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Trace element profiles in enamel from histologically-controlled laser-based mass spectrometry reveal dietary cyclicity in *Pongo* and *Homo erectus* from Sangiran

Jülide Kubat (1,2,3), Alessia Nava (4), Luca Bondioli (5,6), M Christopher Dean (7), Clément Zanolli (8), Nicolas Bourgon (9), Anne-Marie Bacon (1), Fabrice Demeter (10,11), Beatrice Peripoli (6), Patrick Mahoney (4), Richard Albert (3,12), Jeremy McCormack (3,12), Tina Lüdeke (13,14), Christine Hertler (2), Ottmar Kullmer (2,15), Friedemann Schrenk (2,15), Wolfgang Müller (3,12)

1 - University of Paris, CNRS UMR 8045 Babel, Montrouge, France

2 - Department of Palaeoanthropology, Senckenberg Research Institute and Natural History Museum Frankfurt, Frankfurt am Main, Germany

3 - Frankfurt Isotope and Element Research Center (FIERCE), Goethe University Frankfurt, Frankfurt am Main, Germany

4 - Skeletal Biology Research Centre, School of Anthropology and Conservation, University of Kent, Canterbury, United Kingdom

5 - Bioarchaeology Service, Museum of Civilizations, Rome, Italy

6 - Department of Cultural Heritage, University of Padova, Italy

7 - Department of Earth Sciences Natural History Museum, London, United Kingdom

8 - Univ. Bordeaux, CNRS, MCC, PACEA, UMR 5199, 33600 Pessac, France

9 - Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

10 - Lundbeck Foundation GeoGenetics Centre, GLOBE Institute, Copenhagen, Denmark

11 - UMR 7206 EcoAnthropologie, Muséum National d'Histoire Naturelle, CNRS, Paris, France

12 - Institute of Geosciences, Goethe University Frankfurt, Frankfurt am Main, Germany

13 - Emmy Noether Group for Hominin Meat Consumption, Max Planck Institute for Chemistry, Mainz, Germany

14 - Senckenberg Biodiversity and Climate Research Centre, Frankfurt, Germany

15 - Department of Paleobiology and Environment, Institute of Ecology, Evolution, and Diversity, Goethe University Frankfurt, Frankfurt am Main, Germany

julide.kubat@parisdescartes.fr

The hominid fossil record from the Sangiran Dome in Java is among the largest in Southeast Asia and provide evidence of an early dispersal of *Homo erectus* onto the Sunda Shelf during the Early Pleistocene. The high morphological variability in the fossil record has been linked to an increased diversity in hominid taxa on Java during the Pleistocene. The seasonal availability of food resources, combined most likely with phases of connections between landmasses, and niche partitioning within hominids, may have contributed to this biodiversity. We performed the first geochemical analyses on fossil enamel of *Homo erectus*, *Pongo* and associated large mammal fauna from the Sangiran Dome to infer dietary strategies at ~weekly time resolution. Trace element ratios (Sr/Ca and Ba/Ca) were obtained by utilizing histologically-controlled spatially-resolved laser-ablation inductively-coupled-plasma mass spectrometry (LA-ICPMS) analyses. The degree of post-mortem diagenetic modification of the biogenic Sr/Ca and Ba/Ca signals was assessed using trace elements such as U and Mn. In addition, stable carbon and oxygen analyses ($\delta^{18}\text{O}$, $\delta^{13}\text{C}$) were performed on one *Homo erectus* premolar to estimate palaeoclimate and contribute to dietary assessments. Sr/Ca ratios of mammalian teeth with known trophic positions provide a trophic level framework for the hominid specimens. *Pongo* displays an herbivorous signal, whereas Sr/Ca ratios of *Homo erectus* are in range of omnivorous and carnivorous mammals. *Pongo* and

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Homo erectus exhibit annual patterns in their time-resolved Sr/Ca profiles. The distribution pattern of Sr/Ca (and Ba/Ca) along the enamel dentine junction in *Pongo* shows distinct seasonal cycles, with high and narrow peaks indicating the consumption of peculiar plant-based food resources probably during monsoon seasons, and low values reflecting different food availability during dry seasons. *Homo erectus* enamel has a relatively low annual Sr/Ca intra-tooth variability, suggesting that it was able to meet its nutritional needs more independently of seasonal oscillations.