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Precious metals and the early Anthropocene: Evidences from the Peshawar Basin, Pakistan

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The recognition of the relationship between geosphere, biosphere and humans led to the introduction of the Anthropocene as a potential new time unit of Earth's history. Today, the most intensively discussed questions are IF and WHEN the anthropogenic influence on geological processes and the Earth System as a whole started to dominate and overwhelm natural processes. The Pleistocene–Holocene lacustrine-floodplain strata of the Peshawar Basin, NW Pakistan, provide ideal sedimentary archives to determine natural (pre-Anthropocene values) background geochemical values for various elements used as Anthropocene proxies. The basin, a historical gateway to the Indian-subcontinent, is the cultural, commercial and strategic hub of human civilization during the last 2500 years and thus an ideal candidate area to search for early anthropogenic signals. The Peshawar city and Hund (Swabi) remained the capitals of the Gandhara Civilization. Archaeological trenches at the Gor Khuttree (Peshawar) and Hund Museum (Swabi) present the ideal sites for radio-carbon dating that provides a consistent record dating back to at least 500 BCE and allowing the differentiation of various ruling dynasties and cultural periods in the area. Geochemical analysis of the high resolution samples from various horizons provides clear signals attesting anthropogenic influence in the distribution of As, Zn, Cu, Mo, Pb, Hg, Ag and Au. The geochemical proxies indicate limited anthropogenic Arsenic and Zinc contribution to the Earth's System in the area. The area experienced very high anthropogenic Copper contamination only during the Hindu Shahi period (800 – 1100 CE) a time when anthropogenic mercury and lead distribution also reached peak values. The striking finding is the consistently extremely high anthropogenic silver and gold contribution to system throughout the area's archaeological history. When correlated against the anthropogenic mercury contamination in the area; it appears that Hund (Swabi) was a major silver-gold panning site throughout its known history whereas Peshawar was the major silver-gold processing center and thus business hub of the area. However the extremely high mercury values at the Gor Khuttree since the Hindu Shahi period also point toward the decorative and ornamentation-related anthropogenic mercury contribution in addition to its use in gold-panning at Hund. Thus, the Peshawar Basin provides conclusive evidences verifying significant anthropogenic interference in the Earth's System since at least 500 BCE.