# Ice-core evidence of earliest extensive copper metallurgy in the Andes 2700 years ago

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Access to metal is considered as a main driving force for the socioeconomic development of cultures and countries. Advances in agriculture, warfare, transport, cookery, and the entire Industrial Revolution are impossible without metal. Historically, Andean copper (Cu) in particular was an essential resource of wealth for pre- and post-colonial societies and still plays a central economic role in many South American countries today. Despite of this importance the onset of extensive Cu metallurgy in South America is still debated.

Here we present a 6500-years Cu emission history for the Andean Altiplano, based on ice-core records from Illimani glacier in Bolivia, providing the first complete history of large-scale Cu smelting activities in South America. We find earliest anthropogenic Cu pollution during the Early Horizon period ~700–50 BC, and attribute the onset of intensified Cu smelting in South America to the activities of the central Andean Chiripa and Chavin cultures ~2700 years ago. This study provides for the first time substantial evidence for extensive Cu metallurgy already during these early cultures. In our work we further provide archeological artefacts to document changing Cu metallurgy in South America during the past 2700 years.