Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.16479

Oceans of data: Comparing the sea spray effect on bioavailable strontium across islands

HANNAH F JAMES[1], CARINA T. GERRITZEN[1], MALTE WILLMES[2], RAINER GRÜN[3,4], PATRICE COURTAUD[5], MELANIE FABRE[6], MARIE BALASSE[6] AND CHRISTOPHE SNOECK[1]

[1]Vrije Universiteit Brussel
[2]Norwegian Institute for Nature Research
[3]The National Australian University
[4]Eberhard Karls Universität Tübingen
[5]Université de Bordeaux
[6]Muséum national d'Histoire naturelle

Presenting Author: hannah.james@vub.be

Strontium isotope ($^{87}Sr/^{86}Sr$) baseline maps are the foundation for ecological and bioarchaeological provenance studies. Generally, $^{87}Sr/^{86}Sr$ of soils, plants, and waterways, are predominantly influenced by the bedrock lithology and age. However, in coastal regions and islands $^{87}Sr/^{86}Sr$ of soils and plants can be uncoupled from the bedrock by the influence of sea spray [1,2]. This study investigates the influence of sea spray on bioavailable $^{87}Sr/^{86}Sr$ from islands of varying sizes, climates, and topographical settings. We make use of published bioavailable $^{87}Sr/^{86}Sr$ from Ireland [3] alongside unpublished datasets from the Mediterranean Sea - Corsica, and Menorca and Formentera (Baleares), and the Pacific Ocean - Grand Terre (New Caledonia) and Efate, Pentecost and Espiritu Santo (Vanuatu) [4]. These 842 $^{87}Sr/^{86}Sr$ measurements consist of paired plant and soil leachate samples, as well as triple plant (grass, shrub, tree) sampling.

By comparing the influence of sea spray across a large geologic and geographic gradient, the commonalities, and differences between islands can be examined. Across all islands, their different lithological origins are reflected in the range of bioavailable $^{87}Sr/^{86}Sr$, but in most cases the influence of sea spray is strongly observed. For example, on Grand Terre the wind predominantly comes from the south-east leading to plant and soil leachate $^{87}Sr/^{86}Sr$ being higher than $^{87}Sr/^{86}Sr$ measured in the underlying bedrock (~0.708 compared to ~0.705).

Variation within sampled archives at the same site is seen across all islands, with intra-site variation driven both by geologic and topographic processes. The distance to the coast from sampling sites, as well as modern land use, proximity to rivers, elevation, and slope is examined to identify other non-lithological factors influencing $^{87}Sr/^{86}Sr$. Lastly, predictive modelling of these $^{87}Sr/^{86}Sr$ data to create isoscapes for use in ecological and bioarchaeological studies will be presented, and the challenges encountered when mapping islands will be discussed.

References

[1] Göhring et al., 2023. Sci. Total Environ. 856, 158840
[2] Alonzi et al., 2020. J. Archaeol. Sci. Rep. 33, 102462.;
[3] Snoeck, et al., 2020. Sci. Total Environ. 712, 136248.
[4] Lees, 2010. Unpub MA thesis, ANU, Australia