Hillslope to stream coupling revealed by time-lapse georadar: case study of Capetinga watershed in Brazilian Savanna

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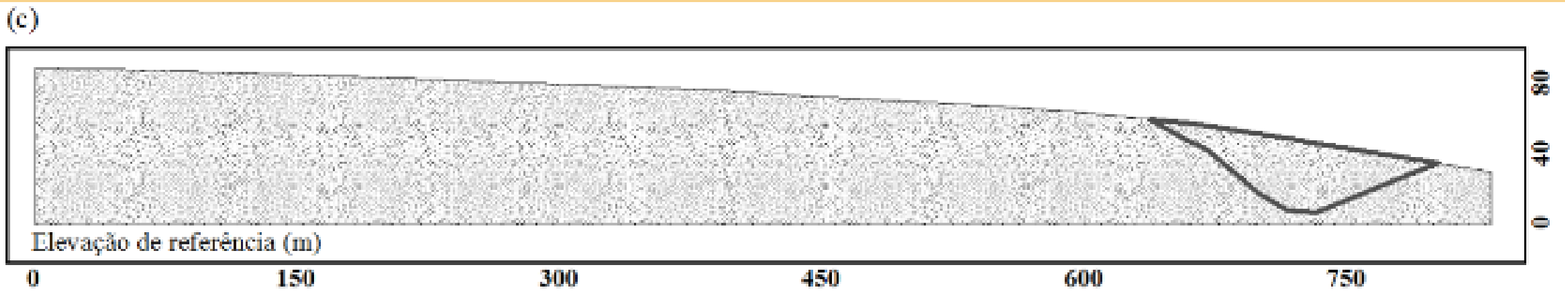

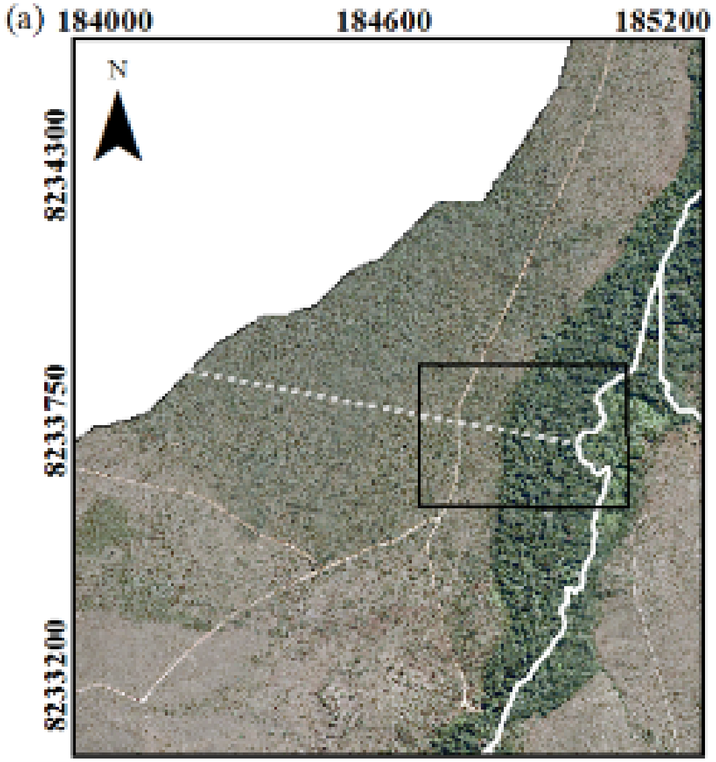

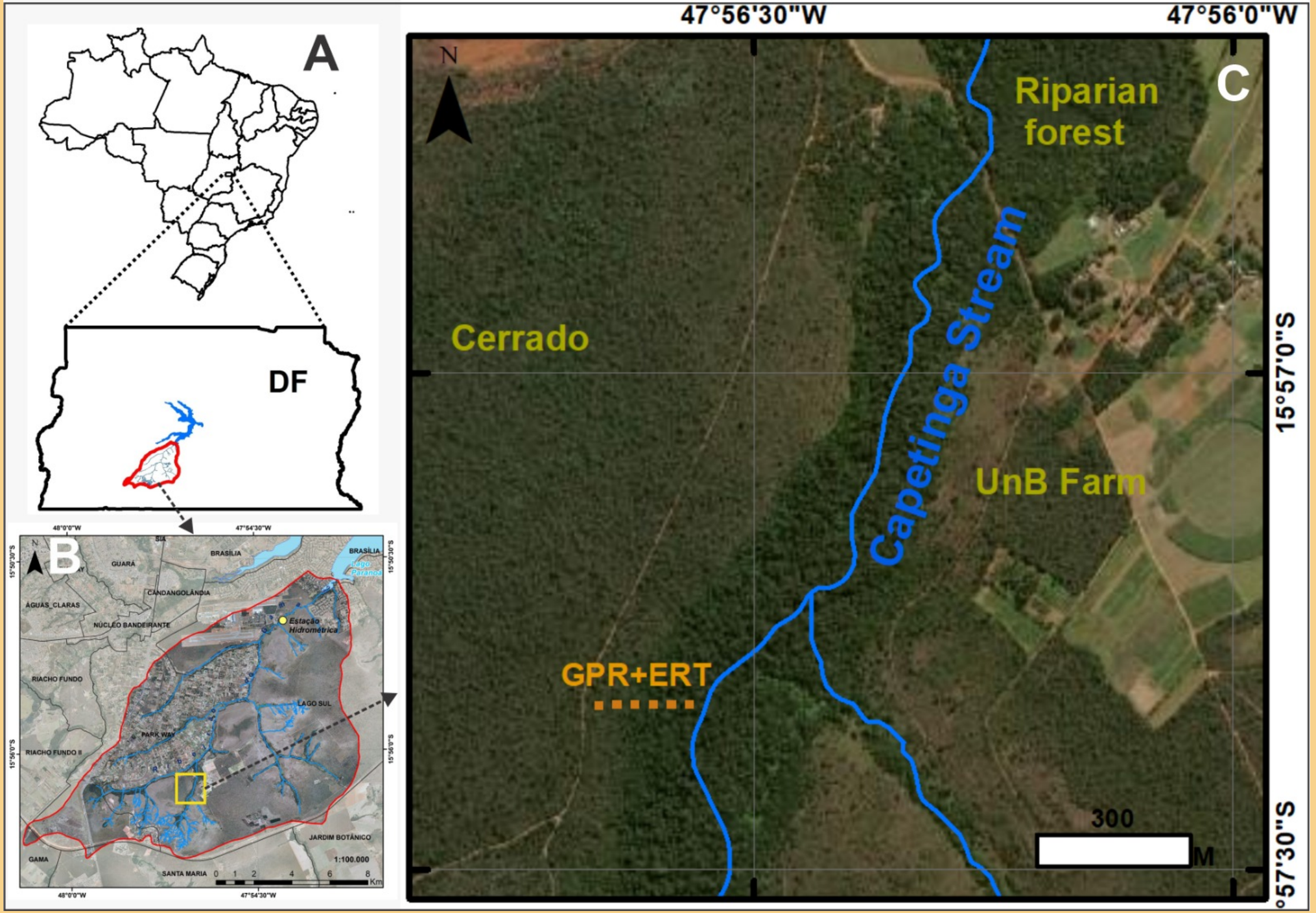
A
DF
B
SIA
BRASÍLIA
Lago Paranoá
GUARÁ
CANDANGOLÂNDIA
ÁGUAS CLARAS
NÚCLEO BANDEIRANTE
Estação Hidrométrica
RIACHO FUNDO
LAGO SUL
PARK WAY
RIACHO FUNDO II
JARDIM BOTÂNICO
GAMA
SANTA MARIA
1:100.000
0 1 2 4 6 8 Km
48°0'0"W
47°54'30"W
15°50'30"S
15°56'0"S
47°56'30"W
47°56'0"W
15°57'0"S
15°57'30"S
N
C
Riparian forest
Cerrado
Capetinga Stream
UnB Farm
GPR+ERT
300
M

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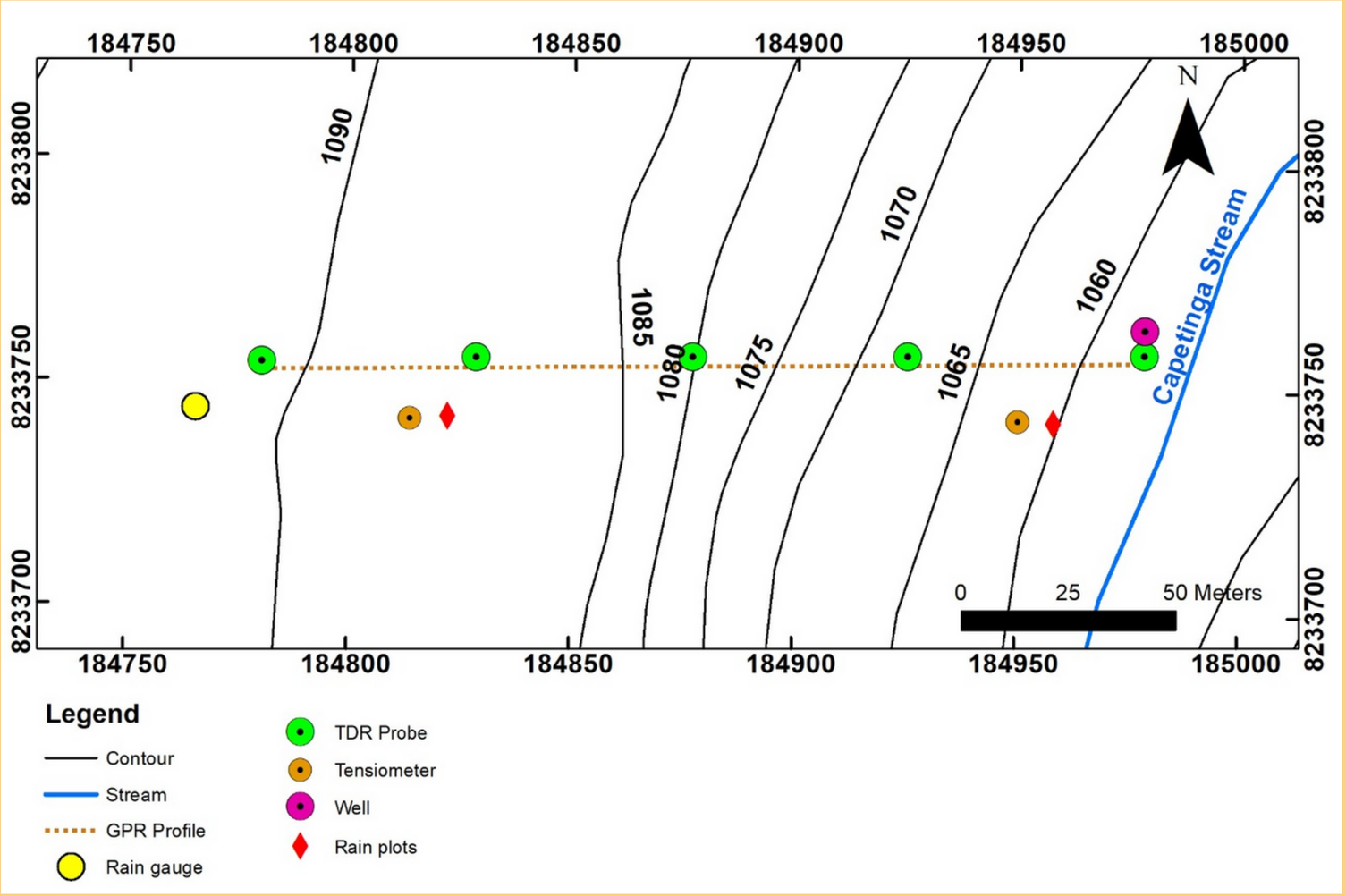
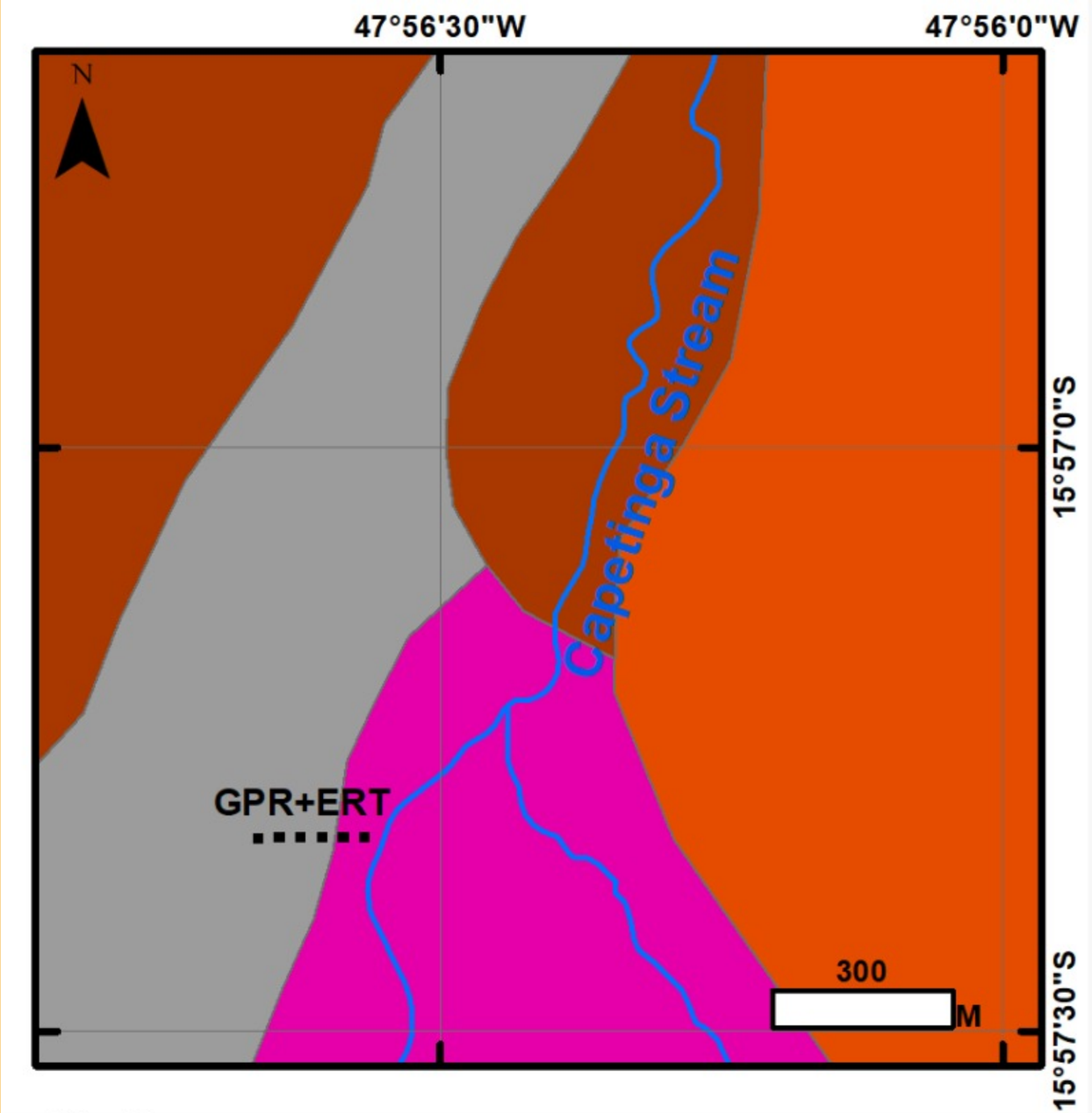
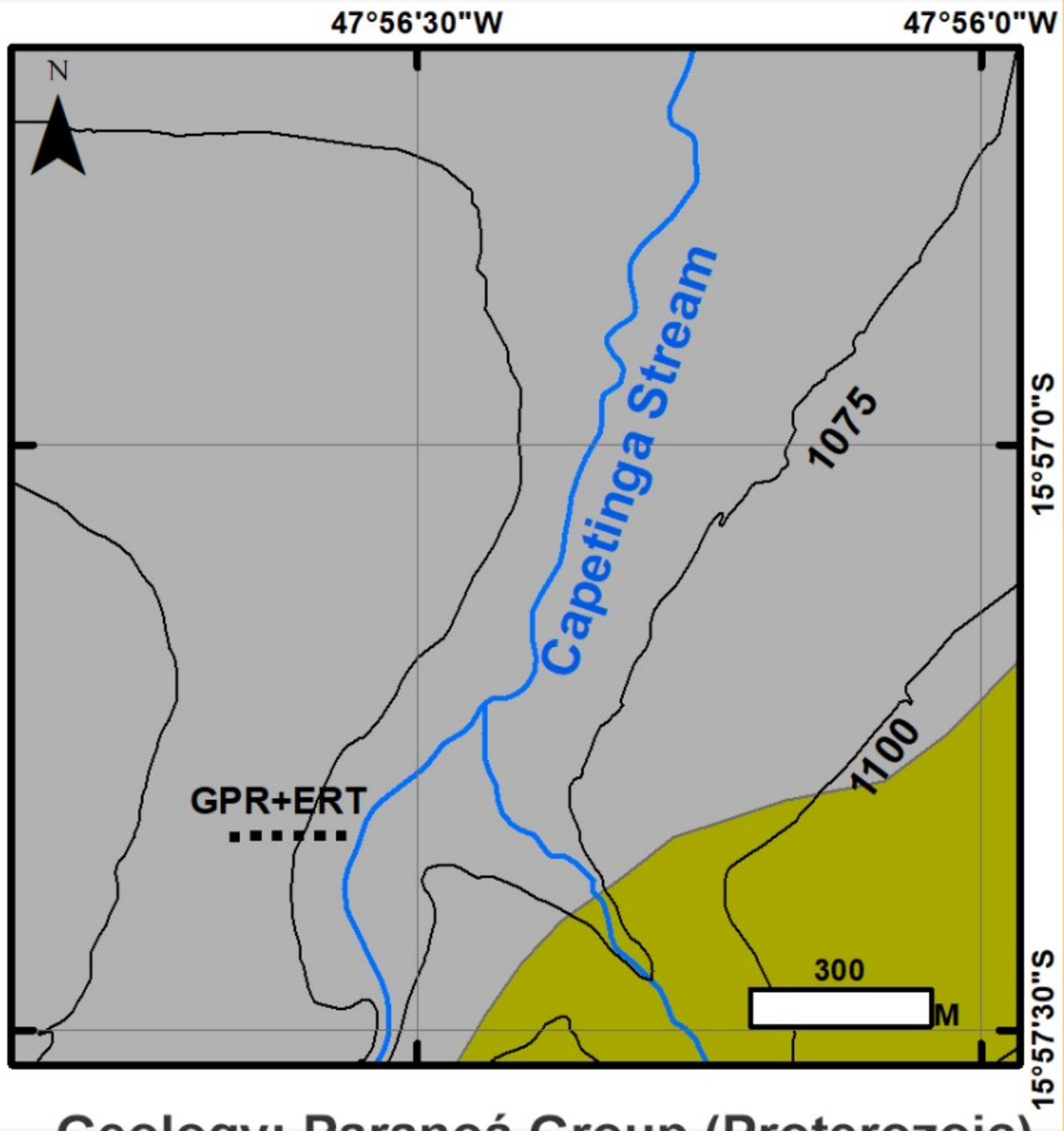
EXPERIMENTAL AND MATHEMATICAL MODELING STUDY OF UNDERGROUND FLOW IN THE CERRADO BIOMA







Soils

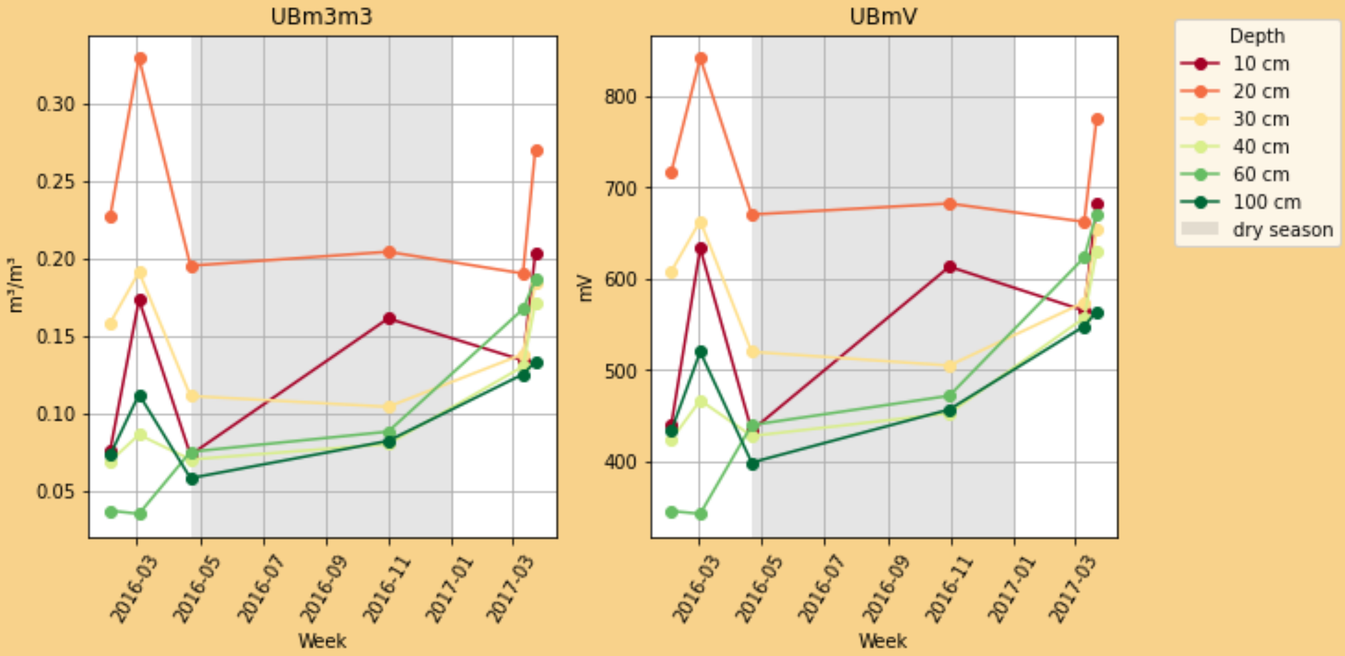
Entisols
Red Oxisols
Yelow/red Oxisols
Inceptsols

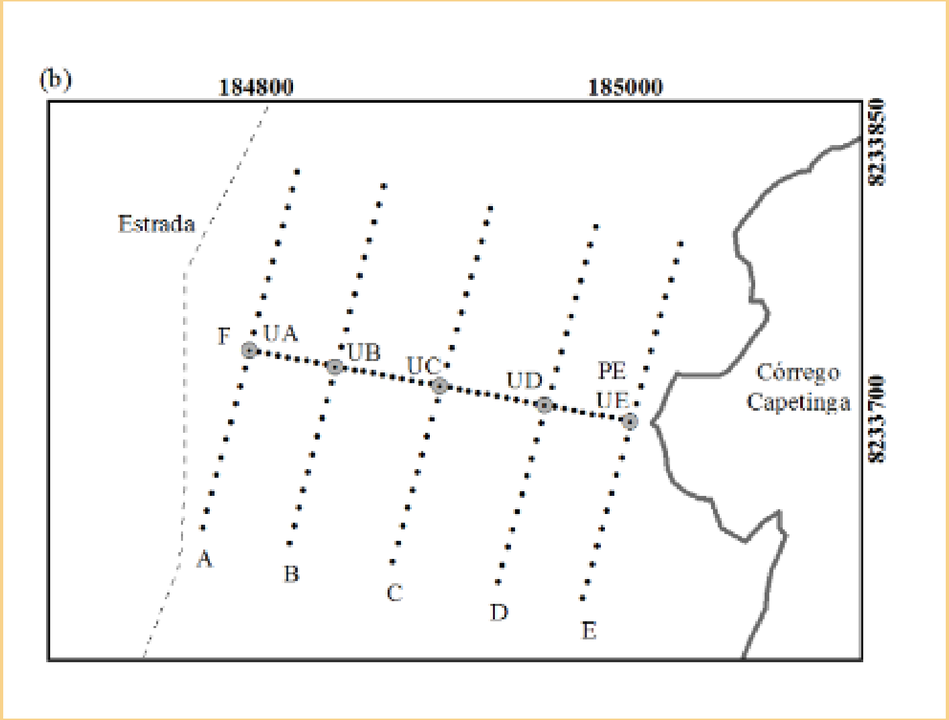
Geology: Paranoá Group (Proterozoic)

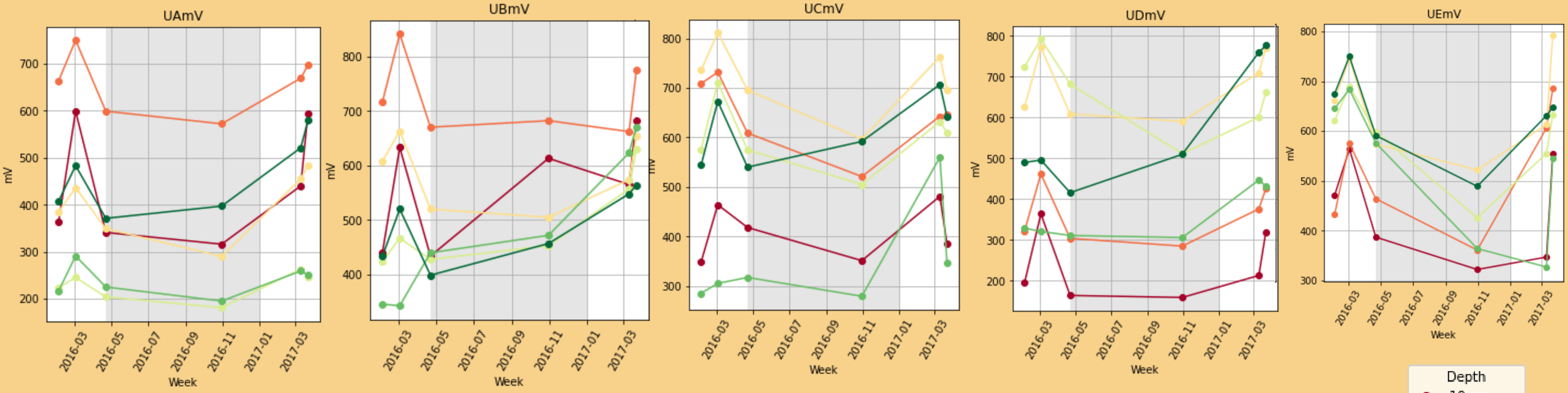
Slate
Sandy Metarhythmite

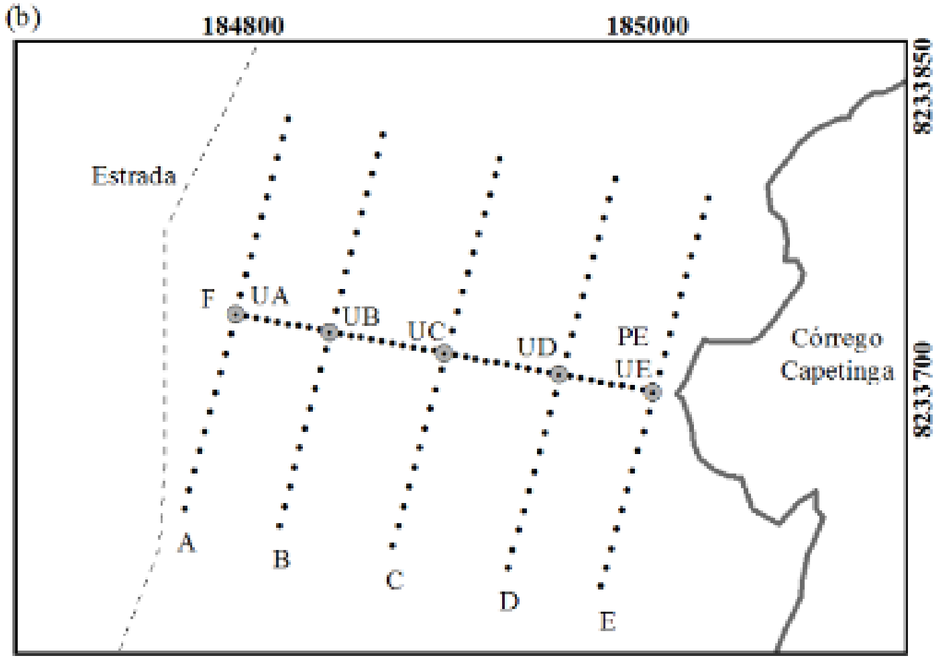
Soil moisture samples

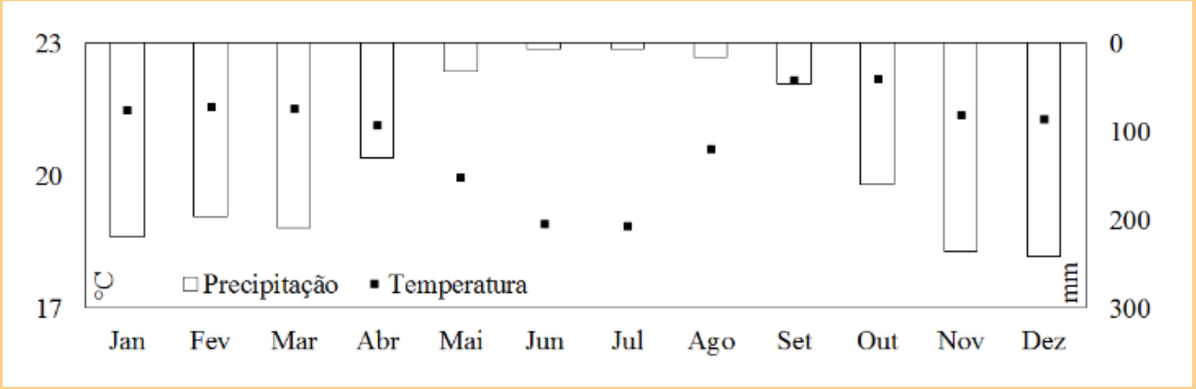
Time-domain reflectometry probes

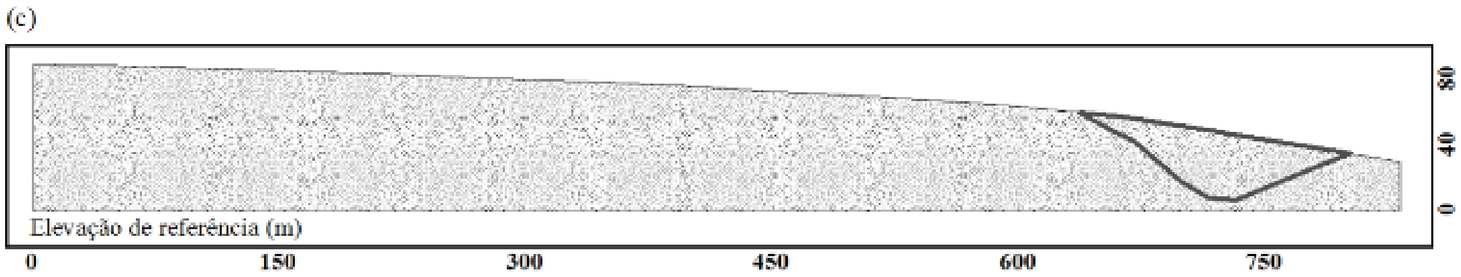




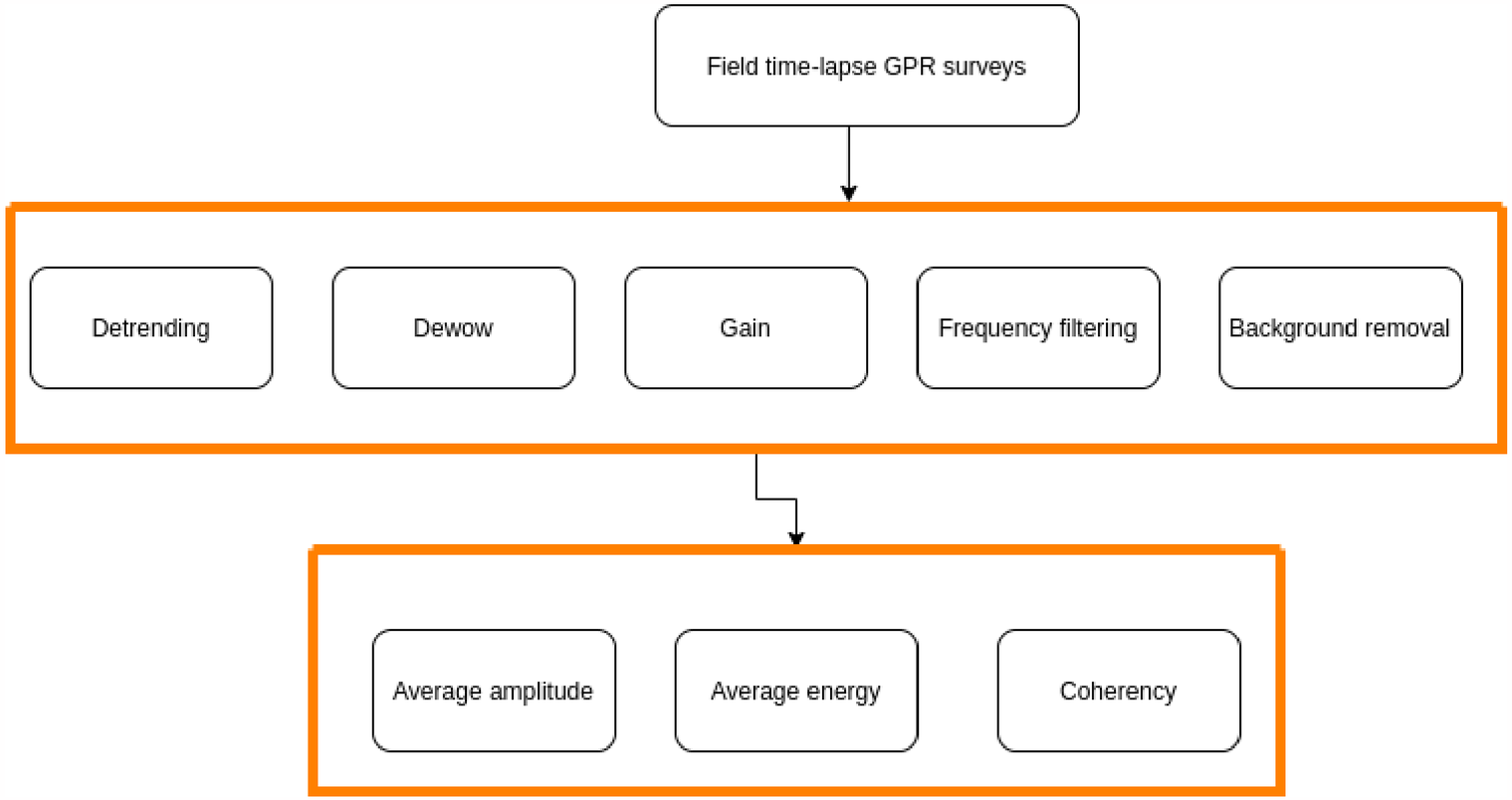

UAmV
UBmV
UCmV
UDmV
UEmV
mV
Week
2016-03
2016-05
2016-07
2016-09
2016-11
2017-01
2017-03
Depth
10 cm
20 cm
30 cm
40 cm
60 cm
100 cm
dry season


(b)
184800
185000
8233850
8233700
Estrada
F
UA
UB
UC
UD
PE
UE
Córrego
Capetinga
A
B
C
D
E


23
20
17
0
100
200
300
°C
mm
Precipitação
Temperatura
Jan
Fev
Mar
Abr
Mai
Jun
Jul
Ago
Set
Out
Nov
Dez


(c)
Elevação de referência (m)
0
150
300
450
600
750
80
40
0

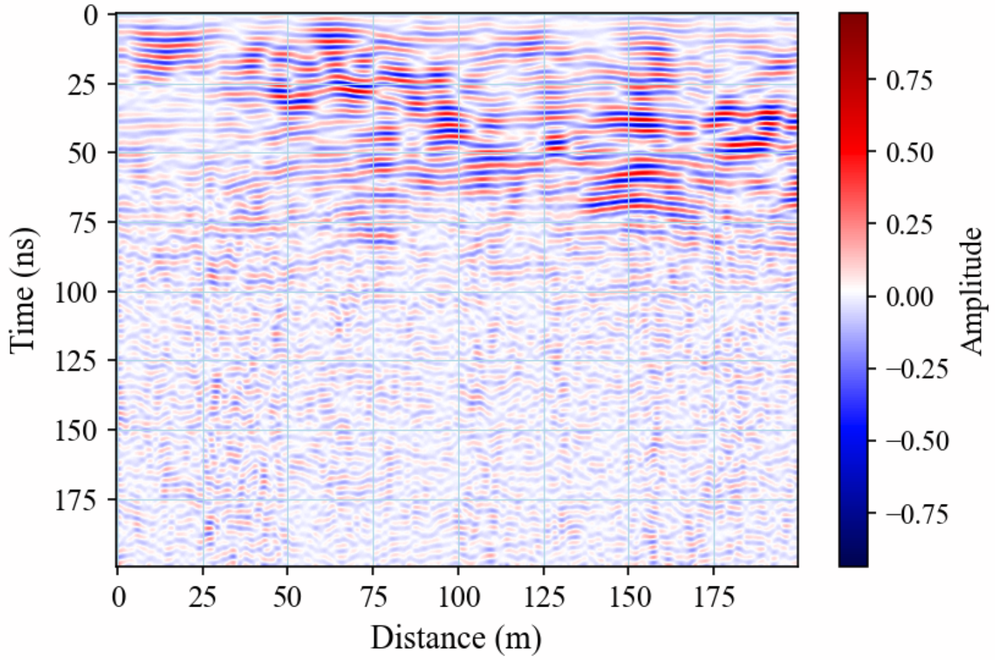
Processing steps



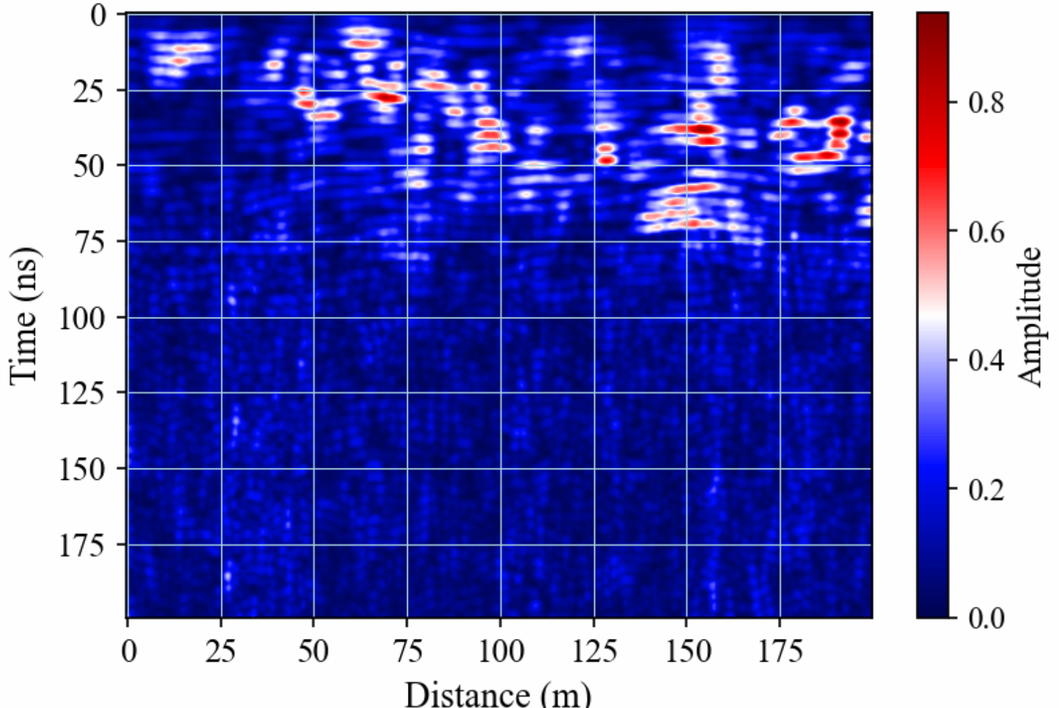
Average amplitude

The average amplitude is determined by calculating the average of all positive values within a fixed time window, with negative amplitudes discarded. The longer the time window, the worst the vertical resolution. This attribute is helpful to interpret the layers' depth.

Pre-processed data



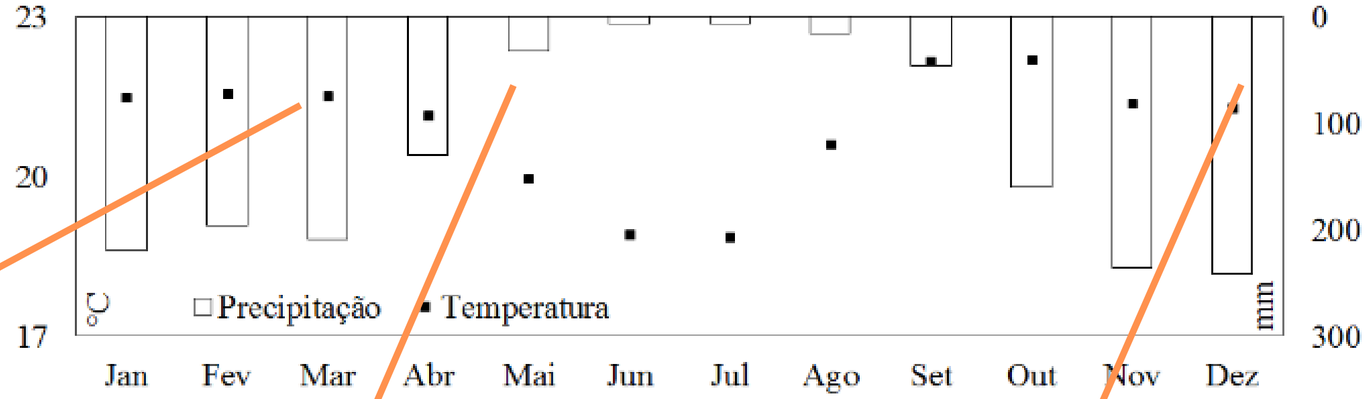
Average amplitude

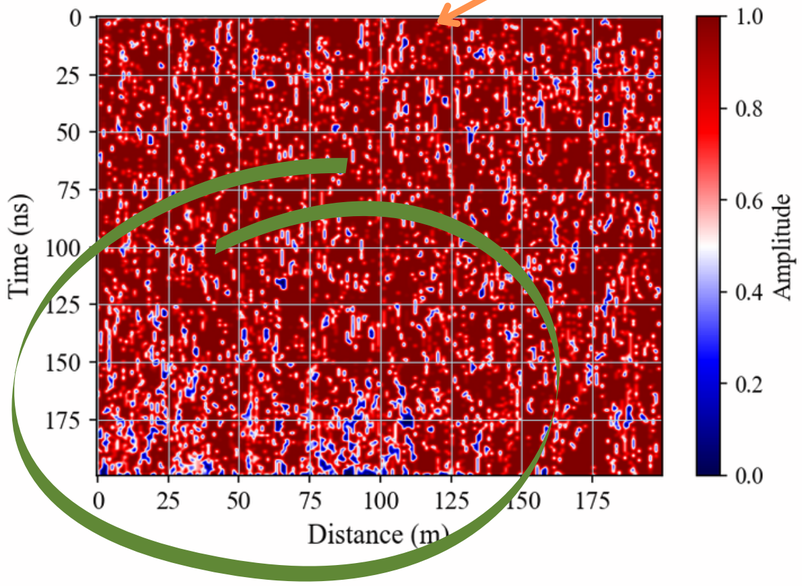


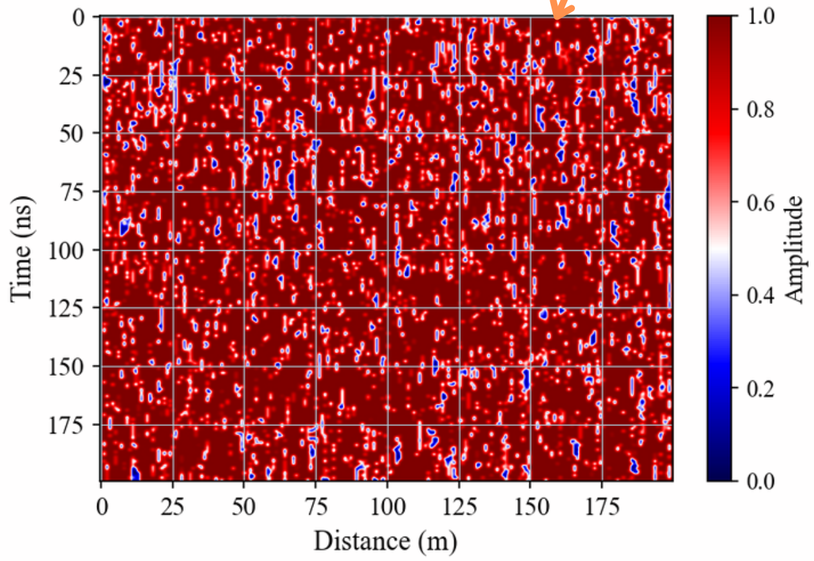
Coherence attribute

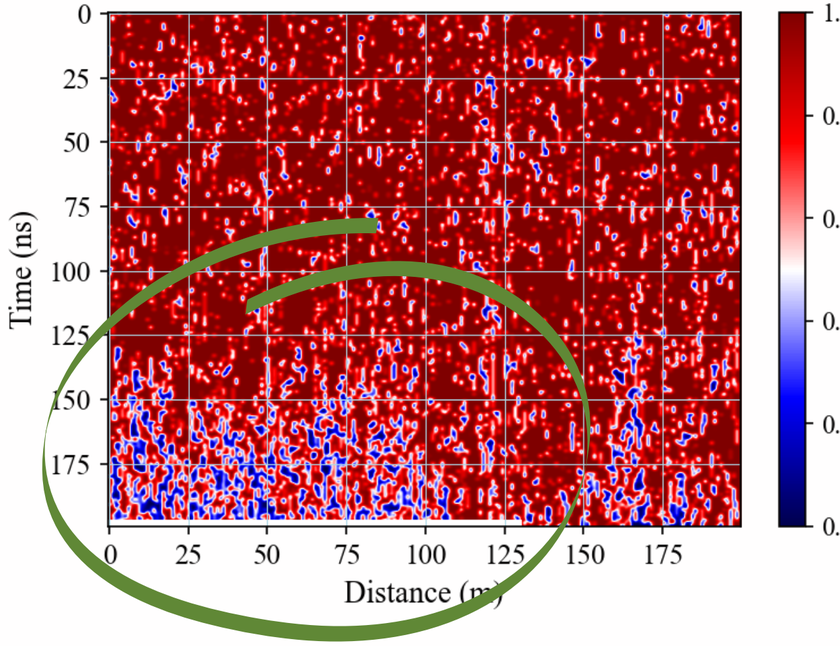
$$\rho_x(x_i,t,\Delta t_x)=\frac{\sum_{\tau=-\omega}^{\omega}u(x_i,t-\tau)u(x_{i+1},t-\tau-\Delta t_x)}{\sqrt{\sum_{\tau=-\omega}^{\omega}u^2(x_i,t-\tau)\sum_{\tau=-\omega}^{\omega}u^2(x_{i+1},t-\tau-\Delta t_x)}}$$

quantitatively describes the waveform similarity of multi traces





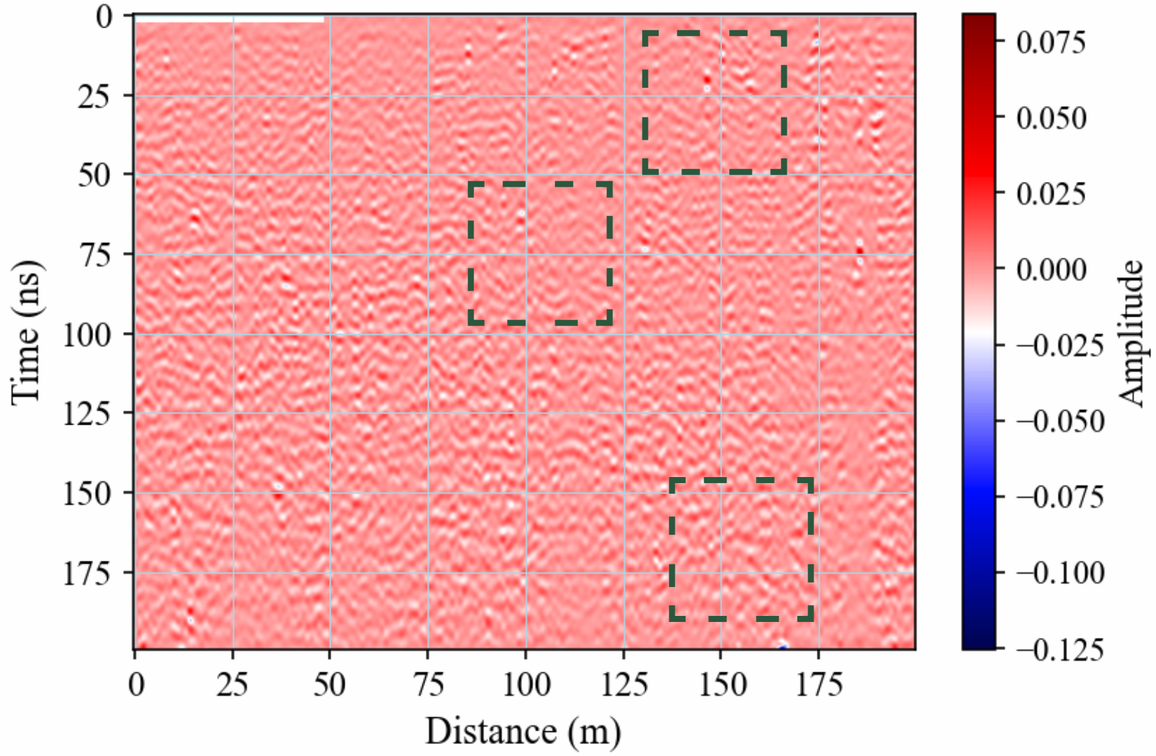




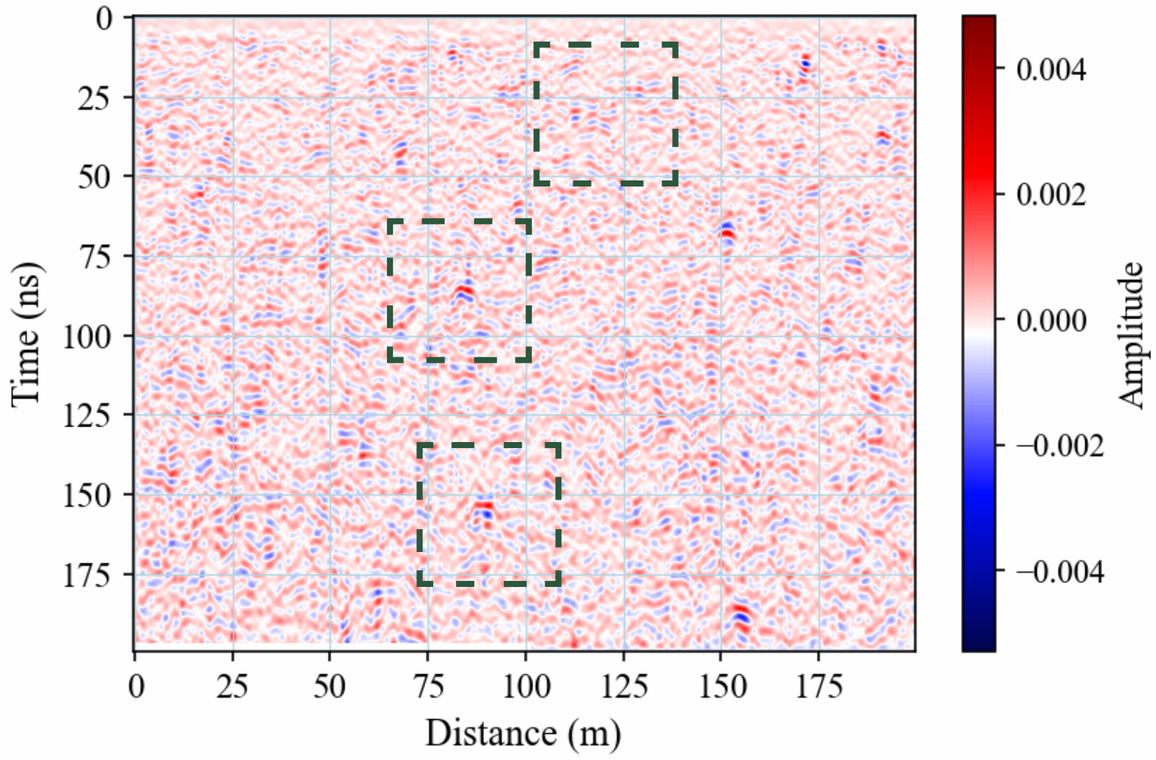
Geometry match tracking

Reflection differences between rainy season radargrams collected in subsequent year, repeated GPR surveys over the same transect (200MHz antenna)

2016



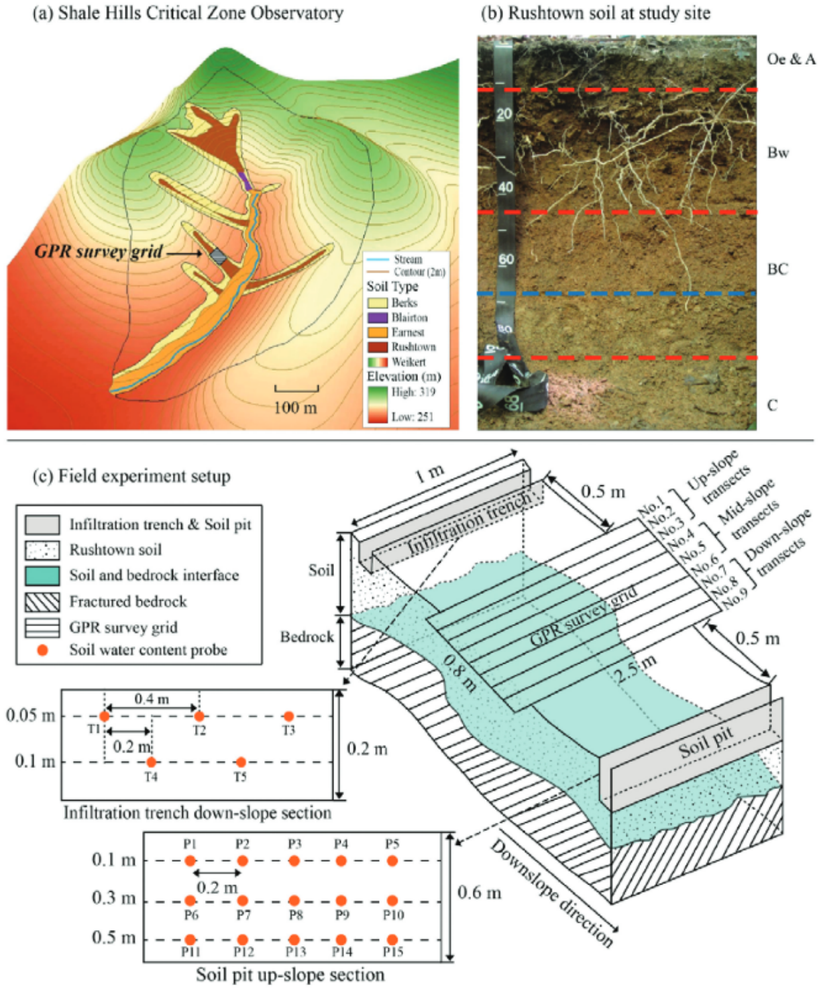
2017

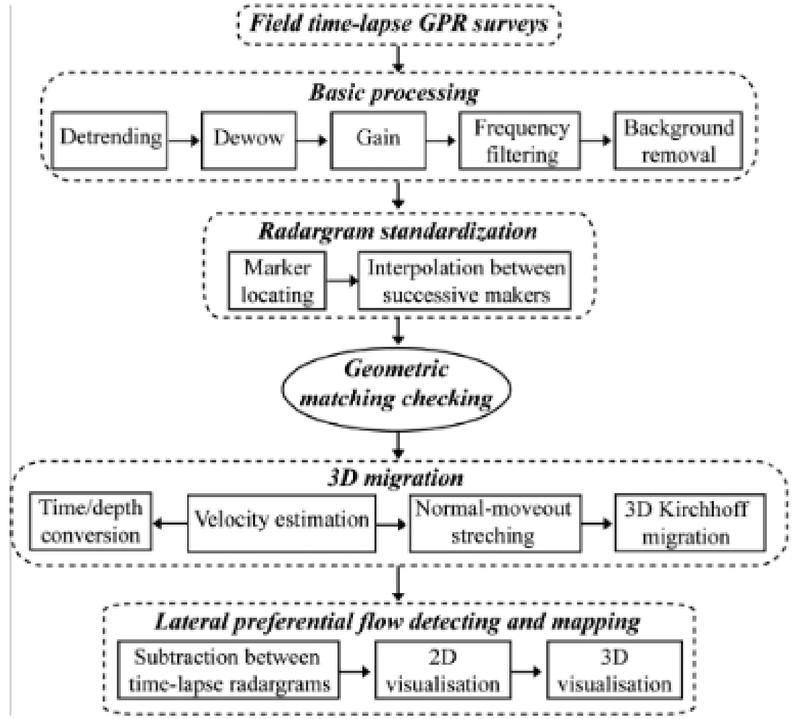


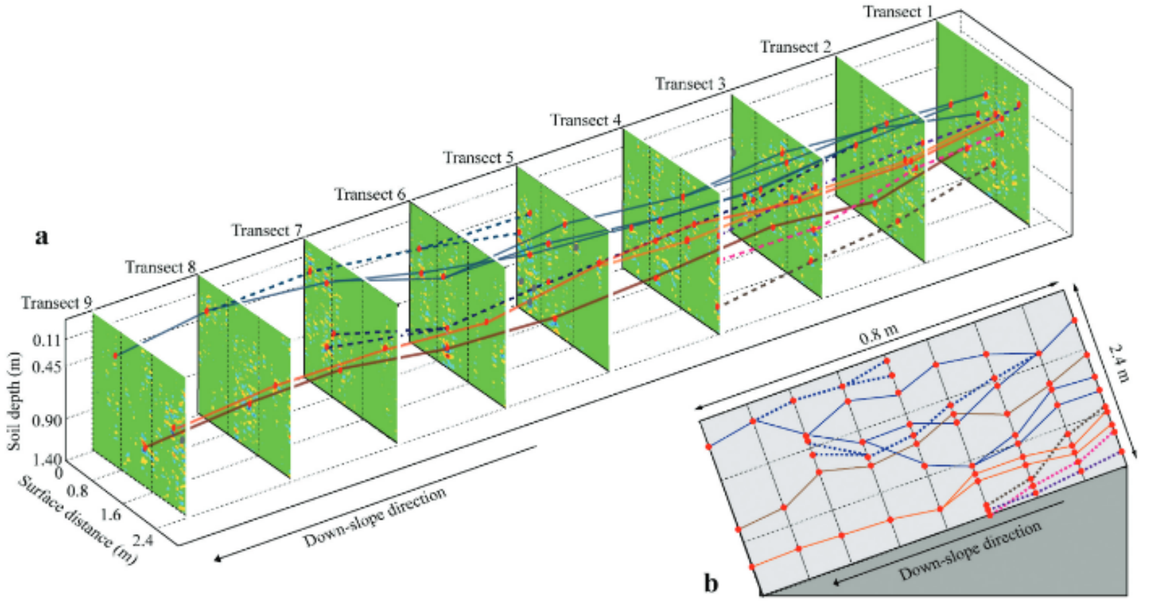
Next steps

Subsurface lateral preferential flow network revealed by time-lapse ground-penetrating radar in a hillslope

Li Guo[1,2,3], Jin Chen[1,2], and Henry Lin[3]







Thank you

susanne@unb.br