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*Soil Research*

### Supplementary Material

#### **Estimating the attainable soil organic carbon deficit in the soil fine fraction to inform feasible storage targets and de-risk carbon farming decisions**

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## The Supplement

Table S1. Description of the environmental covariates used in the spatial modelling framework

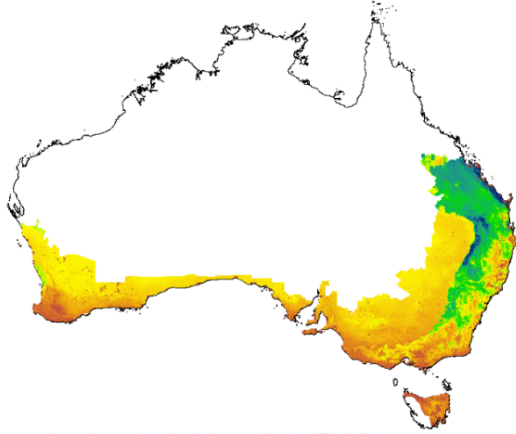
Category	Covariate name	Native spatial resolution	Source	Abbreviation
Climate	Mean annual aridity index	90 m	CSIRO	Clim_ADM
Climate	Average Pan Evaporation - Annual	5 km	BOM	Clim_evapann
Climate	Average daily max temperature - Annual	5 km	BOM	Clim_maxann
Climate	Average daily mean temperature - Annual	5 km	BOM	Clim_meanann
Climate	Average daily min temperature - Annual	5 km	BOM	Clim_minann
Climate	Average Rainfall - Annual	5 km	BOM	Clim_rainan
Climate	Average Rainfall - Spring	5 km	BOM	Clim_rainspr
Climate	Average Rainfall - Summer	5 km	BOM	Clim_rainsum
Climate	Average Rainfall - Winter	5 km	BOM	Clim_rainwin
ParentMaterial	Radiometric grid of Australia (Radmap) v4 2019 - Potassium	0.001 Degrees	Geoscience Australia	PM_radmap_v4_2019_filtered_pctk_GAPFilled
ParentMaterial	Radiometric grid of Australia (Radmap) v4 2019 - Thorium	0.001 Degrees	Geoscience Australia	PM_radmap_v4_2019_filtered_ppmt_GAPFilled
ParentMaterial	Radiometric grid of Australia (Radmap) v4 2019 - Thorium Potassium ratio	0.001 Degrees	Geoscience Australia	PM_radmap_v4_2019_ratio_tk_GAPFilled
ParentMaterial	PM_Silica		Geoscience Australia	PM_Silica
ParentMaterial	Weathering Index	90 m	Geoscience Australia	PM_Weathering_Index
Relief	3 second SRTM Derived Digital Elevation Model (DEM) Version 1.0	3 arc-second	Geoscience Australia	Relief_dems_3s_mosaic1
Relief	Multi-resolution Valley Bottom Flatness (MrVBF)	3 arc-second	CSIRO	Relief_mrvbf_3s_mosaic
Relief	Topographic Wetness Index derived from 1" SRTM DEM-H	3 arc-second	CSIRO	Relief_twi_3s

Soil	Soil clay mineral - Illite	90 m	CSIRO	Soil_Illite
Soil	Soil clay mineral - Kaolinite	90 m	CSIRO	Soil_Kaolinite
Soil	Soil clay mineral - Smectite	90 m	CSIRO	Soil_Smectite
Soil	Sum_clay_silt_0_30	90 m	CSIRO	Sum_clay_silt_0_30
Vegetation	MODIS derived mean fractional cover – Bare soil		CSIRO	Veg_Modis_FractCover_Mean_BS
Vegetation	MODIS derived mean fractional cover – Non Photosynthetic Vegetation		CSIRO	Veg_Modis_FractCover_Mean_NPV
Vegetation	MODIS derived mean fractional cover –Photosynthetic Vegetation		CSIRO	Veg_Modis_FractCover_Mean_PV

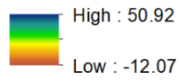
Table S2. The summary of the 90<sup>th</sup> quantile regression coefficients

<b>Model names</b>	<b>Slope</b>	<b>Intercept</b>
Depth 0-0.10 m & precipitation <= 600mm	6.63	10.02
Depth 0-0.10 m & precipitation > 600mm	31.24	7.55
Depth 0.10-0.30 m & precipitation <= 600mm	4.73	3.09
Depth 0.10-0.30 m & precipitation > 600mm	15.28	3.43

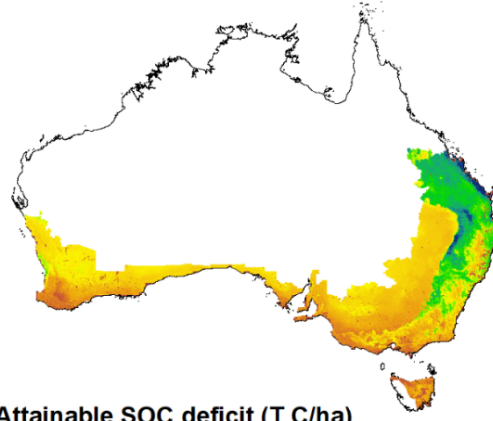
a) Depth interval 0-0.10 m  
Pecentile - 0.05



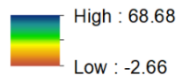
Attainable SOC deficit (T C/ha)



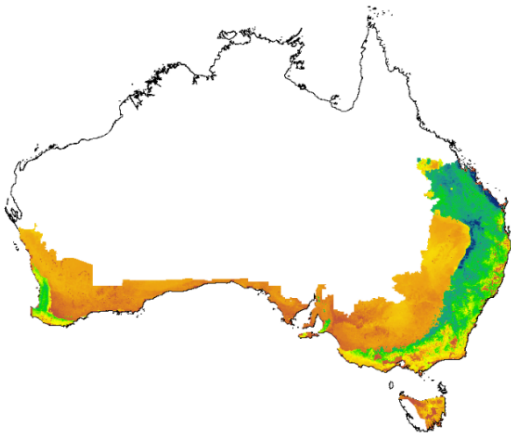
Pecentile - 0.95



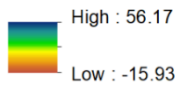
Attainable SOC deficit (T C/ha)



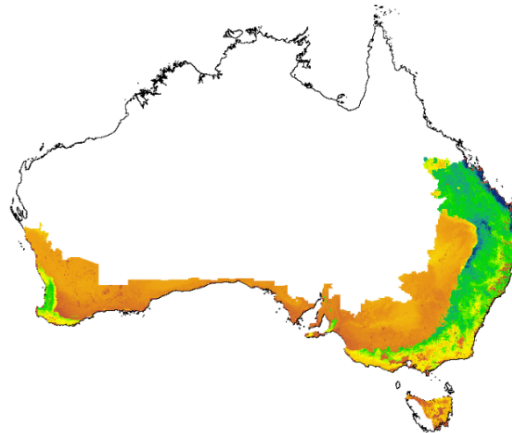
b) Depth interval 0.10-0.30 m  
Pecentile - 0.05



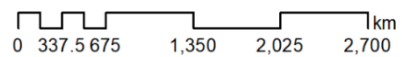
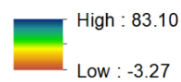
Attainable SOC deficit (T C/ha)



Pecentile - 0.95



Attainable SOC deficit (T C/ha)



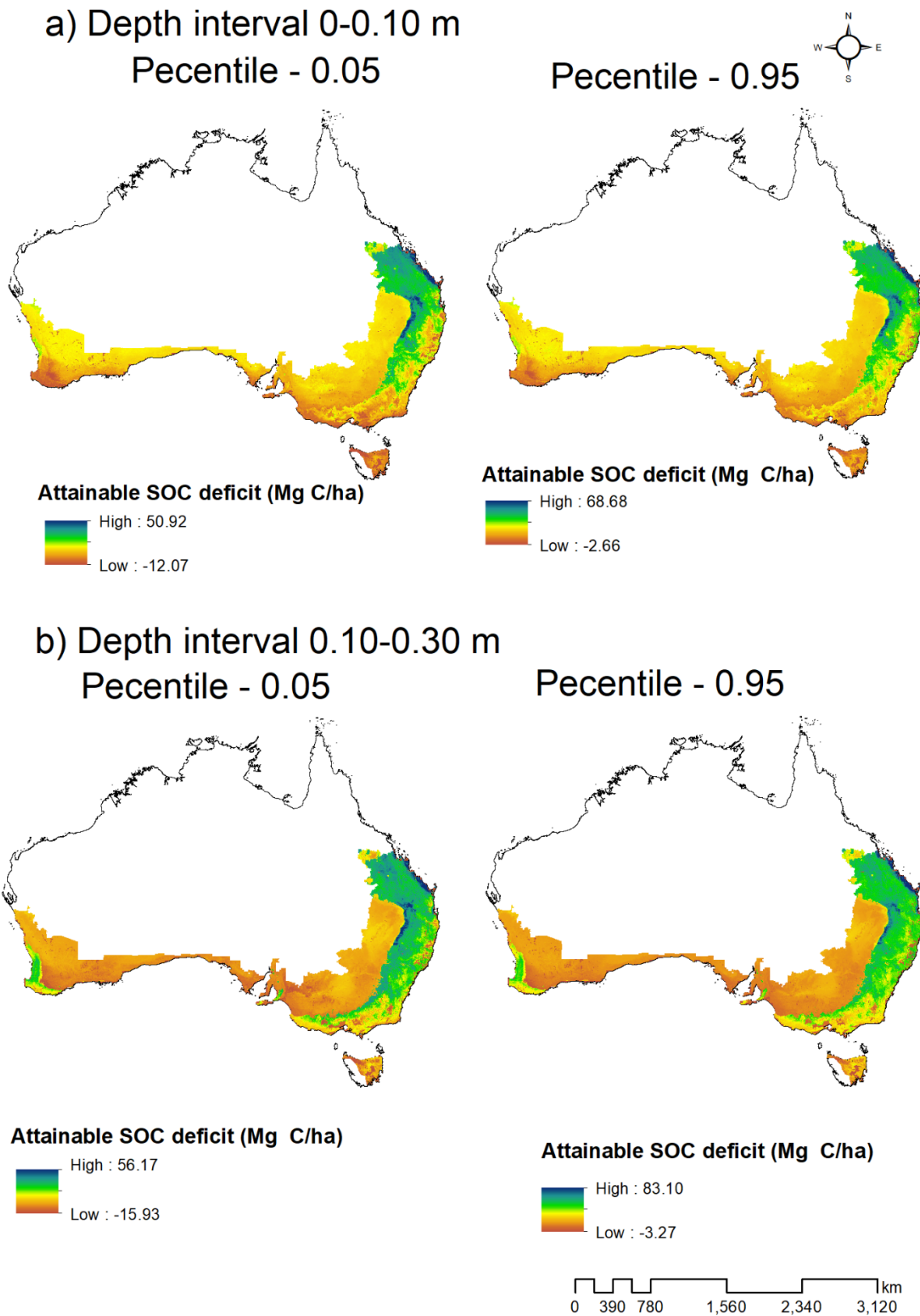


Fig. S1. The 5<sup>th</sup> (lower) and 95<sup>th</sup> (upper) percentiles for the estimated soil organic carbon deficit in the fine fraction of the soil for 0-0.10 and 0.10-0.30 m depth interval respectively