Earth's Future

Supporting Information for

Global-scale shifts in rooting depths in the Anthropocene present unexamined consequences in critical zone functioning

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Introduction

Here we include additional figures and a data table, generated via the same methods detailed in the main text. The figures represent an extension of the figures presented in text and the table represents alternate ways of calculating rooting depth metrics using different representations of rooting depths for desert biomes.

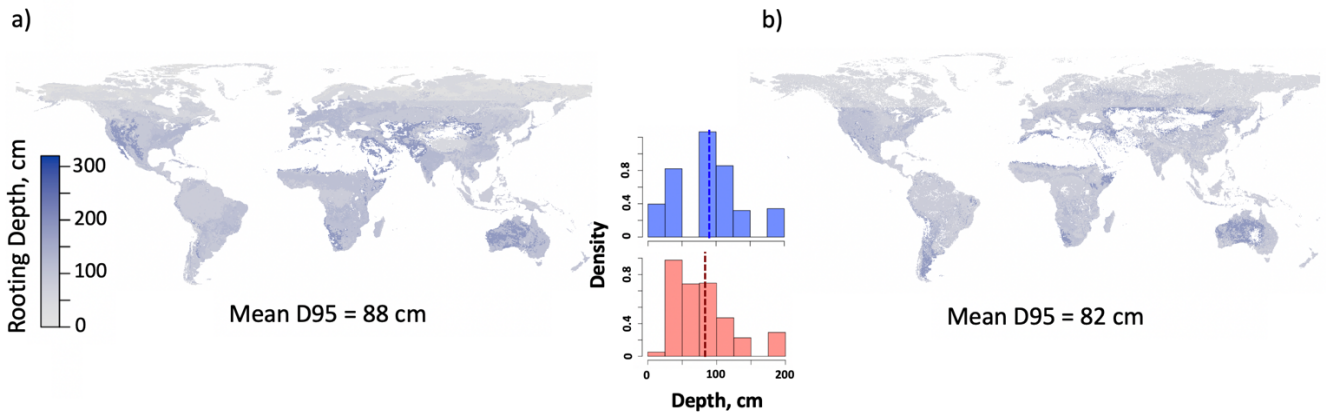

Figure S1. Comparison of potential (A) and contemporary (B) distributions of depth to 95% rooting biomass (D95) across the globe. Inset histograms display the distribution of rooting depths in each map, with dashed lines marking the means of the two datasets (blue histogram represents potential vegetation, red contemporary). Appearance of a distinct color change from dark blue to light grey in Asia and Canada at 60°N is an artifact of restricted maximum rooting depth assignments at northern latitudes used in our calculations to account for growth limitations imposed by frozen soils. Appearance of a distinct color change from dark blue to light blue and grey in Asia and Canada at 50°N reflects reassignment of mixed forests to the boreal forest class above this latitude (Brandt et al., 2013; Price et al., 2013).

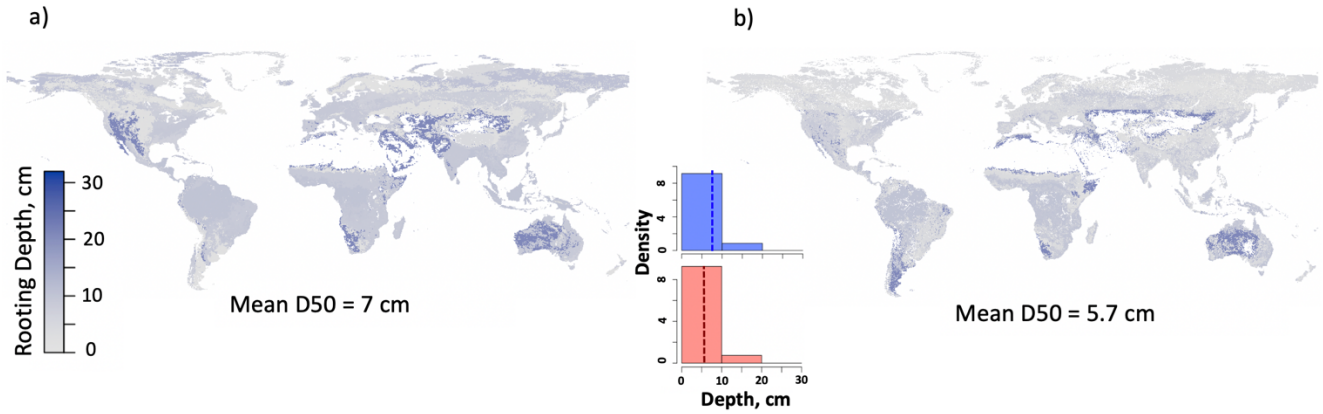

Figure S2. Comparison of potential (A) and contemporary (B) distributions of depth to 50% rooting biomass (D50) across the globe. Inset histograms display the distribution of rooting depths in each map, with dashed lines marking the means of the two datasets (blue histogram represents potential vegetation, red contemporary). The appearance of a distinct color change from blue to light grey in Asia and Canada at 60°N is an artifact of restricted maximum rooting depth assignments at northern latitudes used in our calculations to account for growth limitations imposed by frozen soils. Appearance of a distinct color change from dark blue to light blue and grey in Asia and Canada at 50°N

reflects reassignment of mixed forests to the boreal forest class above this latitude (Brandt et al., 2013; Price et al., 2013).

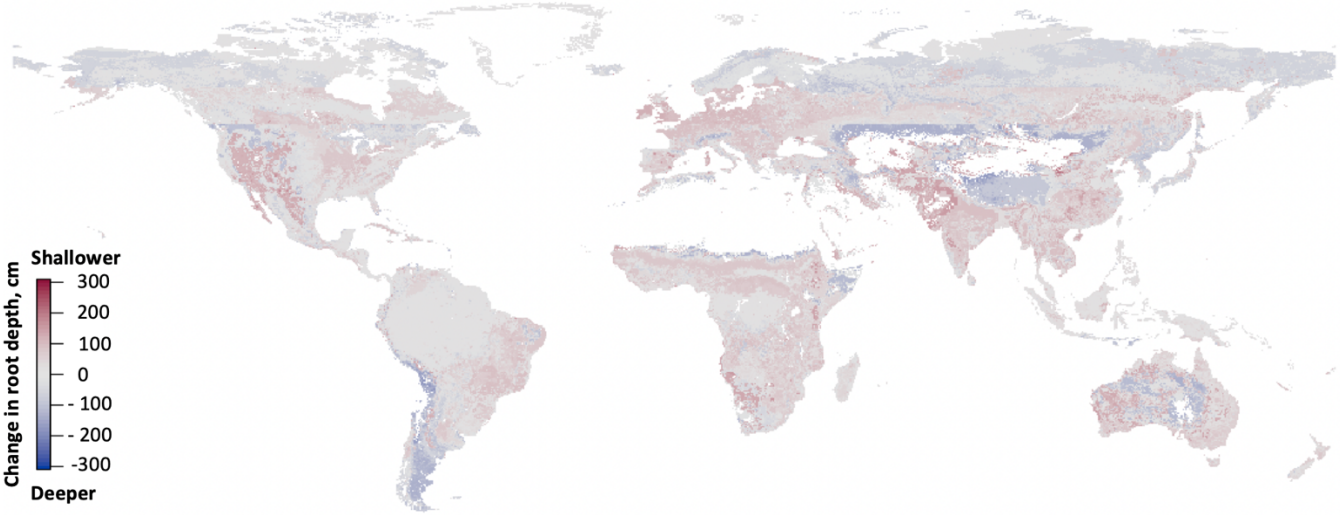

Figure S3. Change in depth to 95% rooting biomass (D95) due to differences in potential vegetation distributions compared to contemporary vegetation distributions. Red regions denote shallower roots in contemporary systems, while blue regions denote deeper roots in contemporary systems when compared to their potential vegetation distributions. Appearance of a distinct color change from blue to light grey in Asia and Canada at 50°N reflects reassignment of mixed forests to the boreal forest class above this latitude (Brandt et al., 2013; Price et al., 2013).

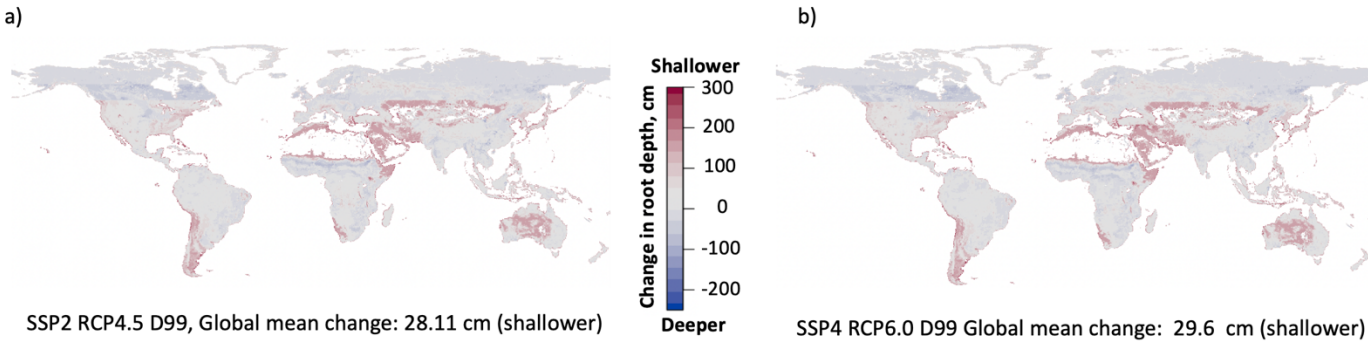

Figure S4. Change in depth to 99% rooting biomass (D99) due to differences between contemporary rooting depth distributions and anticipated rooting distributions under two projected SSP RCP scenarios for the year 2100; SSP2 RCP4.5 (a) and SSP4 RCP6.0 (b). Grey and red colors indicate root depth truncation and blue indicates elongation.

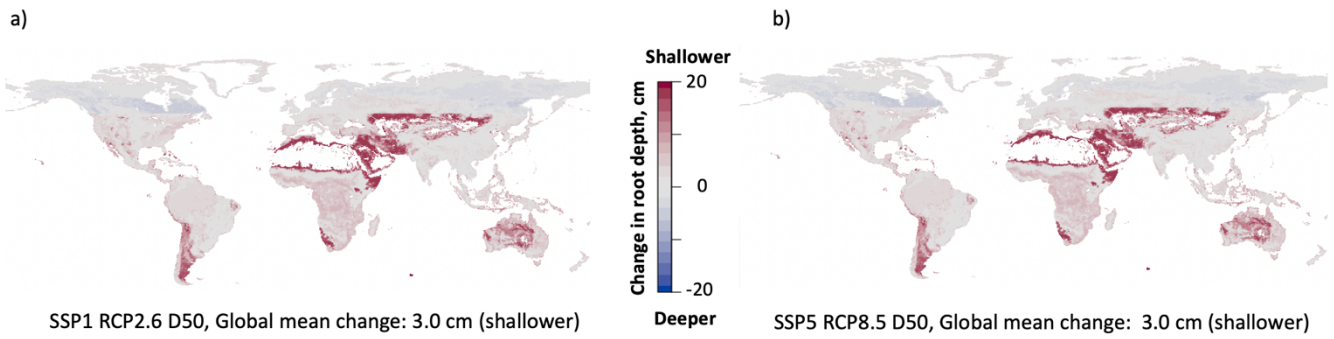

Figure S5. Change in depth to 50% rooting biomass (D50) due to differences between contemporary rooting depth distributions and anticipated rooting distributions under two projected SSP RCP scenarios for the year 2100 (results are similar for both scenarios); SSP1 RCP2.6 (a) and SSP5 RCP8.5 (b). These two maps represent scenarios of greatest projected change and least projected change. Grey and red colors indicate root depth truncation and blue indicates elongation.

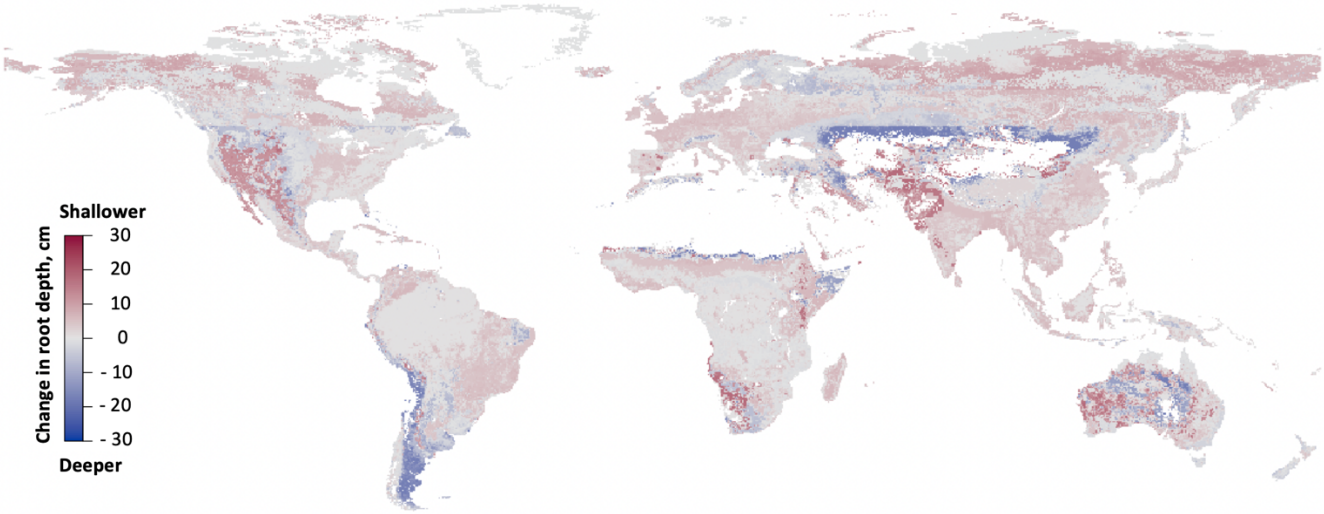

Figure S6. Change in depth to 50% rooting biomass (D50) due to differences in potential vegetation distributions compared to contemporary vegetation distributions. Red regions denote shallower roots in contemporary systems, while blue regions denote deeper roots in contemporary systems when compared to their potential vegetation distributions. Appearance of a distinct color change from dark blue to light grey in Asia and Canada at 50°N reflects reassignment of mixed forests to the boreal forest class above this latitude (Brandt et al., 2013; Price et al., 2013

Table S1. Mean global rooting depth metrics with 95% confidence intervals for potential and contemporary land cover distributions under two scenarios of user assumptions. The third column displays the difference in cm between potential and contemporary root distributions and the percent change in parentheses. The first three rows indicate global means excluding true desert regions. The second three rows include true deserts in calculations of global mean rooting depth metrics but set roots in those systems to a depth of zero.

Metric	Potential Mean Rooting Depth (m, 95% CI)	Contemporary Mean Rooting Depth (m, 95% CI)	Change From potential (cm)
D99 (Desert excluded)	1.50 (+/- 0.001)	1.41 (+/- 0.0001)	-8.15 (5.4%)
D95(Desert excluded)	0.88 (+/- 0.0006)	0.82(+/- 0.00006)	-4.93 (5.6%)
D50 (Desert excluded)	0.07 (+/- 0.00007)	0.057 (+/- 0.000008)	-1.45 (20.7%)
D99 (Desert roots set to 0m)	1.35 (+/- 0.0011)	1.22 (+/- 0.0001)	-14.7 (10.9%)
D95(Desert roots set to 0m)	0.79 (+/- 0.0006)	0.72 (+/- 0.00007)	-11.1 (14.1%)
D50 (Desert roots set to 0m)	0.066 (+/- 0.00007)	0.05 (+/- 0.000007)	-1.7 (25.8%)