



Contribution ID: 276

Type: **Poster Presentation**

Wind erosion suppression using biological methods revisited: The use of microbial/enzymatic-induced carbonate precipitation and biopolymers

Tuesday, 23 May 2023 16:10 (1h 30m)

Dust emission induced by wind erosion affects crop production, the aviation industry, and human health, to name a few. Wind-borne dust particles can have several environmental and health implications. They can carry pathogenic microorganisms and thereby pose health threats. Besides, having entered surface water and oceans, they change water chemistry and quality, subsequently affecting the native ecosystem. Dust emissions not only affect the inhabitants of their source of origin but also have detrimental effects on the life quality of the settlements far away. Thus, dust emission is a global environmental challenge.

Over the past few decades, the need to achieve minimum greenhouse gas emissions has led scientists to search for new compounds and techniques for wind erosion suppression. Having encountered naturally cemented sedimentary formations such as Stromatolite in Western Australia, the idea of a bio-mediated or bio-inspired technique for soil stabilization has appealed to several studies. Therefore, there have been recently numerous studies on the use of biological methods such as microbial carbonate precipitation (MICP) [1-3], enzymatic carbonate precipitation [4-7], and biopolymers for wind erosion mitigation [8].

In this contribution, we briefly introduce these methods, and their main stabilization mechanisms, such as the involved biogeochemical reactions, types of microorganisms, and the induced mechanical effects. Care has been taken to highlight the merits and demerits of each approach and elucidate the challenges in their field-scale applications. Finally, future research perspectives and directions are introduced.

Participation

In-Person

References

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Session Classification: Poster

Track Classification: (MS05) Biochemical processes and biofilms in porous media