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The Australian three-dimensional soil grid: Australia's contribution to the *GlobalSoilMap* project

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The validation statistics calculated from the cross- and out-of-bag validations suggest that the three-dimensional spatial models for predicting the soil attributes have moderate to substantial predictability. In Table S1 we show a summary of the assessment statistics for the independent test set validations of the models used to predict total P, total N, total OC, bulk density, $\text{pH}_{\text{CaCl}_2}$, pH_{Water} , ECEC and AWC. Generally, these statistics suggest that the predictions were almost unbiased and that the primary contribution to their inaccuracy was from their imprecision. For some attributes, such as available water capacity (AWC), the models explained only around 30% of the total variation present, and for others like pH and ECEC, they explained around 80%. For most attributes, the amount of variation explained by the models decreased with depth as we have fewer data with depth, often smaller concentrations at depth and because many of our predictors describe only surface processes. For some attributes, like pH_{Water} and ECEC, this was not the case and the amount of variation explained by our models remained relatively constant with depth (Table S1).

In Table S1 we also list coverage probabilities for our estimates as the proportion of the particular soil attribute values at each depth that fell within the 90% confidence limits of our estimates. Overall, our predictions were reliable.

Table S1. Summary of the validation statistics and coverage probabilities (P_c) of the three-dimensional spatial modelling and predictions of total P (%), total N (%), total organic C (%), bulk density (g cm^{-3}), $\text{pH}_{\text{CaCl}_2}$, pH_{Water} , effective cation exchange capacity (ECEC, $\text{cmol}_c \text{kg}^{-1}$) and available water content (AWC, %). The statistics are the coefficient of determination (R^2); the concordance correlation coefficient (ρ_c), the root mean squared error ($RMSE$) and the mean error (ME).

		Depth layer /cm					
		0-5	5-15	15-30	30-60	60-100	100-200
AWC	R^2	0.292	0.315	0.275	0.242	0.187	0.156
	ρ_c	0.432	0.455	0.436	0.396	0.340	0.286
	$RMSE$	0.046	0.043	0.040	0.041	0.043	0.055
	ME	-0.004	-0.003	-0.004	-0.006	-0.007	-0.010
	P_c	0.87	0.87	0.86	0.86	0.86	0.84
Bulk density	R^2	0.533	0.526	0.447	0.441	0.311	0.376
	ρ_c	0.690	0.677	0.607	0.604	0.481	0.532
	$RMSE$	0.166	0.151	0.158	0.136	0.145	0.132
	ME	0.001	0.002	-0.008	-0.002	0.003	0.001
	P_c	0.89	0.90	0.90	0.92	0.94	0.88
ECEC	R^2	0.785	0.791	0.786	0.783	0.781	0.770
	ρ_c	0.830	0.834	0.830	0.828	0.825	0.817
	$RMSE$	0.150	0.148	0.155	0.162	0.172	0.197
	ME	0.006	0.003	0.005	0.005	0.006	0.008
	P_c	0.91	0.92	0.92	0.92	0.92	0.92
pH_{Water}	R^2	0.794	0.816	0.822	0.821	0.810	0.794
	ρ_c	0.882	0.895	0.899	0.899	0.892	0.882
	$RMSE$	0.773	0.525	0.571	0.629	0.702	0.773
	ME	0.008	0.002	0.004	0.008	0.009	0.008
	P_c	0.78	0.75	0.76	0.77	0.76	0.76
$\text{pH}_{\text{CaCl}_2}$	R^2	0.623	0.636	0.587	0.612	0.643	0.639
	ρ_c	0.775	0.784	0.749	0.767	0.788	0.784
	$RMSE$	0.647	0.654	0.807	0.863	0.910	0.991
	ME	-0.003	-0.002	-0.001	0.003	-0.028	-0.055
	P_c	0.82	0.86	0.86	0.86	0.86	0.81
Total OC	R^2	0.660	0.610	0.560	0.392	0.373	0.287
	ρ_c	0.790	0.760	0.720	0.564	0.521	0.435
	$RMSE$	0.250	0.220	0.240	0.307	0.338	0.359
	ME	-0.007	-0.002	0.003	0.011	0.011	0.022
	P_c	0.98	0.98	0.98	0.98	0.98	0.98
Total N	R^2	0.540	0.450	0.450	0.420	0.300	0.260
	ρ_c	0.690	0.610	0.620	0.590	0.480	0.420
	$RMSE$	0.250	0.290	0.270	0.260	0.240	0.240
	ME	0.001	0.005	0.004	0.002	-0.002	-0.002
	P_c	0.96	0.95	0.94	0.94	0.93	0.93
Total P	R^2	0.430	0.450	0.450	0.390	0.380	0.370
	ρ_c	0.600	0.610	0.610	0.560	0.560	0.560
	$RMSE$	0.290	0.290	0.280	0.280	0.280	0.290
	ME	0.004	0.005	0.004	0.006	0.003	0.008
	P_c	0.83	0.92	0.92	0.92	0.92	0.92

Fine spatial resolution three-dimensional multi-scale maps of available water content (AWC, %), bulk density (g cm^{-3}), effective cation exchange capacity (ECEC, $\text{cmol}_c \text{ kg}^{-1}$), pH_{water} , total organic C (%), total N (%) and total P (%) in each of the six standard *GlobalSoilMap* depth layers are shown in Figure S1.

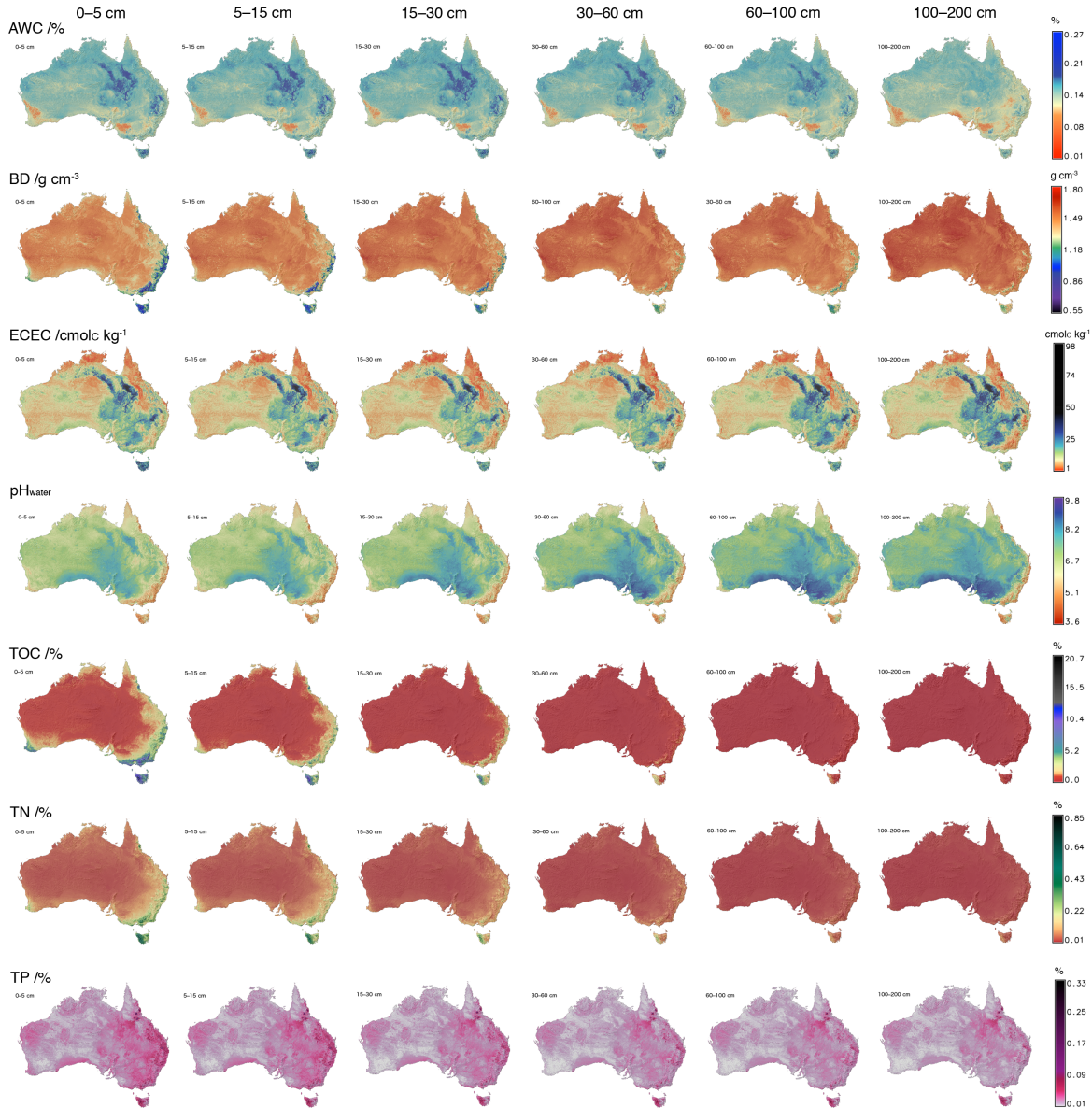


Figure S1 Maps of soil attributes for each of the six *GlobalSoilMap* standard depth layers.

The 90 % confidence limits of the soil attribute maps in Figure S1 are available for free download in raster format under a Creative Commons CC-BY license from <http://www.csiro.au/soil-and-landscape-grid> and <https://data.csiro.au/dap/search?q=tern+soil>.