Termitaria as regolith landscape attributes and sampling media in northern Australia

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Abstract

This study provides one of the first accounts of the relationships between termites, termitaria and the pedolith, towards developing their application as a biogeochemical sampling medium for mineral exploration. Mapping regolith–landforms, termitaria, and the associated termitaria biogeochemistry show that termites are an integral control on the organisation of trace metals in the landscapes of northern Australia. In particular, termites are important for transporting geochemical signatures from depth, through the pedolith and to the ground surface. This occurs by way of bioturbative and constructional activities of the mound-building termites, which in this study included *Nasutitermes triodiae*, *Amitermes vitiosus*, *Drepanotermes rubriceps*, *Tumulitermes hastilis* and *T. pastinator*. Termitaria from these species are mappable regolith–landform attributes at the local scale; this highlights their specific preferences for colony sites, such as access to vegetation, drainage, and the availability of construction materials. The mound-building termites featured in this study are also soil modifiers, altering the pedolith terms of both structure and chemistry. Developing an understanding of these processes has helped to refine a model for pedolith development through biotic processes, which is applicable to subtropical and tropical climatic regions, where termites act as important ecosystem engineers. This research project fills a niche for new scientific investigation of deeper regolith profiles and associated terrains; it moves away from theories of shallow soil development overlying an abiotic deep regolith, towards understanding pedolith development as wholly biotically driven. For mineral explorers this means that ore-related elements, such as Au, As and Zn, are re-organised and moved towards the land surface in settings such as buried Au-deposits and mineralisation in the Tanami region, and Pine Creek Orogen. A key finding within the study of the application of this technique is that the fine, silt-clay (<79 µm) from termitaria is capable of accurately delineating the surficial expression of buried Au mineralisation. Termitaria can therefore provide an accessible surficial biogeochemical sampling media that can be used in mineral exploration programs

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Signed,

Anna E. Petts

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Dedication

This thesis is dedicated to the strong, intellectual, wonderful women who have touched my life and given me the inspiration, and motivation, to achieve in whatever I choose to do. This is for you, Nancy Sue and Bette Belle.

Mom, Grandma, Friend, Listener, Loved.