

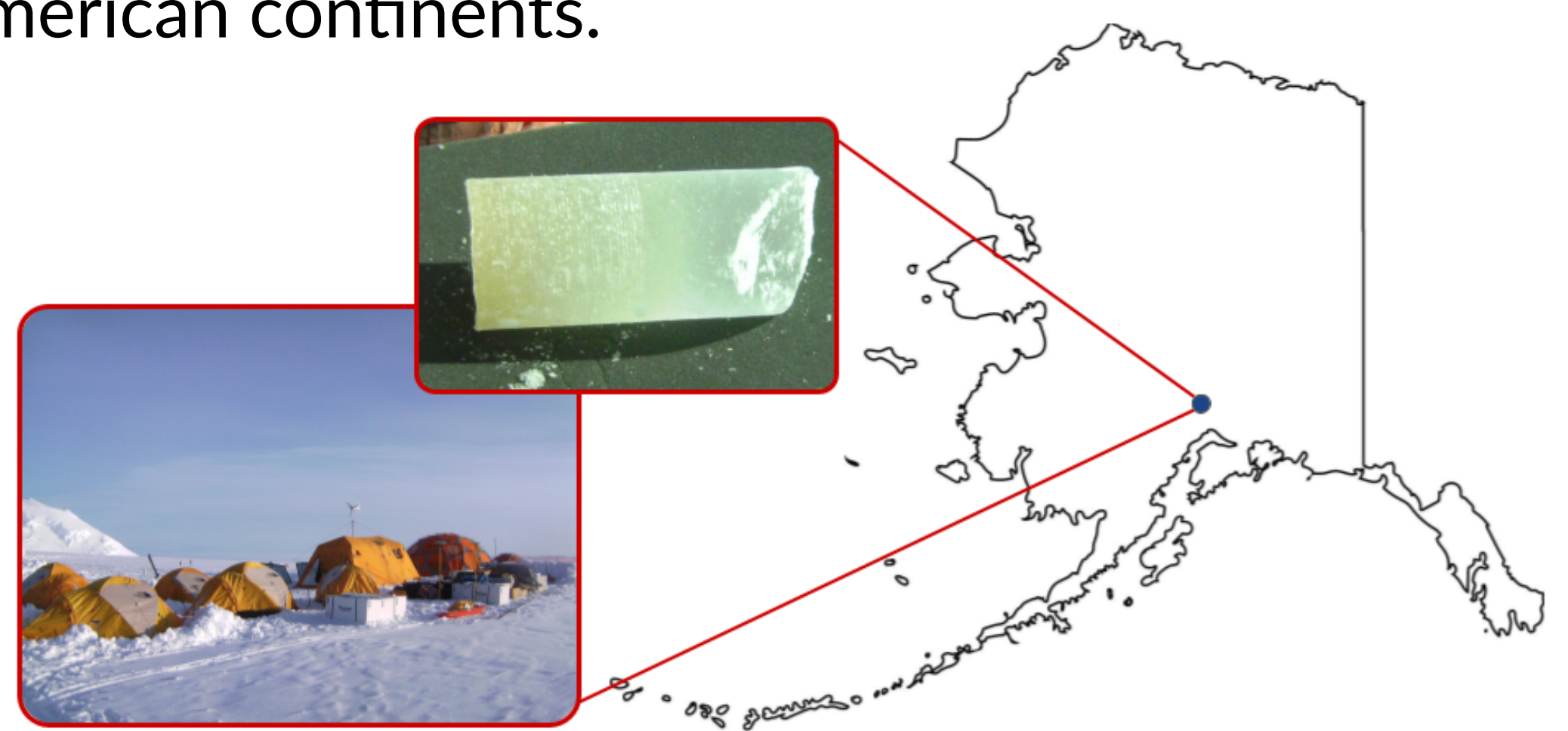
Novel lead (Pb) record tracing the impact of human policy and culture on Asian pollution emissions in the North Pacific atmosphere over the last 1,600 years

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BACKGROUND

- Lead (Pb) deposited in ice cores can show changes in human policy, culture, and technology across hundreds to thousands of years.
- Pb isotopes can be used to "fingerprint" pollution sources.
- Little work has been done in the North Pacific, despite its linkage between the Asian and North American continents.



METHODS

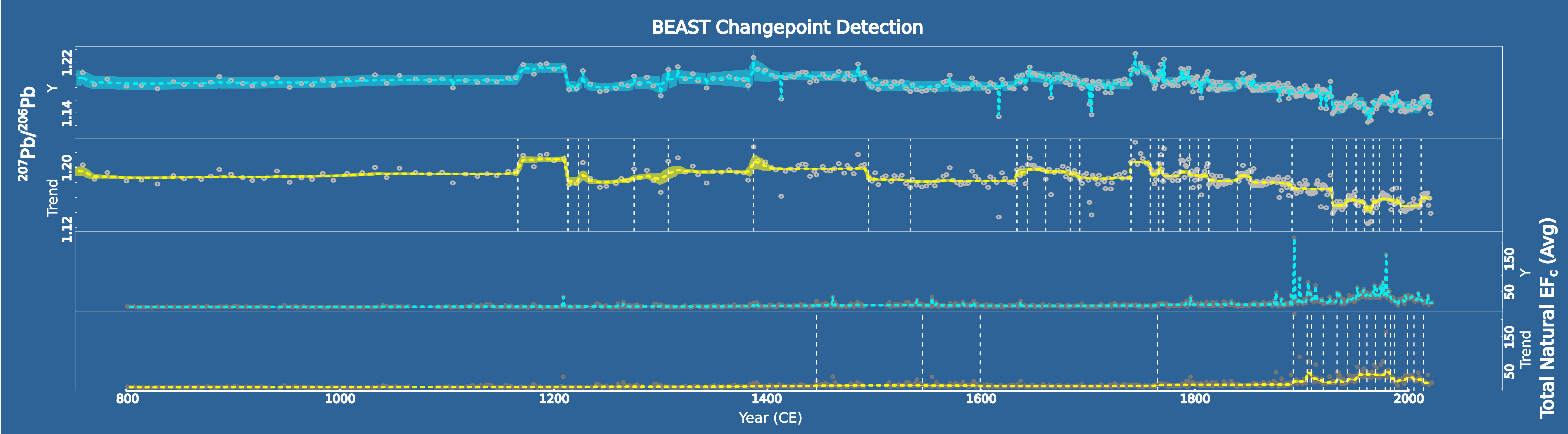
1. Collected ice cores from Begguya (Mt. Hunter; 62.95°N, 151.09°W, 3900 m asl).
2. Melted cores at Dartmouth College using a continuous ice core melting system with discrete sampling for Pb analyses.
3. Analyses conducted at the UMaine Climate Change Institute (CCI) ICP-MS facility.
4. Produced a ~1,600 year (350 to 2022 CE) record Pb concentration and isotope ratios.

RESULTS

- Beginning in the late 1970s, the concentration record shows a large increase (~10 to ~100 ng/g), coincident with the industrialization of China.
- Pb isotope ratios form distinct clusters, indicating multiple Pb pollution sources
- Interestingly, preliminary analysis of Pb isotope ratio data indicate regional variations. This implies a change in sampled air masses between North Pacific sites.

Human impact on the enviroment over time is traceable using lead (Pb) in ice cores.

Even the sources of the pollution can be determined.



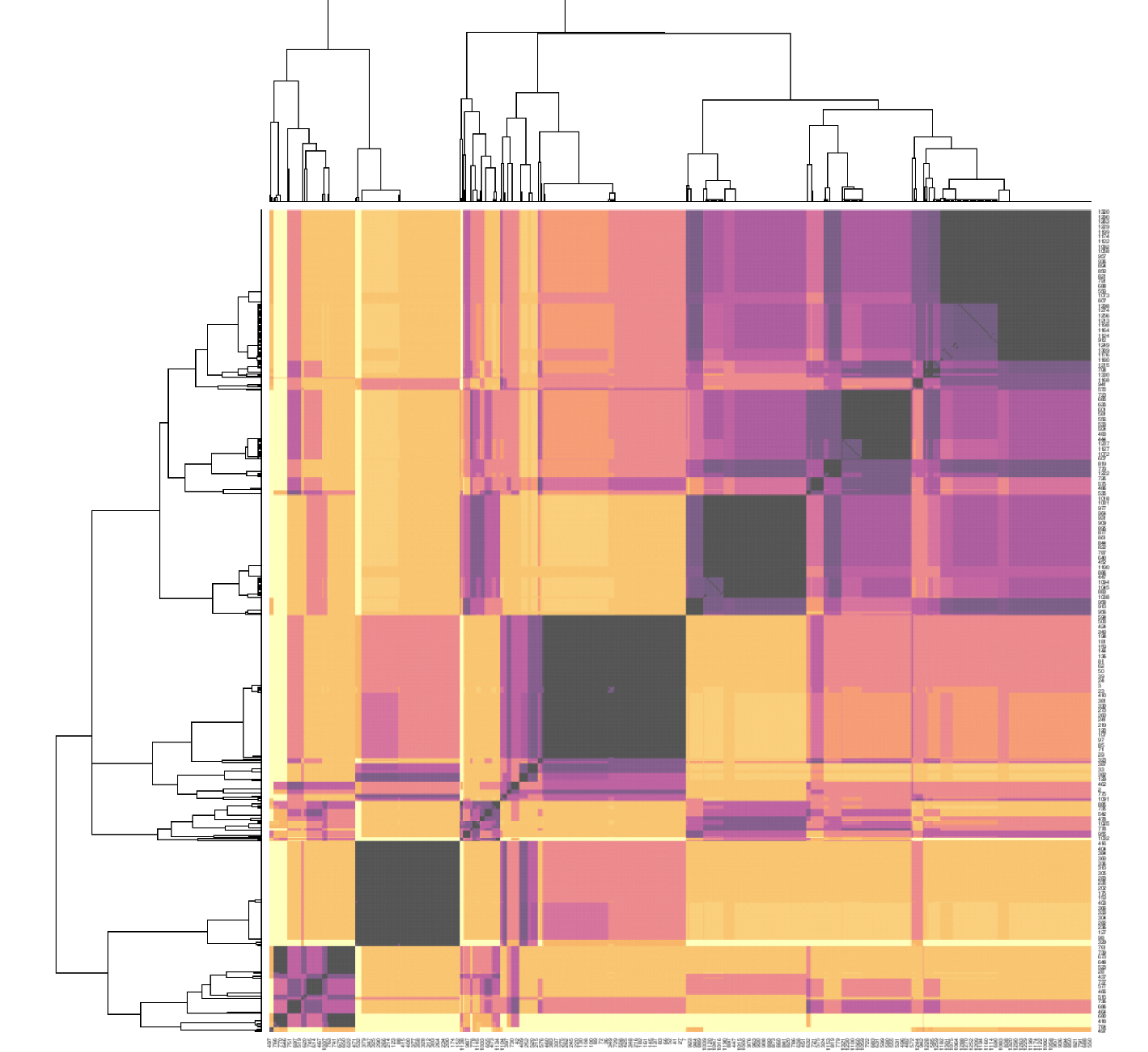
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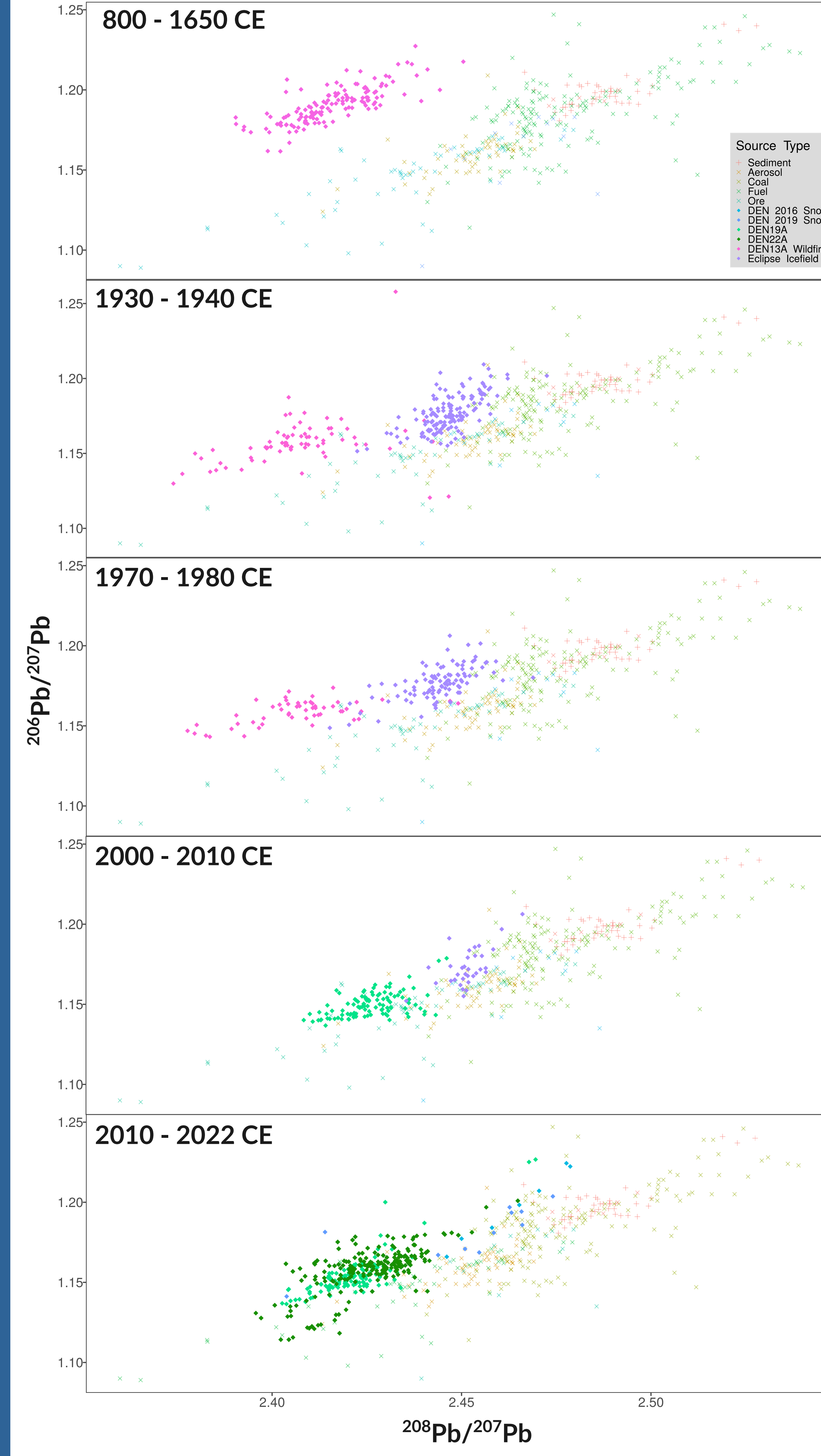
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Pb isotope data metaclustering (n = 1331, k = 5)



Pb Isotope ranges through time, plotted with Asian anthropogenic sources*

*Data from: This study; Koffman et al., 2022; Sierra-Hernández et al., 2024, Mukai et al., 2001, and Bi et al., 2017.



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