Are Fungus-Growing Termites Major Contributors To Sediment Grain-Size Distributions In Subtropical Environments?

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1. Introduction

Fungus-growing termites (FGT) have long been considered as **ecosystem engineers** (Jones, 1990) for the modifications they bring to the soil, their ability to concentrate nutrients, and their capacity to create patches of fertile land. This work proposes to compare two distinct substrata one fine, one coarse, on which FGT built mounds offering the opportunity to compare the impact of FGT on two different and contrasting grain-size settings.

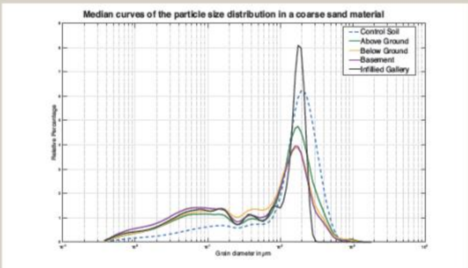
A young active fungus-growing termite mound in the Chobe savanna landscape

2. Methods

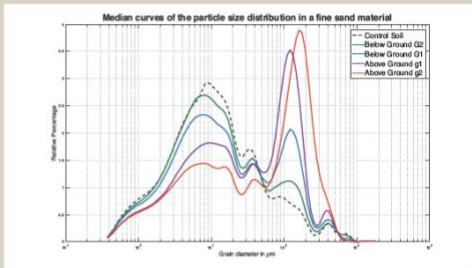
Two FGT mounds where selected in the Chobe Enclave, northen Botswana. In order to measure the sedimentary modifications carried out by termites between the parent materials and associated mounds, **two types of sediments were chosen, one coarse (dominated by sands) and one fine (dominated by fine diatomeceous silt). 258 samples** have been characterized using a laser **grain-size analyzer** and obtained curves processed using **end-member mixing analysis (EMMA)** as well as **curve deconvolutions.** 10 specific distribution groups were obtained, each being characterized by its median curve, as shown in the Results.

Location of the two studied termite mounds in a subtropical environment of Botswana

3. Results

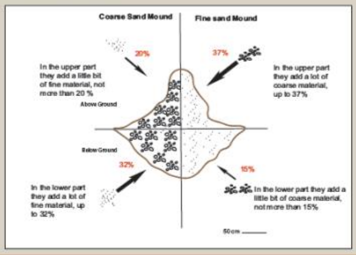


In order to meet their functional requirements, termites, when in a coarse sand context, tend to enrich their mound in fine material, this especially in the lower part.



In order to meet their functional requirements, termites, when in a fine sand context, tend to enrich their mound in coarse sand material, this especially in the upper part.

Although FGT have obvious specific capabilities to change their environment, there are only a few studies that have highlighted their ability to modify the grain-size distributions of the sediments and soils that are forming the environment where they develop (Abe, 2009; Jouquet and Lepage, 2002). Fungus-growing termites have the capacity (i) to adapt to any kind of parent material to build their mounds, (ii) and to enrich or deplete this parent soil to meet their texture requirements in terms of mound stability and appropriate settings to insure the success of the colony.



4. Conclusion

It is demonstrated that, whatever a given parent material, the result in their construction will converge to a required optimum; in other words, by selecting, transporting, and mixing at will the various grain-sizes available from the surrounding environment, fungus-growing termites reach the mandatory texture adapted to the functions and properties for their mounds. Once abondonned and detroyed by erosion, the mounds modify the grain-size distribution of the sediment on which they developed, changing the sedimentological parameters of the geological formation.

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Fungus-growing termites (FGT) have long been considered as ecosystem engineers (Jones, 1990) for the modifications they bring to the soil, their ability to concentrate nutrients, and their capacity to create patches of fertile land. Although FGT have obvious specific capabilities to change their environment, there are only a few studies that have highlighted their ability to modify the grain-size distributions of the sediments and soils that are forming the environment where they develop (Jouquet, 2002). Therefore, the aim of this study is to document the potential impact of FGT in an environment in which sands are dominating grain-size distributions, but also, where some concentrations of fine material, in this case diatomites, are found, offering the opportunity to compare the impact of FGT on two different and contrasting grain-size settings. In other words, this work proposes to compare two distinct substrata one fine, one coarse, on which FGT built mounds. The sedimentary modifications carried out by termites between these two parent materials and associated constructed mounds are assessed using techniques mostly based on grain-size distributions and soil micromorphology. Only very few studies have combined both methods to highlight the role FGT play in the selection of grain-sizes to build their epigeal mounds (Abe, 2009). In order to conduct this investigation, two FGT mounds where selected in the Chobe Enclave, northen Botswana, in the surroundings of the VTR Research Center. Two types of sediments were chosen, one coarse (dominated by sands) and one fine (dominated by fine silt). The key questions of this study lie on the capacity of fungus-growing termites (i) to adapt to any kind of parent material to build their mounds, (ii) and to enrich or deplete this parent soil to meet their texture requirements in terms of mound stability and appropriate settings to insure the success of the colony. Therefore, it is demonstrated that, whatever a given parent material, the result in their construction will converge to a required optimum; in other words, by selecting, transporting, and mixing at will the various grain-sizes at disposition from the surrounding environment, fungus-growing termites reach the mandatory texture adapted to the functions and properties for their mounds.

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