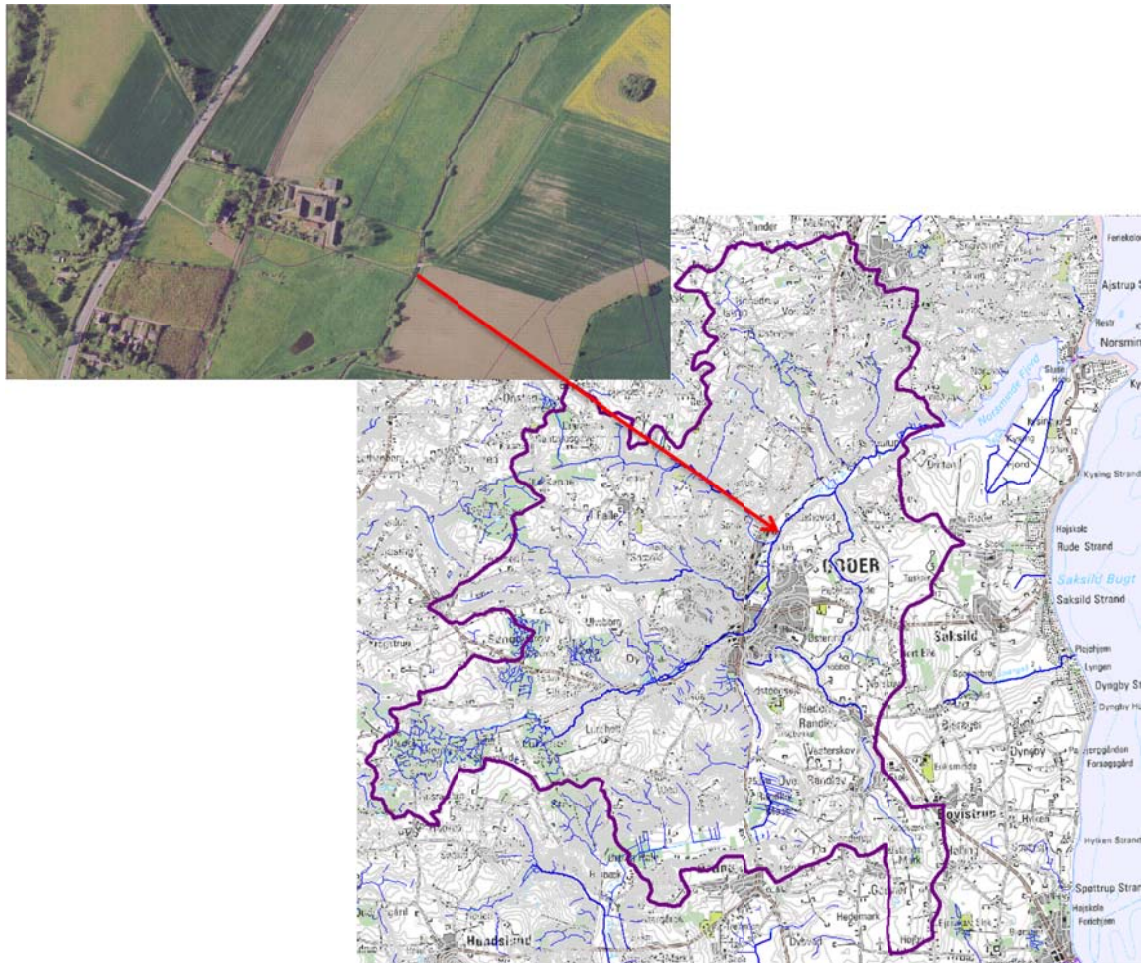


Figure 1. Water samples were collected from Odder stream close to the Sander Enggård farm north-east of Odder. The upper picture shows the farm and Odder stream. The arrow in red color shows where the Sander Enggård farm and the water sampling site were located within the Odder-Rævså stream catchment shown with a lilac line.

The water samples from Odder stream were collected over time using a 6712FR fiberglass refrigerated ISCO water sampler (Teledyne, Lincoln, NE, US). The ISCO sampler was installed in a heat insulated shanty house, Figure 2 and 3.



Figure 2. The heat insulated shanty house with an almost installed 6712FR fiberglass refrigerated ISCO water sampler. The model is shown by the little picture inset.



Figure 3. The heat insulated shanty house after installation located close to Odder stream and the water level at August 3th 2011.

Water sampling

Water samples were collected from Odder stream in the period 10th November 2011 to the 13th August 2013.

The sampling density is given in table 1. Due to technical or other reasons no water samples were collected 19th December 2011, 31th January 2012, 31th March 2012, 22nd July to 21th August 2012, 23th September 2012 to 14th November 2012, 3th to 6th March 2013 and 9th and 10th March 2013.

Time	Sampling density
10 th November 2011 to 4 th April 2012	1 sample of 2 subsamples every 24 hours
4 th April 2012 to 4 th July 2012	1 sample of 7 subsamples every 1 week
10 th July 2012 to 13 th August 2013	1 sample of 2 subsamples every 2 days

Table 1. Sampling density of water samples from Odder Stream.

The water level changed markedly over the sampling period. Figure 4 illustrates a low water level situation in Odder stream at the 17th May 2011 and Figure 5 illustrates a very high water level at the 12th December where the water in the stream reach almost up to the shanty house.



Figure 4. Water level at Odder stream the 17th May 2011.



Figure 5. Very high water level in the Odder stream 5th January 2012. The diver is seen in the back.

Nitrate, N-total, chlorine, and sulphate

The water samples were preserved at 4 °C until they were analyzed. The water samples were filtered using a 0,45 µm Q-MAX ® Syringe PES filter (Frisenette ApS, Knebel, Denmark) before analyses.

Nitrate (NO_3), chlorine (Cl), and sulphate (SO_4), were measured using an IC system with a 19 IC Detector, 820 IC Separation Center, 818 IC Pump, 833 IC Liquid handling Unit equipped with a Metrosep A Supp 5 column connected to a 838 Advanced IC Sample processor (Metrohm Ltd, Herisau Switzerland).

The concentration of total nitrogen (N-tot) was measured at a Shimadzu TOC-V CPH with a Total Nitrogen Unit (TNM-1) and a Shimadzu ASI-V 93 TOC auto sampler (Shimadzu Corporation, Tokyo, Japan).

The concentrations of nitrate and total nitrogen with time are given in figure 6. The ratio between nitrate-N and total N over time is given in figure 7. The concentrations of chlorine over time are given in figure 8 and the concentrations of sulphate over time are given in figure 9.

All the data is available in an excel file.

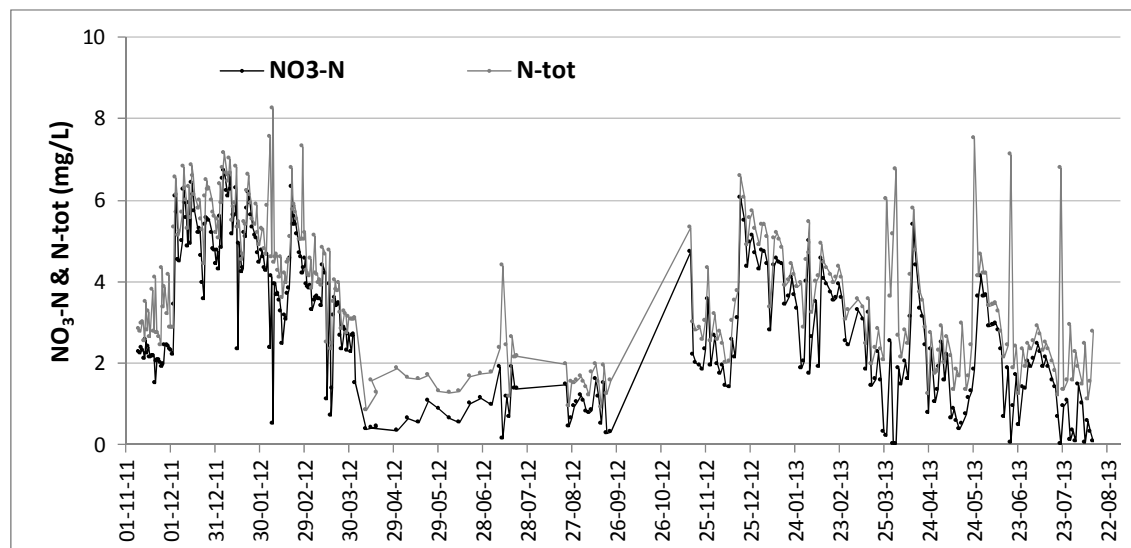


Figure 6. Nitrate calculated as nitrate-N ($\text{NO}_3\text{-N}$) and total amount of nitrogen (N-total) over the sampling period from 10th November to 13th August.2013.

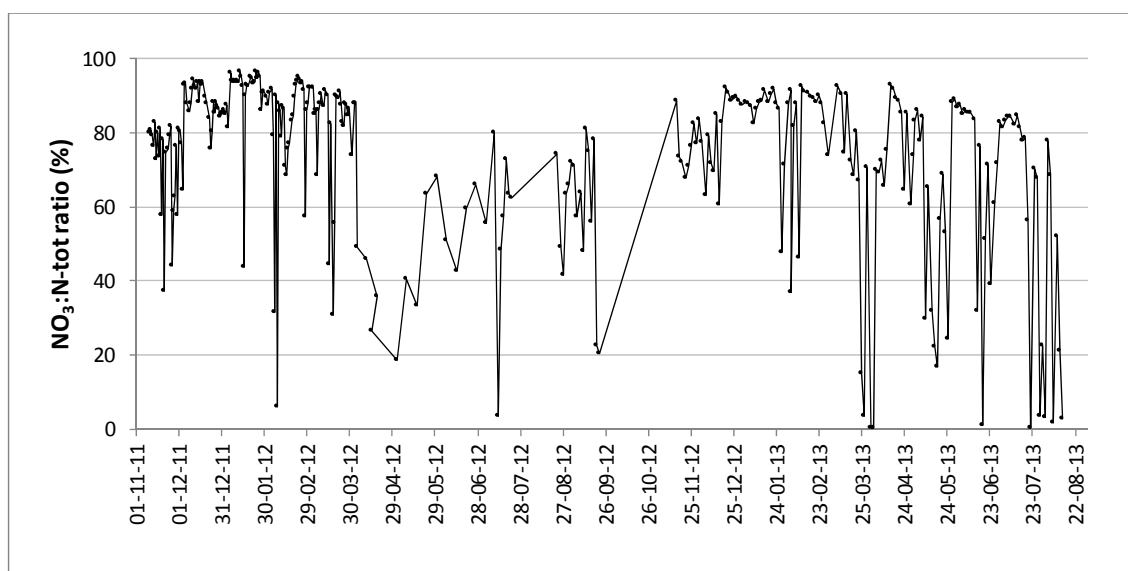


Figure 7. Ratio between nitrate-N (NO₃-N) and total nitrogen (N-tot) in per cent over the sampling period from 10th November to 13th August.2013.

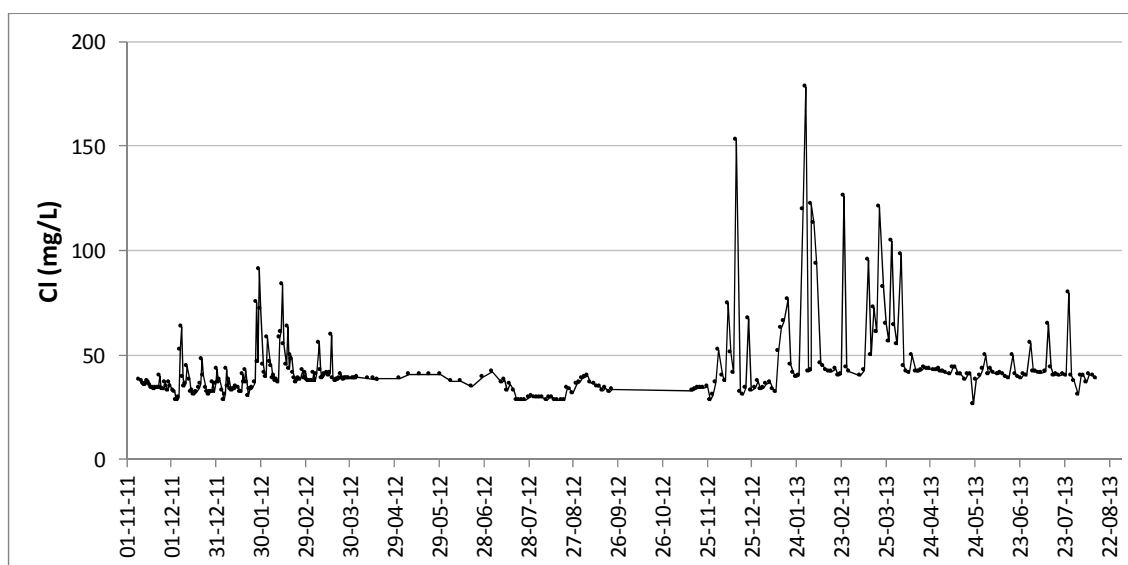


Figure 8. Chlorine over the sampling period from 10th November to 13th August.2013.

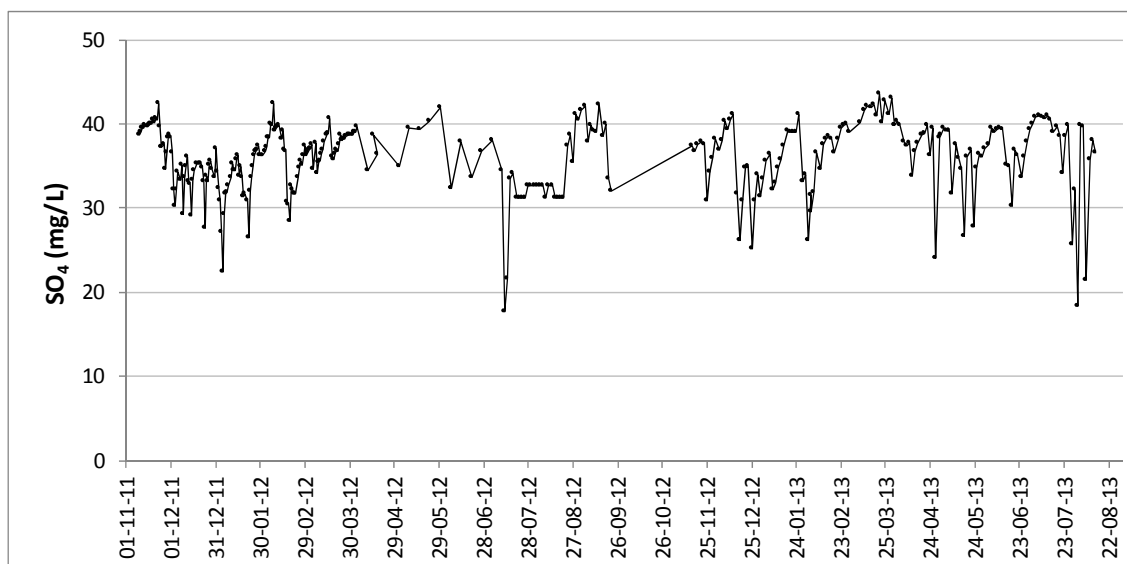


Figure 9. Sulphate over the sampling period from 10th November to 13th August.2013.

References

Nilsson, B. 2013. Exchange of nitrate in the transition zone between groundwater and stream water in the Norsminde catchment. Technical NiCA note. Available at www.nitrate.dk

Acknowledgement

We want to thank Lasse Gudmundsson and Per Jensen, GEUS, for planning and installation of the water sampling equipment, collection of water samples, and many illustrative pictures from the site. Also thank to Christina Rosenberg Lynge and Pernille Stockmarr, GEUS, for handling and measurements of water samples in Inorganic Laboratory at GEUS.