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Hydrology and Earth System Sciences
Discussions

Interactive comment on "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.

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Response to Anonymous reviewer No 2 (master student) We appreciate that the reader acknowledged that we "...have done a lot of work and looked at the problem from many different aspects". The reader "was impressed by the geographical area covered in this research as well as how many different aspects were looked at". We also acknowledge his/her opinion that "...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".

However, the reviewer "... could not sense the importance of the presented data and

what do they mean for the Earth nor a smaller world of Siberia." In response to this remark, we would like to state that the snow deposition in Siberia is the main source of water which is transported to the Arctic Ocean by Siberian rivers, including dissolved and particulate elements. The importance of the riverine flux to the Arctic Ocean and the Arctic Ocean itself for the regulation of the climate and biota of the planet is well known and discussing this issue goes beyond the scope of this paper. We would also like to point out that, to the best of our knowledge, this is the first attempt to generalize the snow chemical composition across such a large latitudinal transect of the Arctic and subarctic zone.

We further agree with the reviewer that "...The article's structure is somehow blur and it is difficult to follow the authors ideas." In the revised version, we will clarify the presentation and will focus our description of results on most important findings.

The reviewer also noticed that "Research question and hypothesis seem too general". The working hypothesis for this study was that the chemical composition of snow should reflect the contribution of three main sources of dissolved and particulate forms of chemical elements. From the one hand, these are marine aerosols and mineral dust from remote deserts provinces, provided via long-range atmospheric transport. From the other hand, these are local sources of pollution such as towns, gas and oil industry centers and roads.

The reviewer correctly pointed out that "Many parts of the report contains the expression "described elsewhere" which in its frequency can be a bit irritating". We will carefully revise the description of methods and sites geography and remove the references to previous works as much as possible. Following the recommendation of this reviewer, we will revise the graphics to make them self-explanatory and we will provide more description, taking care of providing the proper reference to the previous figures. All the figures in the revised manuscript will be fully original.

The reviewer provided a list of detailed remarks; all of them are very useful and will be

carefully considered in the revised version. In particular, the cause for the latitudinal dependence in Fig 2 of elevated concentrations of Ni, Cd and Sb is most likely industrial impact, but given relatively low number of data points around industrial centers it is hard to prove it unambiguously. The main interest of this work was to provide a general view of element concentration across the WSL.

Further important remarks of reviewer were the request to provide the information on what the elements have in common or a suggestion why they acted in the same way (L 277). In fact, these are all soluble (highly labile) elements, originated either from marine aerosols or from leaching from soluble minerals such as carbonates. We avoided too much discussion in the Results section. The reviewer correctly pointed out that "The mineralogical composition was presented only for selected snow samples and it would be good to indicate what was the criteria for this selection". The choice was determined by sufficient amount of collected particulate phase for quantitative XRD and SEM analyses. These samples however, are highly representative for snow samples of Siberia and they cover full latitudinal range investigated in this study.

The reviewer also noticed that "In the results the authors claim correlation while its ratio is less than 0.3 and he/she wondered whether this is an effect of not enough data supply." This is certainly true. We reconsider the criterion of correlations using sophisticated multi-parametric statistics (PCA and newly added Hierarchical Cluster Analysis (HCA), see our response to reviewer No 1)

We thank the reviewer for generally positive opinion on our paper and we hope to have a chance of presenting the revised manuscript to the journal.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-578, 2016.