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**Innovations and advancements to Enhanced Weathering**
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Beyond the progressive vast and intense emissions reduction strategies, forecasted climate scenarios reveal that huge amounts of $CO_2$ need to be removed from the atmosphere to avert climate warming above the dangerous levels of 1.5°C. Several Negative Emission Technologies (NET) have been proposed and research efforts to enhance its range of carbon drawdown efficiency, costs, environmental influence, etc. are being intensified. Examples of such NETs include Ocean fertilization and afforestation/Reforestation (which are organic pathways) as well as enhanced weathering and mineral carbonation (which are inorganic pathways). Of interest for this study is enhanced weathering (EW) and the innovative advancement in its knowledge. Based on reviews and research findings, here, we show EW's potential carbon dioxide removal (CDR), nutrient replenishment, and soil improvement. Its reaction rates can be accelerated by increasing the reaction temperature, decreasing the particle size and high surface area, increasing the pressure, modulate the solution chemistry through a catalyst; which could be organic or organic additives, and hypothetically biologically (such as microorganisms and bacteria). We identified up-to-date research gaps and innovative advancements necessary to maximize the potential of EW, such as its quantification, managerial demands, comprehensive knowledge, geomicrobiology, climate-based limitations, beneficial influence, and the possibility of re-emissions. Also, we argue that EW is most suitable for forest soil in tropical regions and a perfect strategy for efficient land use. Its implications for marginal lands and the reclamation of post-mining sites were discussed. For a comprehensive pathway of both organic and inorganic carbon removal and other beneficial influence of EW, we recommend the combination of different NETs.
**Keywords:** Negative Emission Technologies (NETs), inorganic and organic carbon