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Large global variation in the carbon dioxide removal potential of seaweed farming due to biophysical constraints

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ABSTRACT

Estimates suggest that over 4 gigatons per year of carbon dioxide (Gt-CO2 year−1) be removed from the atmosphere by 2050 to meet international climate goals. One strategy for carbon dioxide removal is seaweed farming; however its global potential remains highly uncertain. Here, we apply a dynamic seaweed growth model that includes growth-limiting mechanisms, such as nitrate supply, to estimate the global potential yield of four types of seaweed. We estimate that harvesting 1 Gt year−1 of seaweed carbon would require farming over 1 million km2 of the most productive exclusive economic zones, located in the equatorial Pacific; the cultivation area would need to be tripled to attain an additional 1 Gt year−1 of harvested carbon, indicating dramatic reductions in carbon harvest efficiency beyond the most productive waters. Improving the accuracy of annual harvest yield estimates requires better understanding of biophysical constraints such as seaweed loss rates (e.g., infestation, disease, grazing, wave erosion).

Full Text:

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