

REVIEW

Impact of snow deposition on major and trace element concentrations and fluxes in surface waters of Western Siberian Lowland

by Vladimir P. Shevchenko et al.

Introduction

The article by Vladimir P. Shevchenko et al. titled "Impact of snow deposition on major and trace elements concentration and fluxes in surface waters of Western Siberian Lowland" attempts to contribute towards a better understanding of processes affecting element concentration and fluxes in the Western Siberian Lowland (WSL) by analyzing the snow deposition. Authors have looked at dissolved and particulate fraction of snow and compared it to this of river and lake waters. Then they compared the river fluxes in spring with snow water stock and investigated how the particles concentration and trace elements depended on snow particulate fraction. Additionally they tried to find a latitude influence. In the discussion they compared transportation fraction to find out that majority of measured elements was transported in particulate rather than dissolved fraction in the snow water. Then they investigated the effect of industrial and local pollutions and compared it to other places in the world. And finally they analyzed the atmospheric contribution to lakes and rivers composition. The main conclusions were 1) the particulate fraction of surface layer of snow "ranged from 0.4 to 66 mg/l of meltwater and increased in the regions of enhanced dust deposition." 2) the elementary composition of snow water dissolved fraction showed "a F1 x F2 structure with the first factor controlling the insoluble, low-mobile lithogenic elements and the 2nd factor acting on alkaline-earth metals, biogenic elements and anions." 3) the concentration of insoluble elements in snow water "did not change or decreased in response to the increase in PF." 4) the impact of the snowmelt on chemical composition of western Siberian thermokarst lakes and rivers may be very high it case of the rivers it increases northwards for several elements.

Main assessment

The article touches a fairly studied topic but in a area that has not yet been well documented what is being proclaimed by the limited data availability. The authors have done a lot of work and looked at the problem from many different aspects. I was impressed by the geographical area covered in this research as well as how many different aspects were looked at.

What more the article fits the scope of HESS and has a great potential to be interesting especially when put in the larger problematic such as climate change. On top of that it has created a significant amount of data and I get the impression that it will be very useful for future research in this area.

Nevertheless in the form it has now it appeared to me as not fully relevant. I could not sense the importance of the presented data and what do they mean for the Earth nor a smaller world of Siberia. The article's structure is somehow blur and it is difficult to follow the authors ideas. The sentences are often too long and therefore it is very easy to get confused. There are also language errors that make understanding what author wants to say difficult.

Research question and hypothesis seem too general. After a good introduction there is a hypothesis that suddenly tries to put the studied problem into a large scale of climate change but nowhere later is this topic developed.

To the large scale this project is based on the previous research which shows the topicality of the issue but also causes problems while reading because there are too many lines of references in the text. Many parts of the report contains the expression "described elsewhere" which in its frequency can be a bit irritating. The methods are already described in great detail and I do not see a reason for further information unless someone wants to based on this article but then they can contact the authors directly.

The graphics are not self-explanatory and could use more description otherwise without specific knowledge one cannot take the important message out of them. Also when the figure is adapted from previous studies I would state it in its description.

Despite these shortcomings, the data presented in this manuscript seems to be valuable and, thus, the publication of a significantly revised manuscript would be valuable.

List of major and minor points

Title

"Impact of snow deposition on major and trace elements concentration and fluxes in surface waters of Western Siberian Lowland"

I would recommend to specify what fluxes are being considered and add the information about latitude dependence analysis.

Abstract

I found it difficult to read and I had to read it several times before I understood it.

Introduction

In the introduction we see a clear link to previous studies. I would consider limiting the references. The references are listed but not given any explanation nor details.

Nevertheless the introduction clearly indicates the knowledge gap in the studies area and why the western Siberia was chosen.

What I find very good in the introduction is its direct statements on reasons of the originality of the conducted research.

Method

- All method used are presented to a great detailed that it would be possible to reproduce the data.

- I did not find a support for claim that "gas exploration facilities (..) minimally impact the environment."(page 6)

- It is good to state that the equipment was pre-cleaned but it is enough to do it once and not to focus so much on it afterwards.

- In the 2.4 there are results put in the methods part which I do not think belongs there (lines 160-164)

- When based on other results it is not indicated which method was used nor even stated whether it

was the same one or not.

- For someone who does not know how PCA works it is not explained well. I did not fully understand what does the F1 x F2 structure mean.

Results

- In the line 217-218 I would describe how can this effect be explained.

- In case of *Snow water in comparison to lake and river water* in line 238 it says that "only summer-period concentrations" were used. I would suggest to describe what possible consequences could it have.

- I liked the first general description followed by a regional example.

- When listing what elements increased (line 277) I would add information on what they have in common or a suggestion why they acted in the same way.

- The mineralogical composition was presented only for selected snow samples - it would be good to indicate what was the criteria for this selection.

- In the results the authors claim correlation while its ratio is less than 0.3. I would reconsider if that is not an effect of not enough data supply.

Discussion and conclusions

- The discussion part is missing more or less bold ideas of how do the authors explain the results. What do they think causes them (ex 334 - 335) and what do they mean for the bigger picture (ex. climate change) as mentioned in the introduction.

- Interesting results were obtained for latitude dependence and that is why I would add it to the title. I would also write authors thoughts on why in the figure 2 is there extreme at 64-66 for Ni, Cd and Sb.

- I am again missing the explanation on why is this important (ex 393 - 394)

Graphics

- The authors should improve the figures and especially the figure captions to make the figures easier to understand.

- Figures adopted from other studies should contain a proper reference.

- The statement that the Fig. S7 supports the claim that there is an increase in concentration north from 23-24*N does not seem to be the case on the presented figure.

Language

While reading the article I have seen many linguistic mistakes. (ex line 39, 48, 94, 110, 170-171, 492)