Carbon Dioxide Removal Estimation Method to Remove Cumulative Anthropogenic CO_2 Emissions Distribution to Natural Sinks

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Abstract

We provide a method to estimate how to determine the amount of carbon to remove to affect the cumulative emitted anthropogenic carbon dioxide for Carbon Dioxide Removal (CDR) targets when climate modeling is unavailable. Additionally, comparing the growth in anthropogenic carbon dioxide emissions to the late-Holocene atmospheric carbon dioxide concentration for historical context and present hypothetical emissions declines for climate restoration. We explore the recent historical context of cumulative anthropogenic carbon dioxide emissions and how it has induced increases to each of the natural sinks: the oceans, atmosphere, and land. The magnitude of cumulative emissions is obscured when only considering yearly emissions change. A possible baseline CO2 concentration of 280.9 ± 0.9 ppm for pre-human change stretching from 600 BCE to 1750 CE was found and could be explored separately. We show multiple speculative emission declines to zero cumulative CO2 emissions to reach complete climate restoration. For groups seeking climate restoration, which completes in less than half a human lifespan, a pair of emission declines are presented, which complete in twenty years. The declines bound a possibility horizon of complete climate restoration ending with 2100 targets. There is a tradeoff between how fast the climate can be restored compared to how long humans can continue to emit carbon dioxide from the use of fossil fuels and land use change. We conclude with hypothesized climate reversibility through hypothesized emissions declines.