

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

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Overall I think Sierra-Hernandez and others present a comprehensive and interesting follow-up of the 1992 Guliya ice core and highlight some important trends in trace metals that have taken place since then. In general I only have minor comments and suggestions. The largest remaining question in my mind is how an NAO index is mechanistically related to higher EFs, so an explanation of that would be helpful.

Line 56- What is the “new Silk Road”? Line 65- Is this percentage (50-60%) meant to imply this is how much emissions can be attributed to motor vehicles? Lines 93-95- If more anthropogenic sources have emerged, then what new developments have taken place and are in use in this manuscript to attribute possible sources? Lines

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139-140- Fe is an interesting choice. Why not something else like Al? Or Ti? Lines 150-152- What is defined as “pre-industrial” in this case? Before what time period? Lines 192-194- I understand the difference between EF and Excess calculations, but why would some elements have significant trends for EF but not Excess? This needs some additional explanation. Lines 224-225- Since the EDGAR database excludes biomass burning and land use change, is it possible that some of the observed trends could be attributed to these processes? I know it will be hard to make these estimations without quantitative data, but these could be potentially significant. Lines 303-305- A brief mechanistic explanation about how a positive NAO index actually results in higher EFs would be useful. Lines 310-313- However, I think it's important to note that the drop from 1940-1970 is also when there is a gap/transition in the data. Neither coal nor oil consumption estimates extend fully back through this period. And while coal production is still reasonably high, it does start to decline. This is not to say that I don't believe the NAO is having an impact, but I think it's important to highlight that there are some gaps in the data. Lines 337-336- This is an interesting development and would seem to be a reversal of coal consumption declines since 2009 as previously noted in line 320. Was the decline in 2009 a temporary slow down then? Figure 5- The second y-axis on the right needs a label. Figure 6- Why is the 1992 core plotted as a 5-year running median while the 2015 core is a 5-year running mean?

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