



Supplement of

Mapping soil organic carbon fractions for Australia, their stocks, and uncertainty

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Figure S1: Comparison of the sum of predicted soil organic carbon (SOC) fractions and measured total organic carbon (TOC) for three spectral models.

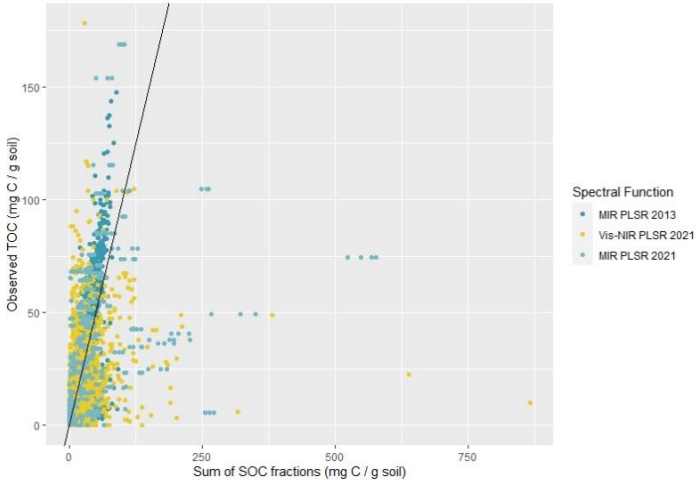


Figure S2: Boxplots of distribution of soil organic carbon among fractions by biome. Mineral-associated SOC (MAOC), particulate organic carbon (POC), and pyrogenic organic carbon (PyOC).

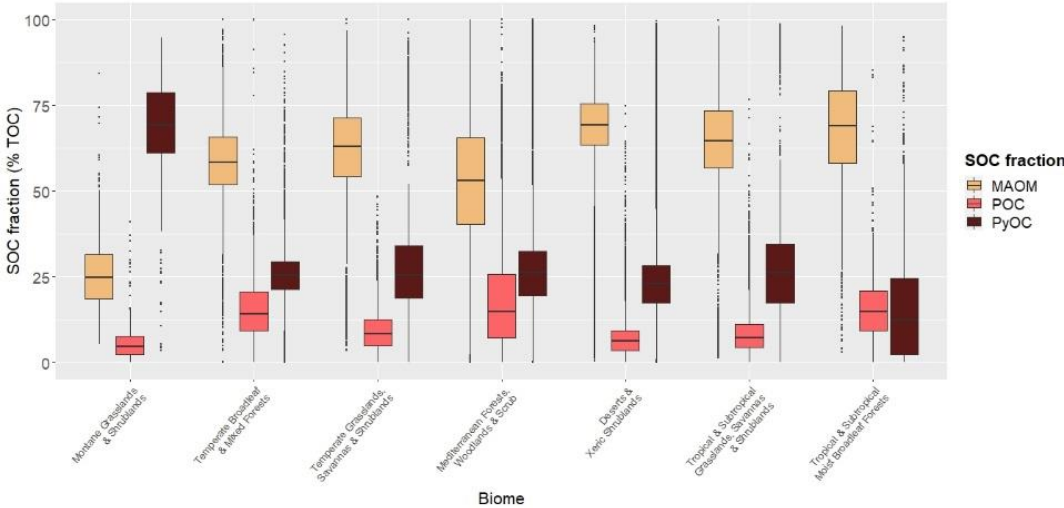
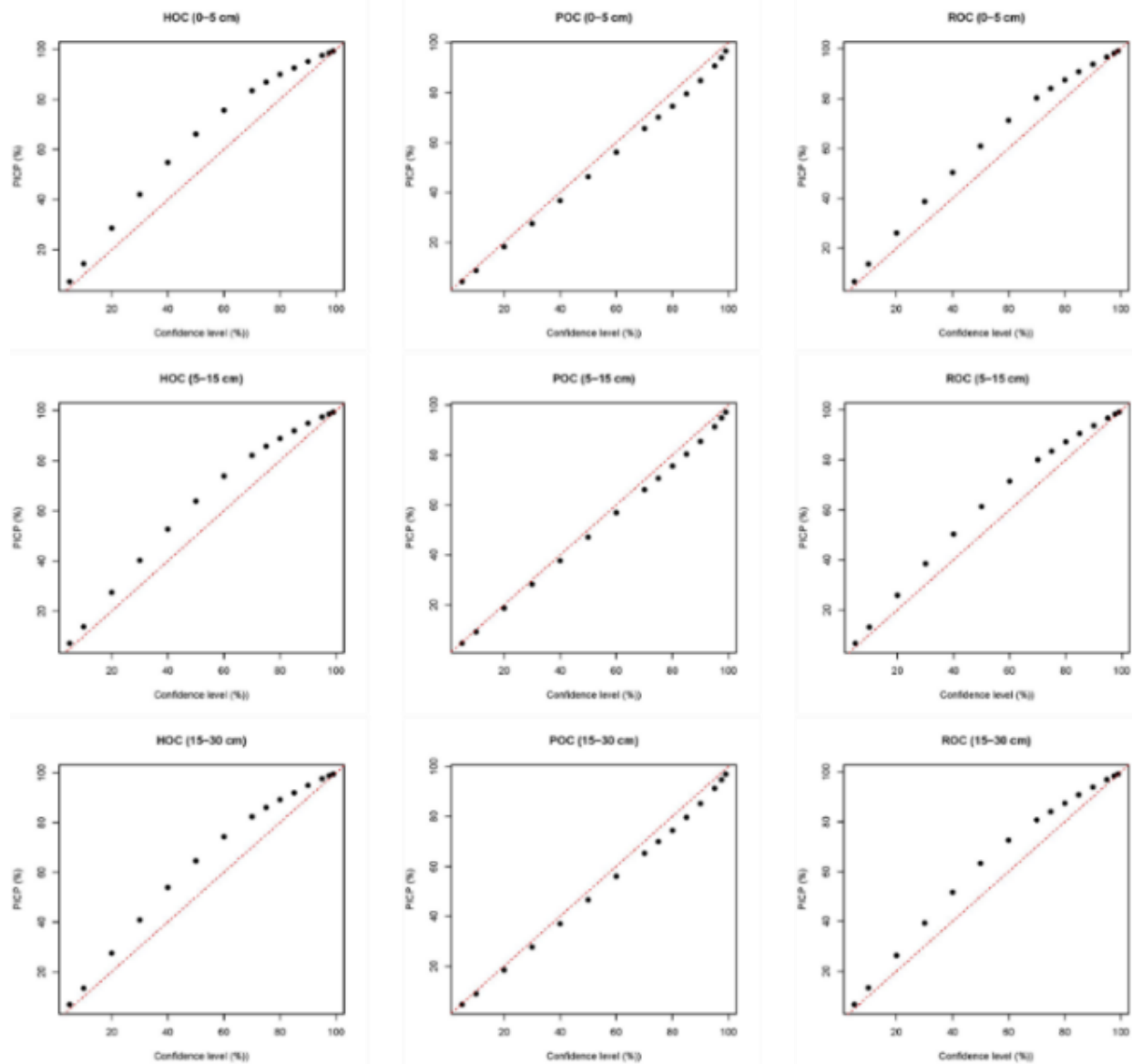


Figure S3: Prediction interval coverage probability (PICP) (%) for different confidence levels for the SOC fractions and three depth intervals. The PICP was calculated with 10-fold cross validation.



SOC fractions contribution to TOC (% SOC)

Figure S4: SOC fractions (% SOC) for the 0-5 cm depth interval. a) Upper prediction limit (95 percentile), b) mean, and c) lower prediction limit (5 percentile). MAOC: mineral-associated SOC; POC: particulate organic carbon; PyOC: pyrogenic organic carbon.

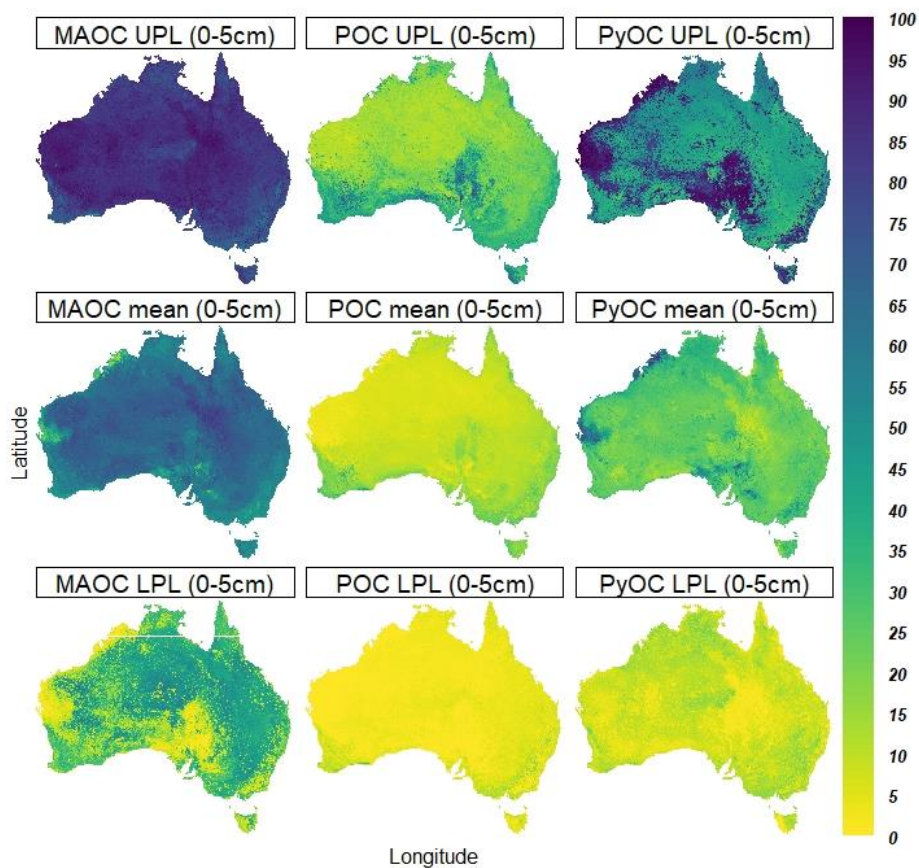


Figure S5: SOC fractions (% SOC) for the 5-15 cm depth interval. a) Upper prediction limit (95 percentile), b) mean, and c) lower prediction limit (5 percentile). MAOC: mineral-associated SOC; POC: particulate organic carbon; PyOC: pyrogenic organic carbon.

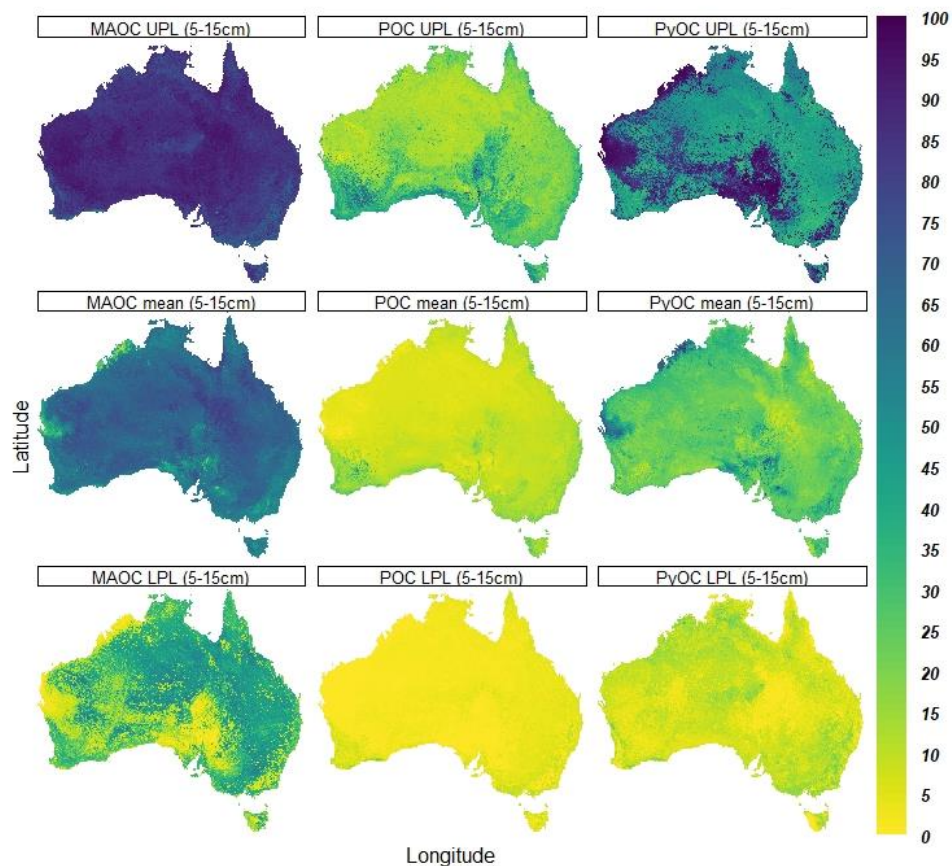
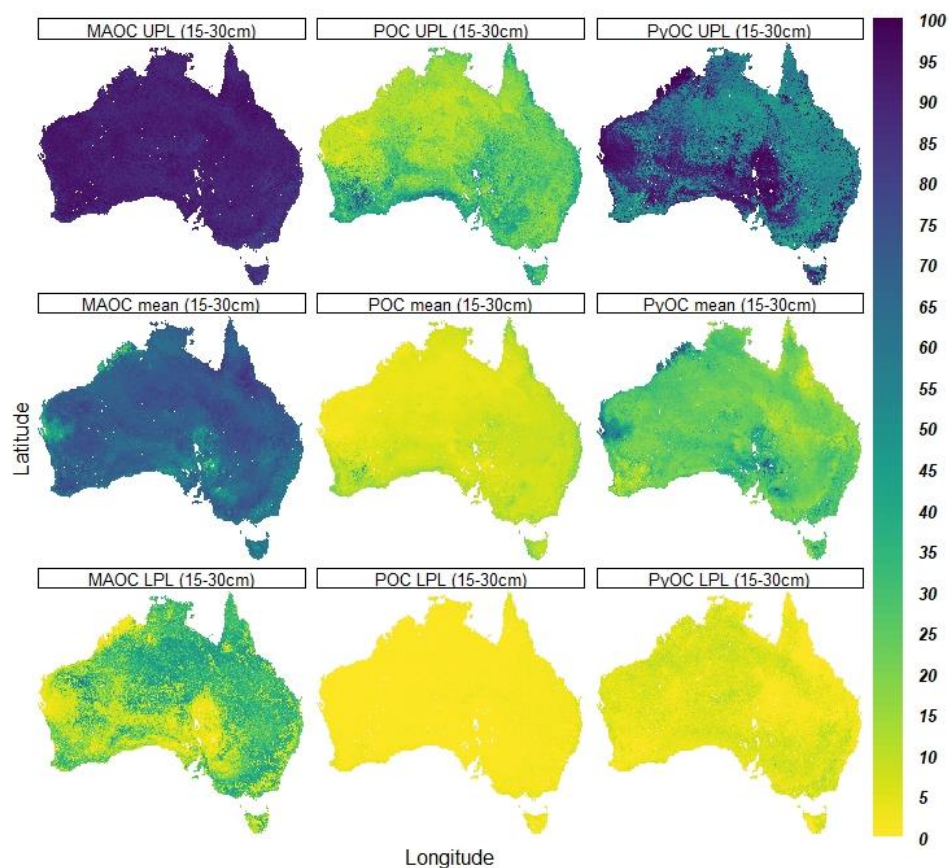


Figure S6: SOC fractions (% SOC) for the 15-30 cm depth interval. a) Upper prediction limit (95 percentile), b) mean, and c) lower prediction limit (5 percentile). MAOC: mineral-associated SOC; POC: particulate organic carbon; PyOC: pyrogenic organic carbon.



Coarse fragments – confusion matrix (classes % volume)

Table S1: Confusion matrix for coarse fragments classes (% volume) for the 0-5 cm depth interval.

	Very few	Few	Common	Many	Abundant	Very abundant
Very few	51201	10205	3648	2135	598	33
Few	3259	7721	2941	2076	466	17
Common	361	956	1581	790	159	8
Many	442	986	1224	2733	831	21
Abundant	45	71	80	203	552	10
Very abundant	0	0	4	8	0	15

Table S2: Confusion matrix for coarse fragments classes (% volume) for the 5-15 cm depth interval.

	Very few	Few	Common	Many	Abundant	Very abundant
Very few	51515	10828	4030	2579	787	65
Few	3736	8555	3141	2285	643	28
Common	348	917	1625	780	177	7
Many	483	1188	1352	3034	1098	37
Abundant	53	108	124	349	709	12
Very abundant	1	0	2	7	2	20

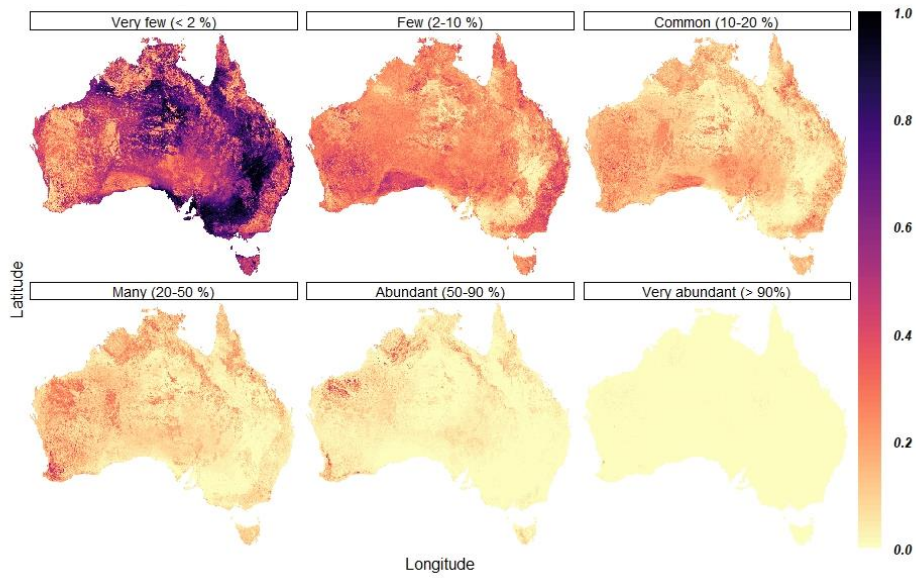
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Table S3: Confusion matrix for coarse fragments classes (% volume) for the 15-30cm depth interval.

	Very few	Few	Common	Many	Abundant	Very abundant
Very few	48427	10843	4682	3487	1310	207
Few	3420	7910	2878	2302	688	66
Common	310	761	1327	600	154	16
Many	645	1226	1268	3324	1367	34
Abundant	208	342	311	1076	2222	56
Very abundant	3	3	1	18	5	32

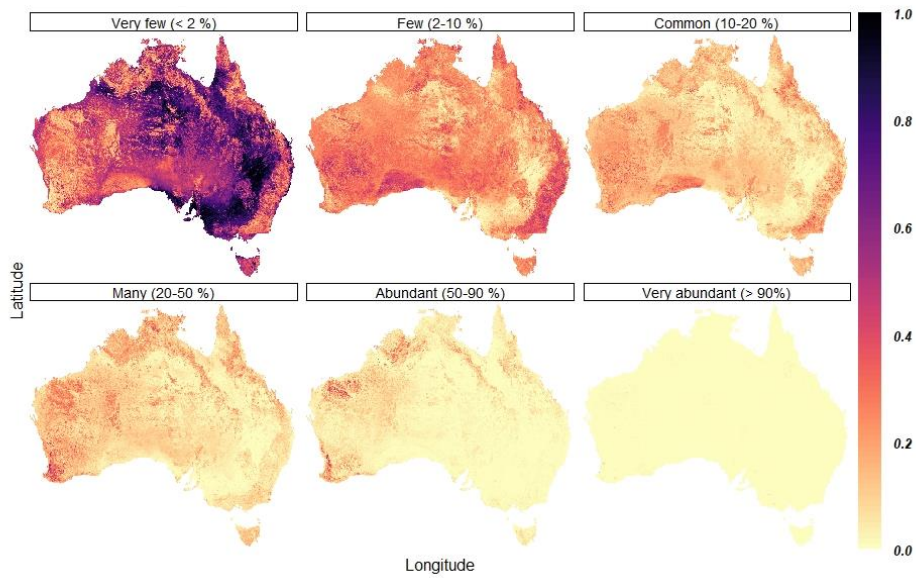
Coarse fragments – Class probability

Figure S7: Coarse fragments (% volume) class probability maps for 0-5 cm.

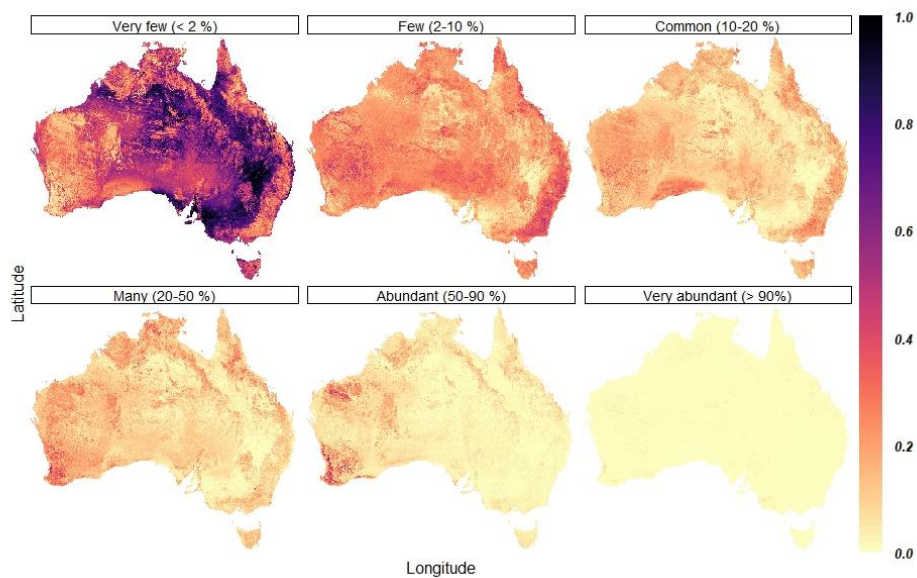


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Figure S8: Coarse fragments (% volume) class probability maps for 5-15 cm.

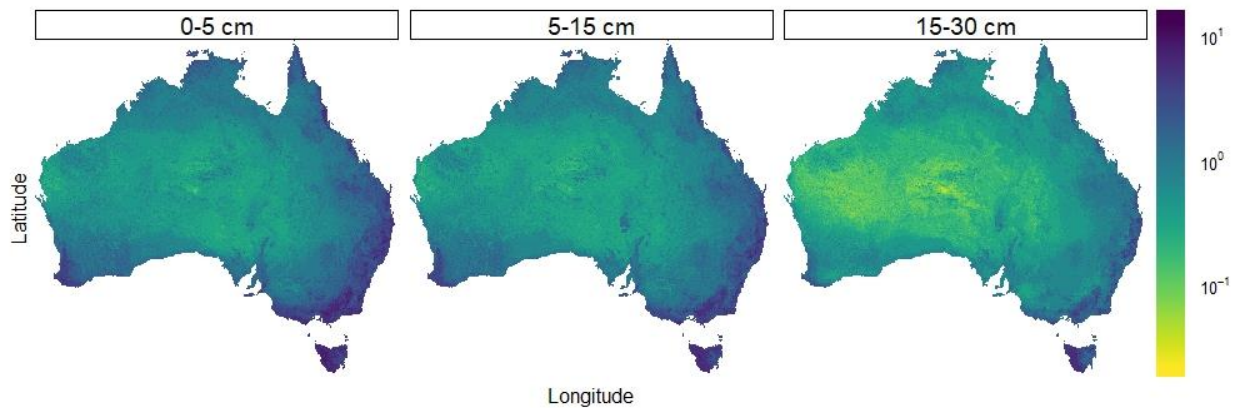


15 Figure S9: Coarse fragments (% volume) class probability maps for 15-30 cm.



TOC concentration

20 Figure S10: Total organic carbon (TOC) concentration (%) in the 0-5 cm, 5015 cm, and 15-30 cm. The scale is in the log₁₀ to differentiate the patterns in areas with small TOC concentration.



SOC fractions density – Uncertainty

Figure S11: SOC fractions density (mg C-SOC fraction cm^{-3}) for the 0-5 cm depth interval. a) Upper prediction limit (95 percentile), b) mean, and c) lower prediction limit (5 percentile). MAOC: mineral-associated SOC; POC: particulate organic carbon; PyOC: pyrogenic organic carbon.

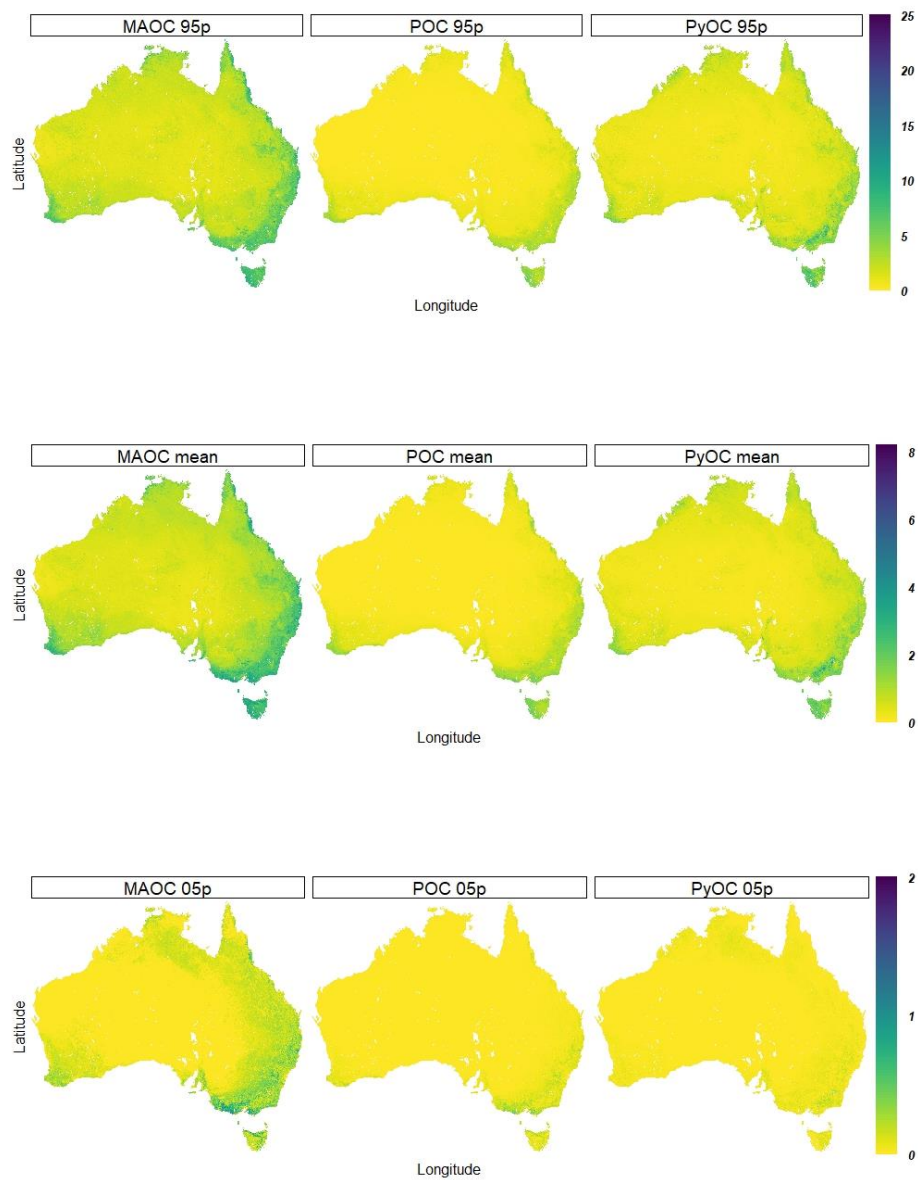


Figure S12: SOC fractions density (mg C-SOC fraction cm^{-3}) for the 5-15 cm depth interval. a) Upper prediction limit (95 percentile), b) mean, and c) lower prediction limit (5 percentile). MAOC: mineral-associated SOC; POC: particulate organic carbon; PyOC: pyrogenic organic carbon.

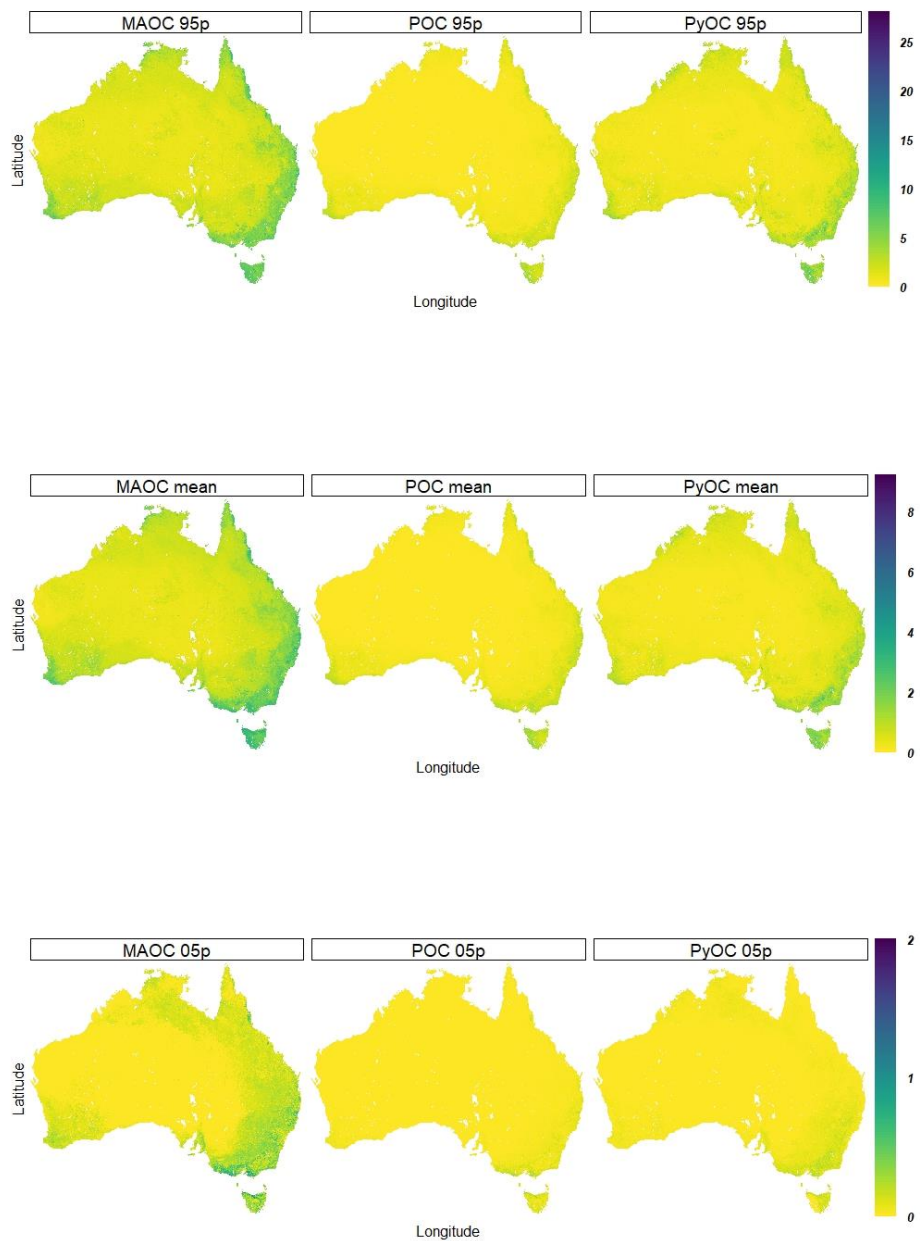


Figure S13: SOC fractions density (mg C-SOC fraction cm⁻³) for the 15-30 cm depth interval. a) Upper prediction limit (95 percentile), b) mean, and c) lower prediction limit (5 percentile). MAOC: mineral-associated SOC; POC: particulate organic carbon; PyOC: pyrogenic organic carbon.

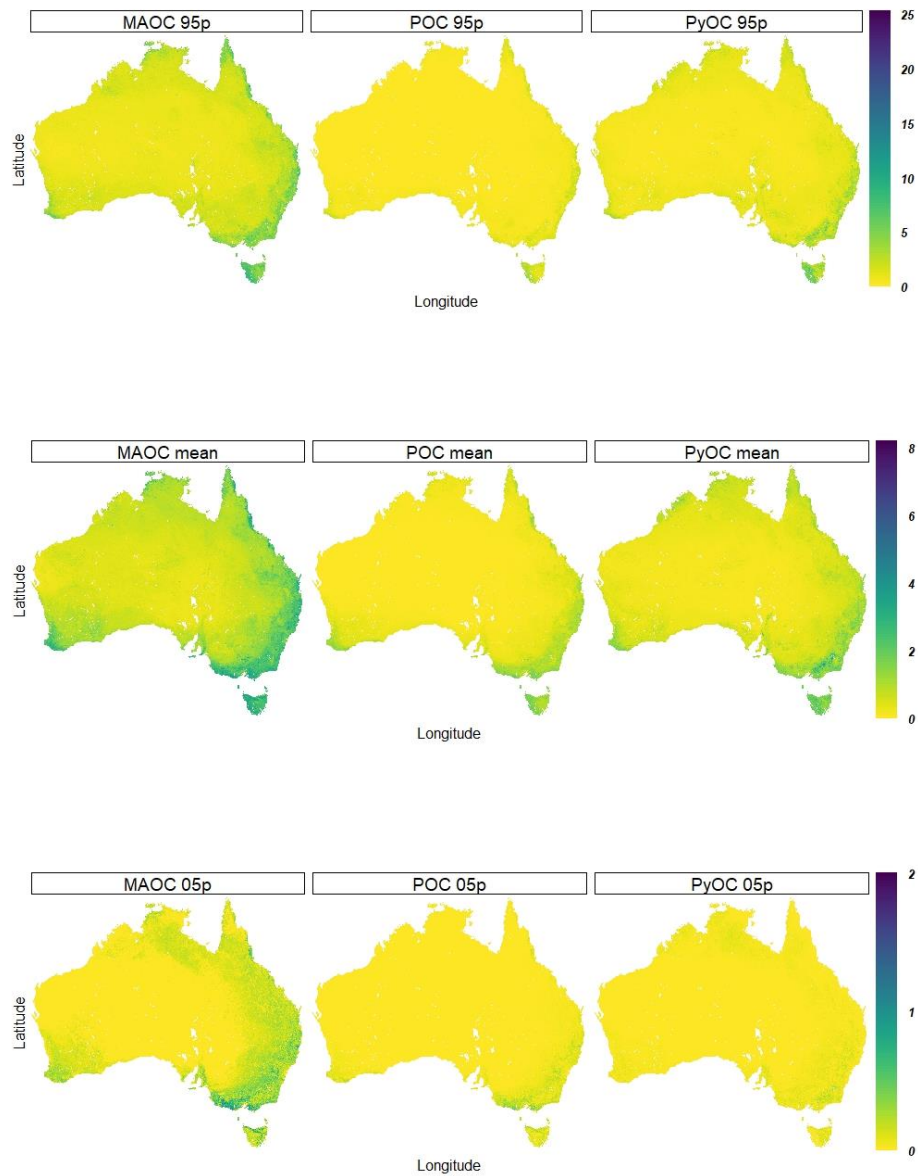
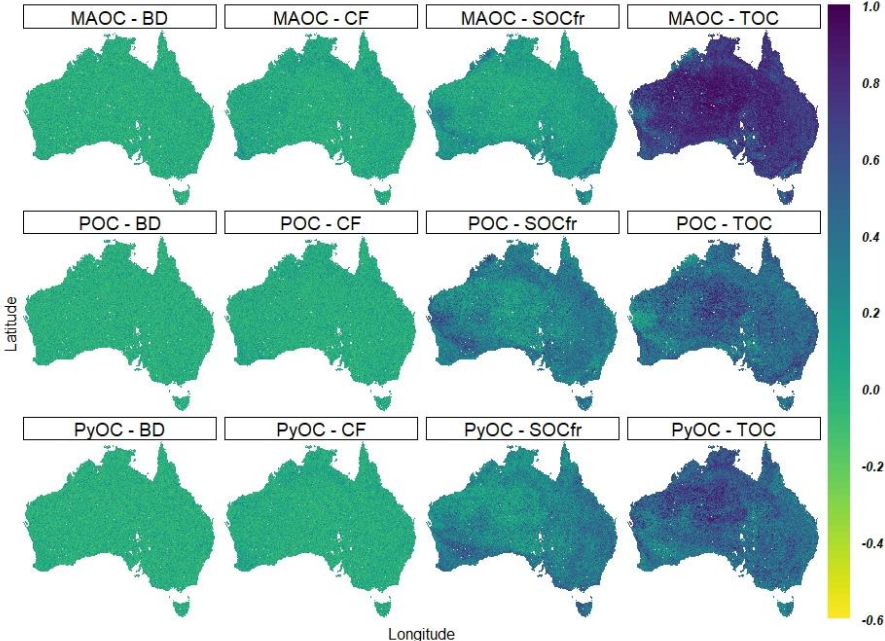


Figure S14: First order Sobol indices for SOC fractions density (units) (0-5 cm).



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Figure S15: First order Sobol indices for SOC fractions density (units) (5-15 cm).

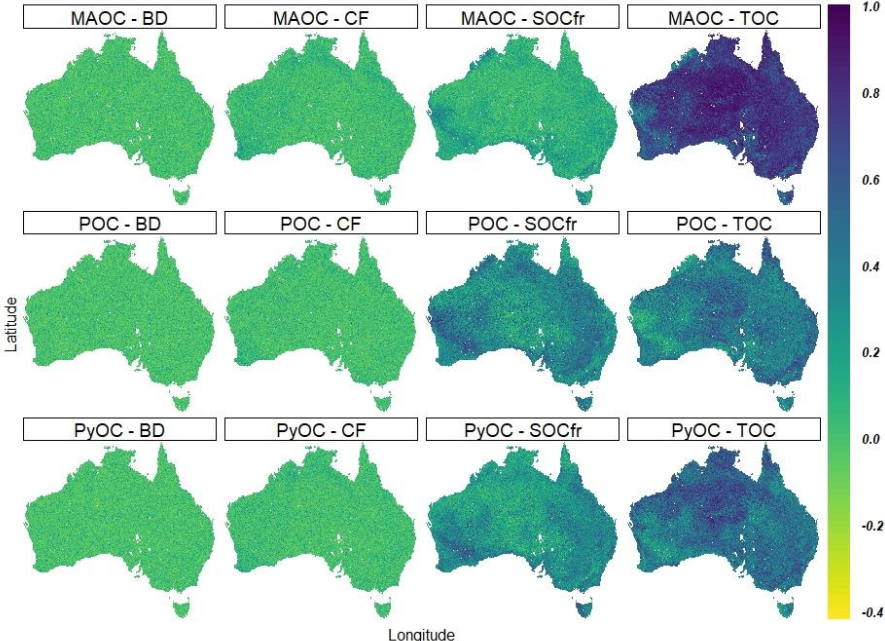
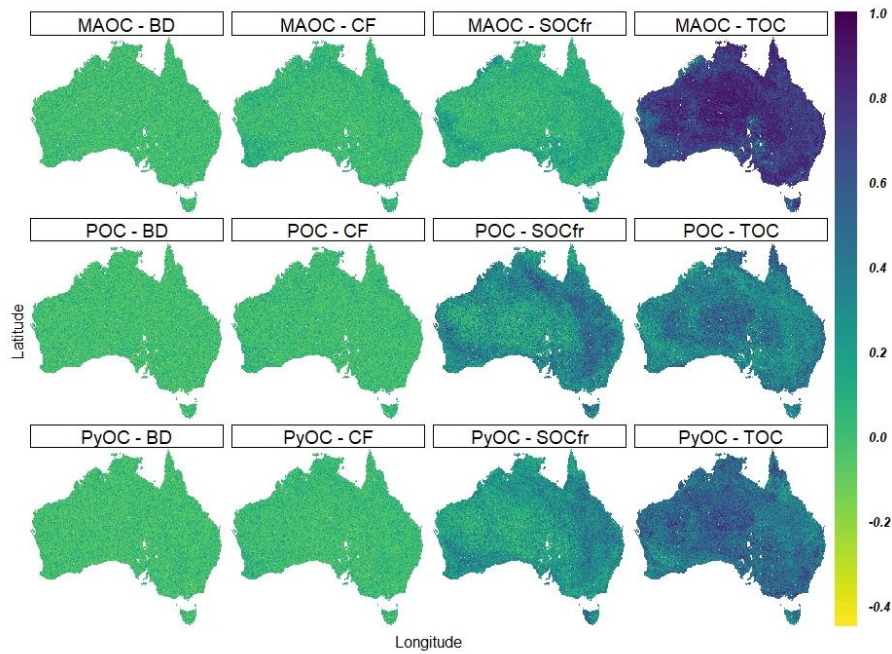


Figure S16: First order Sobol indices for SOC fractions density (units) (15-30 cm).



40 SOC fractions density – Total Sobol indices

Figure S17: Total Sobol indices for SOC fractions density (units) (0-5 cm).

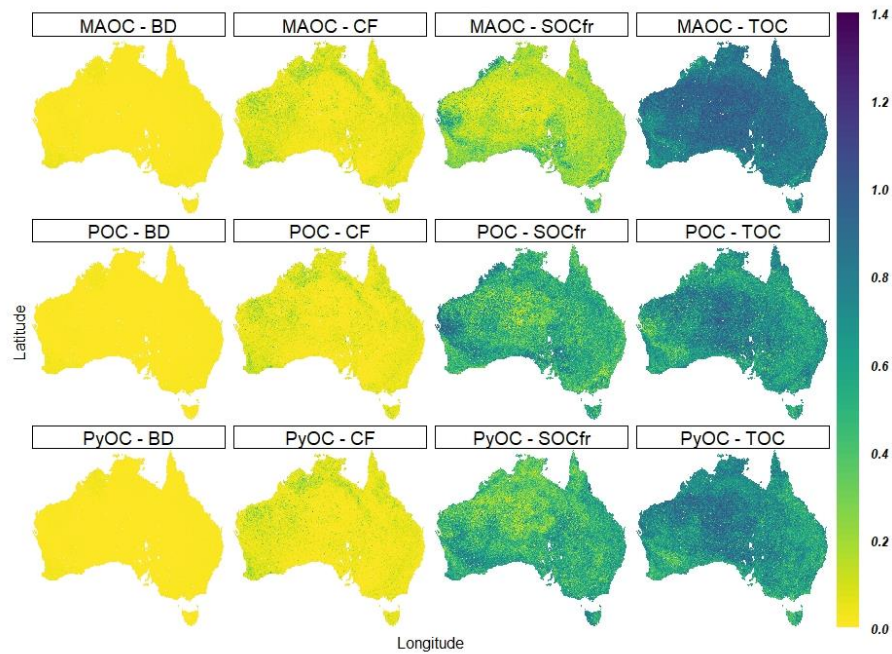
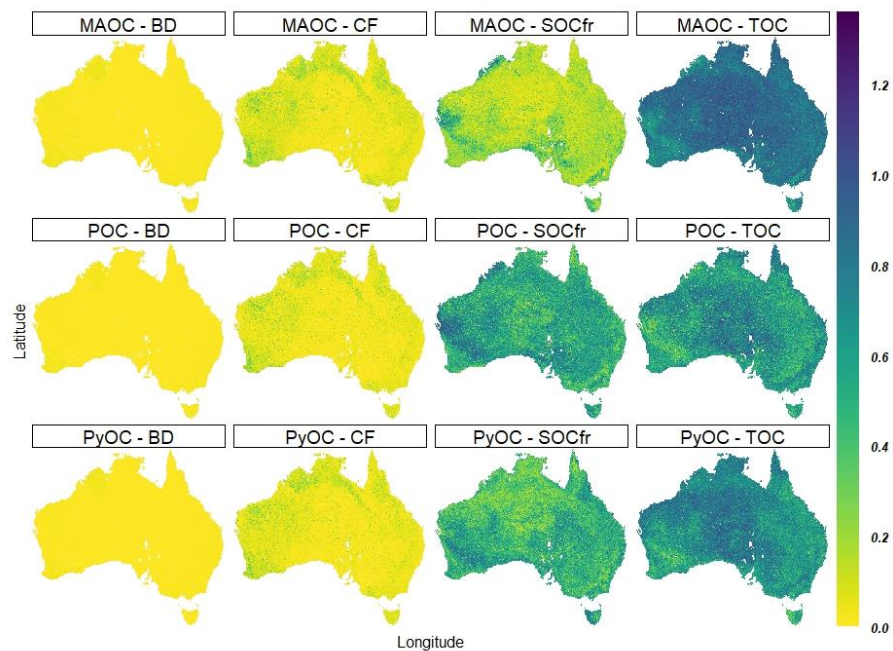


Figure S18: Total Sobol indices for SOC fractions density (units) (5-15 cm).



45 Figure S19: Total Sobol indices for SOC fractions density (units) (15-30 cm).

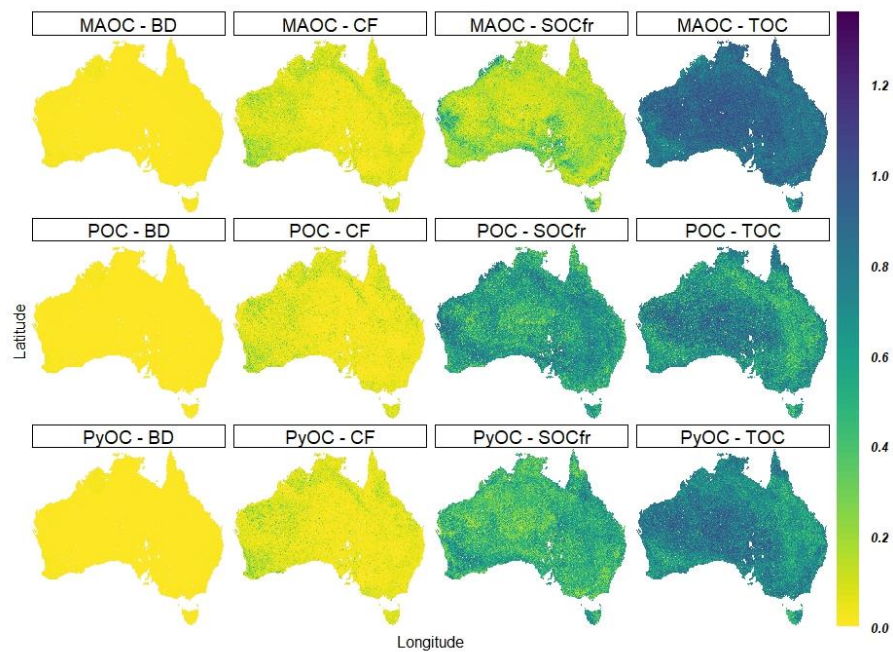


Figure S20: SOC fractions stocks (0-30 cm) – Sobol indices for soil thickness

V1 : First order Sobol index for MAOC stocks (0-30 cm), V14: Total Sobol index for MAOC stocks (0-30 cm),
50 V27: First order Sobol index for POC stocks (0-30 cm), V40: Total order Sobol index for POC stocks (0-30 cm),
V53: First order Sobol index for PyOC stocks (0-30 cm), V66: Total order Sobol index for PyOC stocks (0-30 cm),

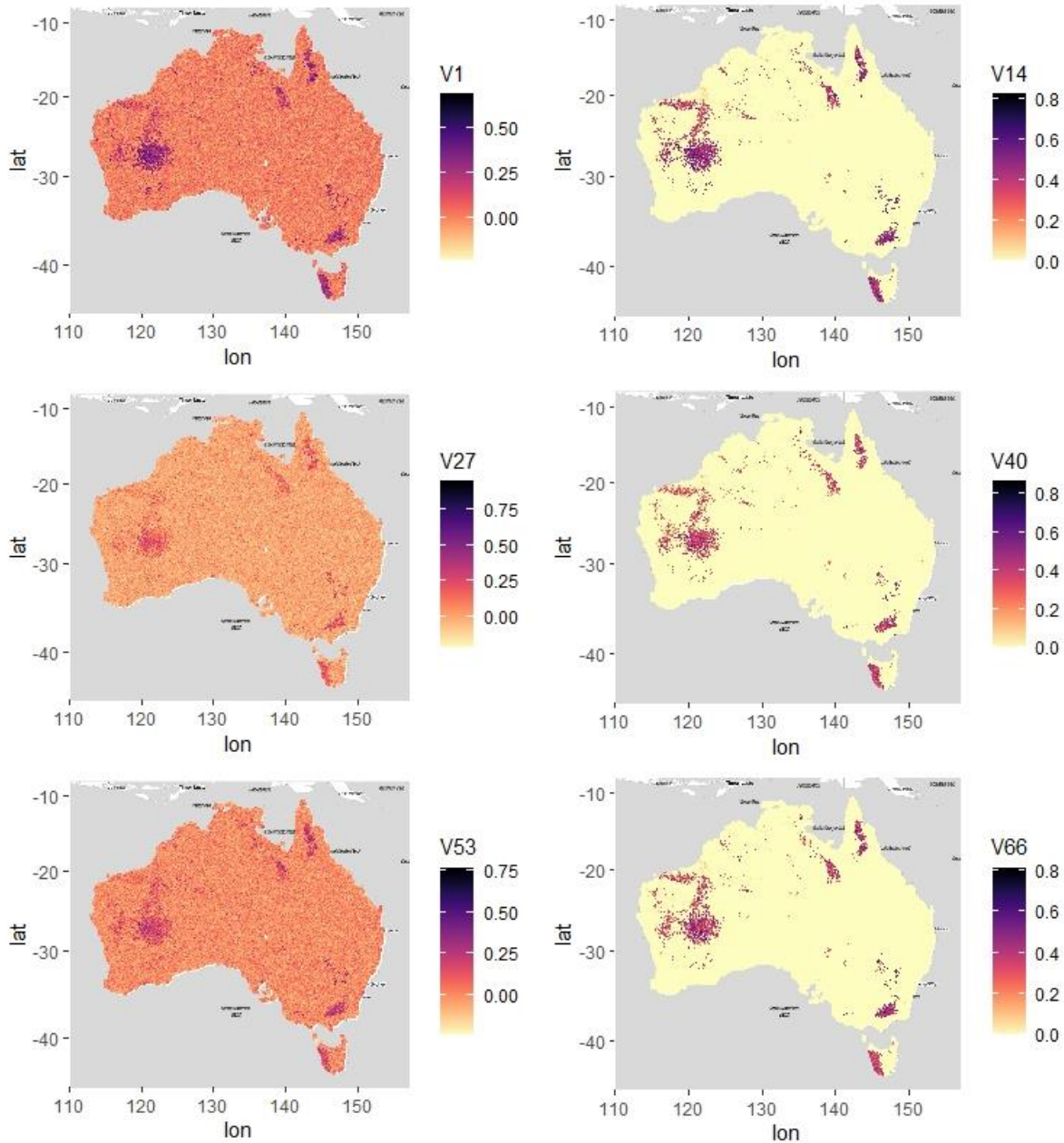


Figure S21: Scatterplot with differences in SOC fraction stocks (Mg C/ ha)

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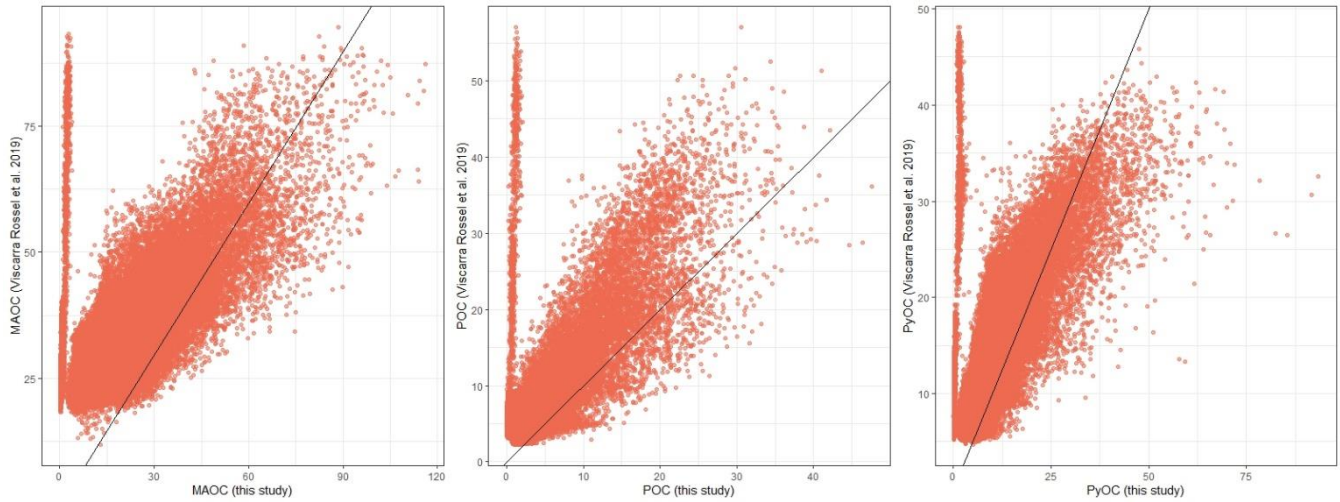


Figure S22: Map with differences in SOC fraction stocks (Mg C/ ha)

60 The differences were calculated as SOC fraction stock (0-30 cm) (this study) – SOC fraction stock (0-30 cm) (Viscarra Rossel et al. 2019). The SOC fractions of this study correspond to the average of 500 simulations for the stock calculations. The differences are more profound in areas of shallow soils (e.g., the Snowy mountains) or peatlands (e.g., eastern Tasmania).

