

## ***Interactive comment on “Atmosphere–ocean exchange of heavy metals and polycyclic aromatic hydrocarbons in the Russian Arctic Ocean” by Xiaowen Ji et al.***

### **Anonymous Referee #1**

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The MS titled “Atmosphere–ocean exchange of heavy metals and polycyclic aromatic hydrocarbons in the Russian Arctic Ocean” written by Ji et al. researched the results of a Russian Arctic assessment of the occurrences and atmosphere–ocean fluxes of 35 polycyclic aromatic hydrocarbons (PAHs) and 9 metals (Pb, Cd, Cu, Zn, Fe, Mn, Ni, and Hg). The topic of this study is quite interesting due to the reflection of anthropogenic influences in the normal biochemical cycles as the balance of geochemical substances between ocean and gas. Authors pointed out the net input of Hg and 35 PAHs into ocean, filling the data gaps in this field. The deposition including dry and wet deposition in the Arctic Ocean so far appeared very sporadic data without a continuous sampling sites and period. The topic of this MS is within scope of ACP, the language usage and

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structure of article is generally good and well-written. However, there are still some minor problems and some questions remained. I would like to support this MS to be published unless my questions and problems are well addressed or answered. There are specific questions I found in this MS.

L43-44, it's quite not logic here, authors should introduce the transported pollutants from low attitude to the polar region as the Arctic rather than the present statements about reducing global emissions. Additionally, global emissions of the atmospheric pollutants were carried by monsoon to the high latitude. What is the contribution of it to the Arctic area? Are there any reports concerning the separate contribution of airborne pollutants to land and ocean? L46, the reason mercury is key problematic pollutant should be briefly mentioned here. And citation is needed here. L47, what kind of sources are referring here? L49, “the melting of contaminated ice” in the ocean or also in the terrestrial land? L68, what is relevant connection between benthic input of metals and air-seawater exchange input? L88-89, the sentence authors make here tried to indicate the inorganic salt ions may increase during the summer melting season, and thence the organic compounds' solubility would change? Now the meaning is not clear. Authors need to rephrase the sentences to clarify. L91, need citation for “the Arctic Ocean is considered as a sink that receives global airborne pollutants”. L203, how surface chlorophyll concentrations were calculated or measured? L218, why H' can be corrected by the salinity? In Fick's law, I am not aware of such connection. H' values are usually considered by the temperature changes. L246, how the uncertainty of air-water exchange net direction was conducted? L263, why only OH radicals were considered to the degradation of PAHs in the atmosphere? L279-280, Do author have any proofs to support the reason with air trajectories of Russian Arctic? L294, which sea Taymyr Peninsula is closer to? Clarify here. L295, I think Shevchenko et al. 2013 should be moved to previous sentence. L419, Can authors explain what molecular weight PAHs were easier to de degraded in the air because it's important for biocycles to consume these carbon sources by organisms. If most of heavy molecular PAHs enter ocean ecosystem, which may not be consumed by biota. L440, I suggest authors to

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put some information of future protective measures for this region.

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