

# ***Interactive comment on “21st Century Asian air pollution impacts glacier in northwestern Tibet” by M. Roxana Sierra-Hernández et al.***

## **Anonymous Referee #3**

Received and published: 10 August 2019

The work of Sierra-Hernández et al. describes trace metal analysis of an ice core from the Guliya ice cap in northwestern Tibet that represents deposition from 1971 to 2015. This extends the metals deposition record from that location that previously ended at 1991. The authors demonstrate increased deposition of several trace metals in the 21st century, with some starting to decrease more recently. Trends in deposition are related to industrial activities in the region and to climate. The measurements are made with good analytical rigor, but some of the trends and source attribution could be more convincing. I recommend the changes detailed below be made to the manuscript prior to consideration for publication in ACP.

## **General comments**

The Authors use two different metrics to assess enrichments of metals, enrichment

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factor (EF) and excess concentration. The rationale for using two metrics (i.e. the unique information provided by each) is not provided. It would be useful to provide additional information of this type in Section 2.3. Where different trends were observed for each metric (e.g. lines 191-194, Figure 2), the authors should explain the reasoning and implications of these differences.

Section 3.2 relating the North Atlantic Oscillation (NAO) to enrichments on the Guliya ice cap is very qualitative and speculative. Although it seems reasonable that some relationship exists with the NAO, there is no quantitative analysis provided. The authors mention that correlation was observed in previous studies (lines 303-305). Was there any correlation observed here? It seems a stretch to conclude that the source of enrichments for several trace metals is related to a specific industry in Pakistan (i.e. line 330).

#### Specific comments

Line 46: Suggest not using an acronym for five-year plan since the term is used only three times in the manuscript.

Lines 55-59: Although the sampling site is given with reference to Xinjiang Province, this area is not labeled on the map in Figure 1(a). This should be added.

Lines 125-133: The quality assurance/quality control of the sample analysis is comprehensive and well-described, demonstrating the quality of the presented data.

Lines 140-141: Please provide a brief description of the PSA used here along with the reference to the previous study.

Lines 165-167: What about Pb deposition post-2008? The first part of the sentence refers to both Pb and Cd, while the final part of the sentence describes only Cd. Please clarify.

Line 252: Statistical information for the significant positive correlations should be provided.

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Line 530: Typo in first word of the caption.

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