

Monitoring of carbon stocks in pastures in the savannas of Brazil through ecosystem modeling on a regional scale

Supplementary material

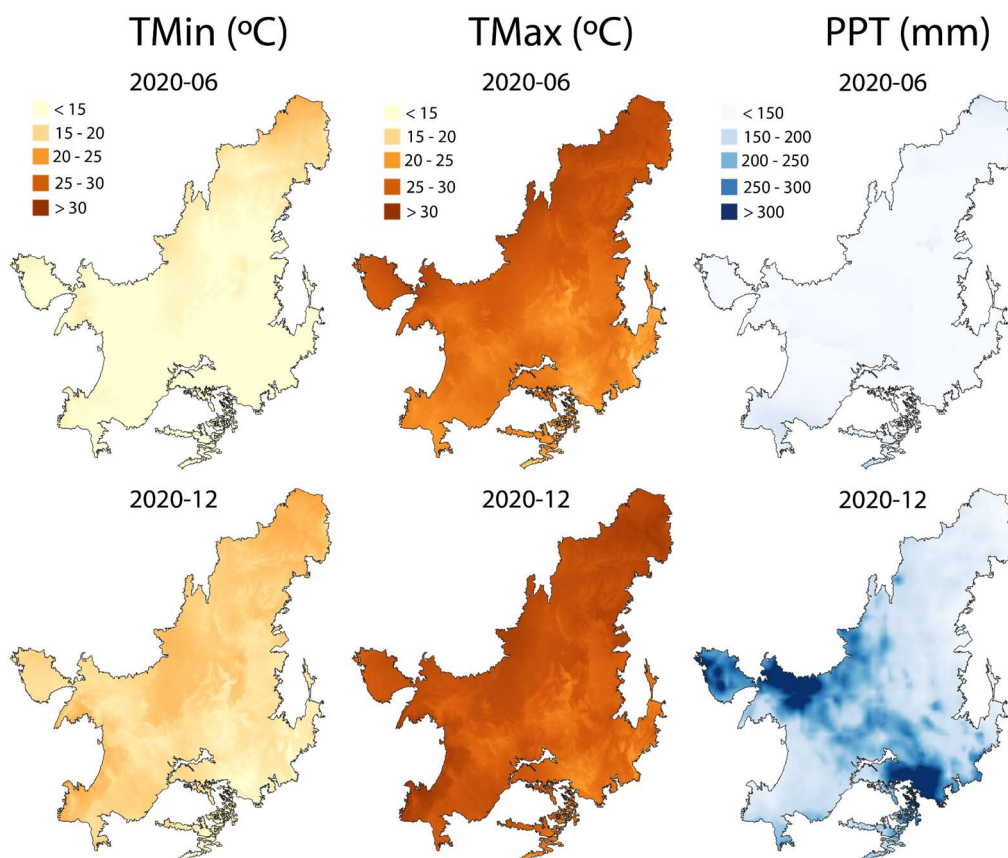


Figure S1: Maps of climate variables in the Cerrado, obtained from the Terraclimate database, and used to model carbon stocks in the pasture areas of the Biome. (TMIN - Minimum temperature; TMAX - Maximum temperature; PPT - Precipitation; For illustration, we used data from June/2020 and December/2020).

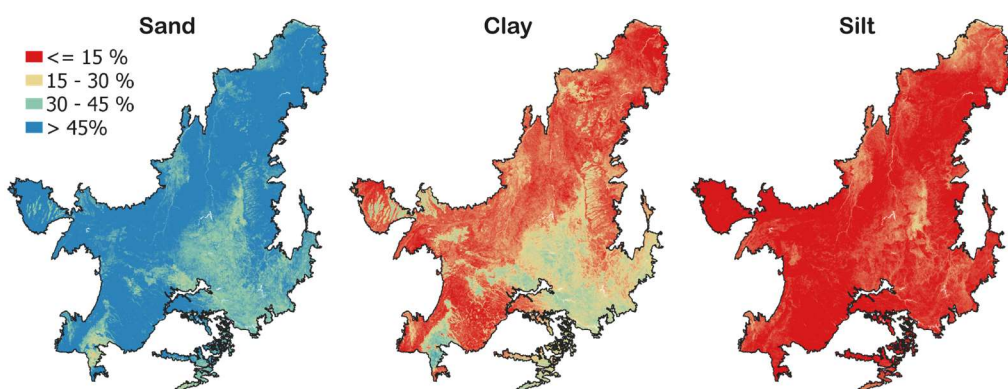


Figure S2: Soil texture maps in the Cerrado, obtained from the SoilGrids database and used to model carbon stocks in the pasture areas of the Biome. Density and acidity (Ph) maps were obtained on the same basis.

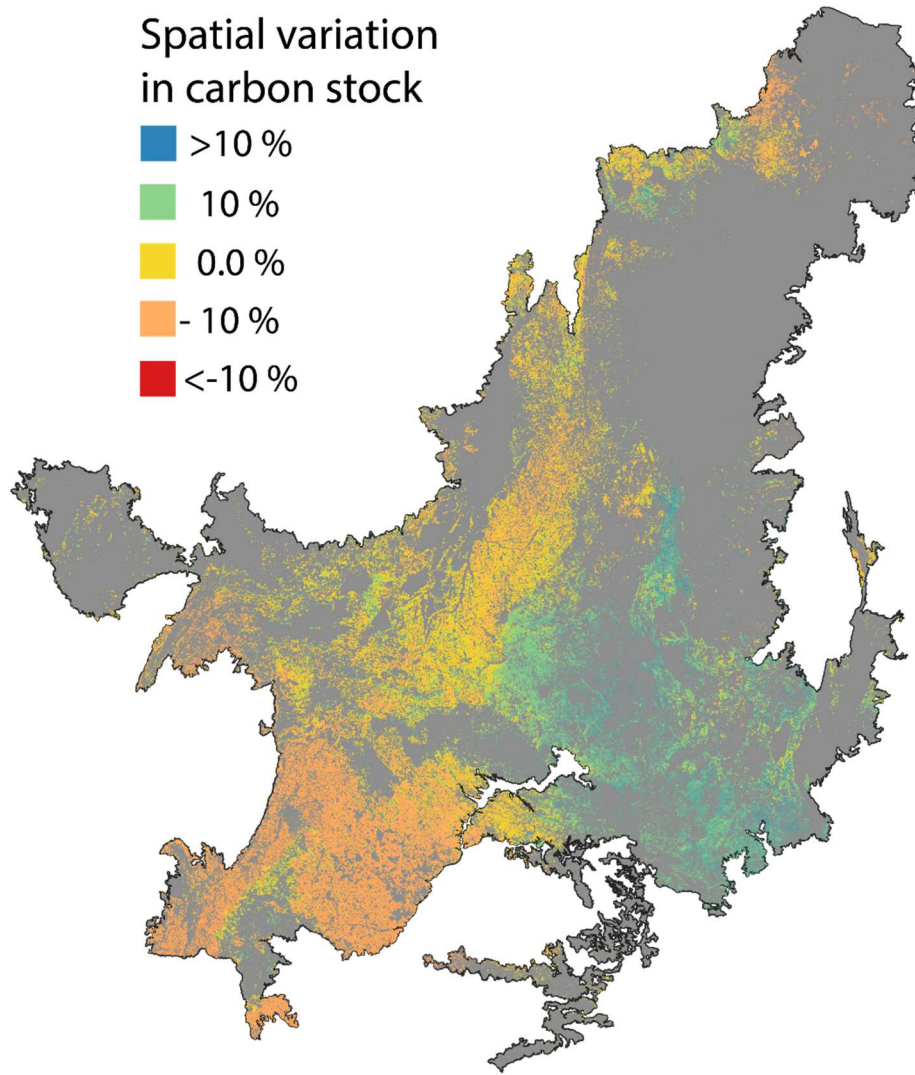


Figure S3: % difference between local and mean SOC stock in the pasture areas of the Cerrado biome (layer 0-20 cm).

The % difference was calculated based on the following equation:

$$X_{i\%} = \left(\frac{X_i}{\bar{X}} - 1 \right) * 100$$

Where: $X_{i\%}$ is the SOC stock for a given pixel X_i and \bar{X} is the mean SOC stock for all the pixels corresponding to the Cerrado pastures.

Table S1: Location and soil characteristics in the 0-20 cm layer of the sites used in the calibration and validation process of the century model to represent pasture areas in the Cerrado.

State	Municipalities	Pasture age (years)	Carbon MgC/ha ⁻¹	Sand (%)	Silt (%)	Clay (%)	Density (g/cm ³)	p.H	Annual precipitation (mm)
MT	Barra do Garças	27	33.45	59.50	19.00	21.50	1.4	6.0	1242.38
GO	Bom Jardim	28	20.29	85.25	10.00	4.75	1.7	5.6	1242.38
TO	Campos Lindos	11	21.07	87.38	2.60	10.03	1.5	5.6	1501.25
TO	Cariri do Tocantins	27	32.33	59.98	8.13	31.90	1.2	5.0	1191.67
MA	Estreito	11	46.19	38.00	14.25	47.75	1.5	5.8	1394.34
GO	Goiás	19	38.71	61.50	21.25	17.25	1.4	5.9	1452.23
MA	Pastos Bons	20	45.39	44.75	10.25	45.00	1.5	5.7	1018.31
TO	Rio dos Bois	11	25.28	78.13	4.63	17.25	1.3	4.9	1387.41
MA	Sucupira do Riachão	23	40.50	55.50	9.50	35.00	1.3	4.7	1018.31
GO	Água Fria de Goiás	>35	51.31	7.50	37.75	54.75	1.2	5.3	1132
MA	Balsas	>35	27.67	77.50	2.75	19.75	1.6	5.7	1242
MT	Barra do Garças	>35	31.64	67.00	11.00	22.00	1.5	5.3	968
BA	Barreiras	>35	29.31	80.75	7.00	12.25	1.6	5.4	863
PI	Bom Jesus Piauí	>35	23.65	63.50	22.00	14.50	1.6	5.7	830
GO	Campinorte	>35	30.70	60.00	11.50	28.50	1.5	5.4	1398
GO	Cocalzinho	>35	41.01	54.00	16.00	30.0	1.4	5.8	1398
TO	Conceição	>35	46.14	20.50	35.00	44.50	1.5	5.9	1333
GO	Cristalina	>35	48.86	11.50	22.50	66.00	1.1	5.5	1148

GO	Edéia	>35	37.33	54.25	15.75	30.00	1.5	6.9	1325
GO	Flores de Goiás	>35	40.92	25.25	25.50	49.25	1.6	5.5	1145
GO	Hidrolândia	>35	56.03	44.50	19.00	36.50	1.4	5.5	1325
GO	Monte Alegre	>35	38.22	62.50	17.25	20.25	1.6	5.9	1317
GO	Montes Claros	>35	32.71	71.75	12.75	15.50	1.5	5.7	1242
GO	Nova Crixás	>35	27.68	62.50	9.00	28.50	1.5	5.4	1452
TO	Nova Olinda	>35	25.93	56.50	27.25	16.25	1.7	5.4	1452
GO	Mundo Novo	>35	21.68	68.25	11.25	20.50	1.6	5.5	1501
GO	Pirenópolis	>35	38.80	49.75	16.75	33.50	1.4	5.6	1398
GO	Rianópolis	>35	31.95	60.50	17.75	21.75	1.5	6.0	1398
GO	Rio Verde	>35	35.24	27.50	22.25	50.25	1.2	5.8	1303
BA	São Desidério	>35	22.61	70.75	4.50	24.75	1.6	6.0	863

Table S2: Modified parameters in Century to simulate traditional pasture management in the Cerrado biome.

	Default of model	Pasture conventional management
Crop.100 file		
PRDX(1) : potential aboveground monthly production for crops (g C m^{-2})	0.3	0.3
PPDF(1) : optimum temperature for production for parameterization	30	22
CFRTC(1): maximum fraction of C allocated to roots under maximum nutrient stress	0.4	0.3
CFRTC(2): minimum fraction of C allocated to roots with no nutrient stress	0.25	0.25
CFRTCW(1): maximum fraction of C allocated to roots under maximum water stress	0.6	0.4
CFRTCW(2): minimum fraction of C allocated to roots with no water stress	0.2	0.1
Tree.100 file		
PRDX(1): potential aboveground monthly production for crops (g C m^{-2})	0.5	0.26

Fonte: Silva 2019.

Table S3: Datasets used to model pasture carbon stock in the Cerrado biome pastures.

Datasets	Study stage / component	Resolution	Date	Source
Conversion year	Calibration and validation sites	30m	1985–2010	https://github.com/lapig-ufg/tvi
	Cerrado pasture maps	30m	1985–2019	https://atlasdaspastagens.ufg.br
Weather data	Calibration and validation sites	Nearest weather station	1980–2017	Brazilian Institute of Meteorology (INMET)
	Spatialization (Cerrado pasture)	4 km	1985–2019	TerraClimate
Soil texture, density, and pH	Calibration and validation sites	-	2010	Assad et al. 2013
	Pasture map resampled	1 km	1985–2019	SoilGrids