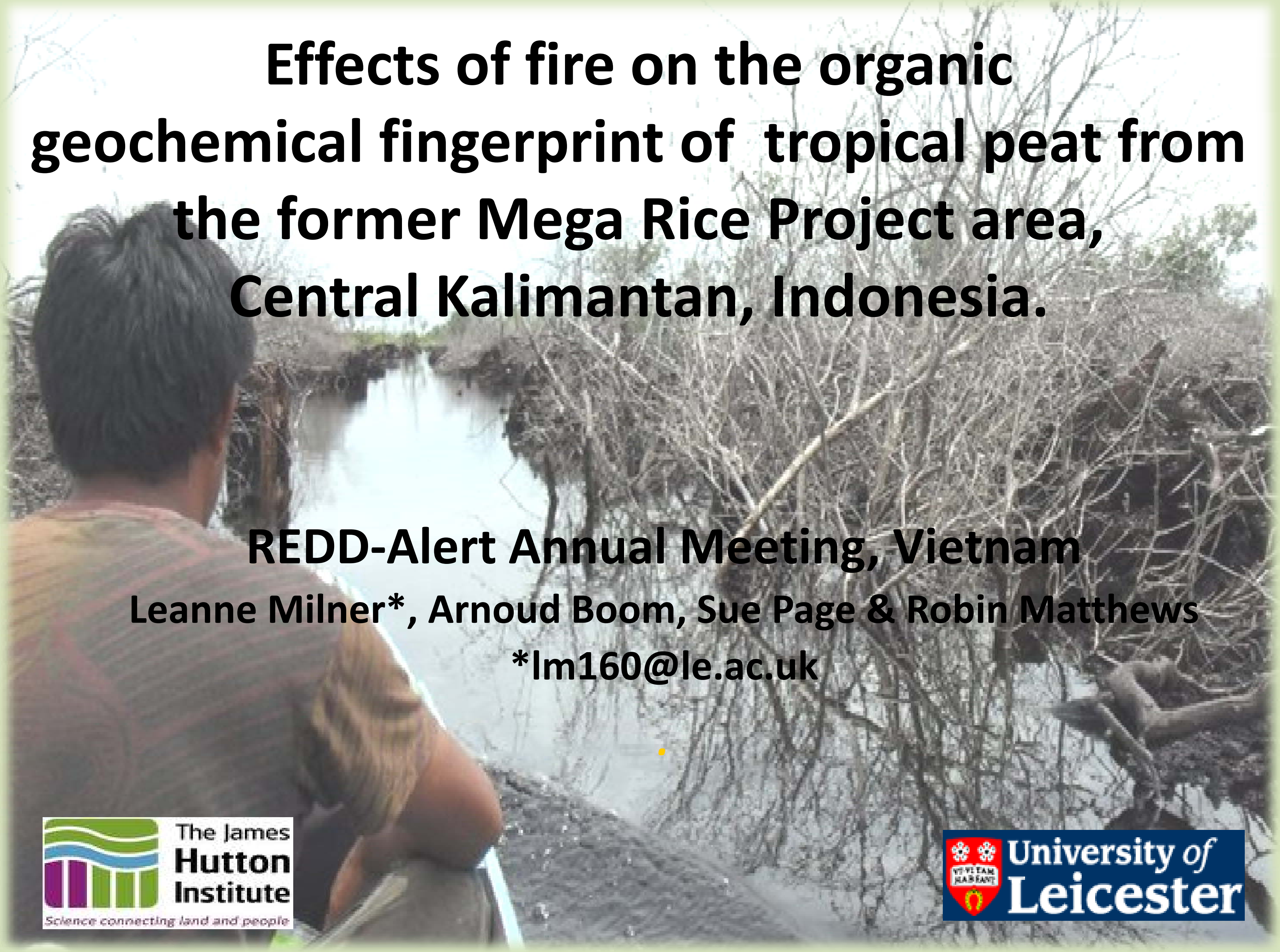

Effects of fire on the organic geochemical fingerprint of tropical peat from the former Mega Rice Project area, Central Kalimantan, Indonesia.

REDD-Alert Annual Meeting, Vietnam

Leanne Milner*, Arnoud Boom, Sue Page & Robin Matthews

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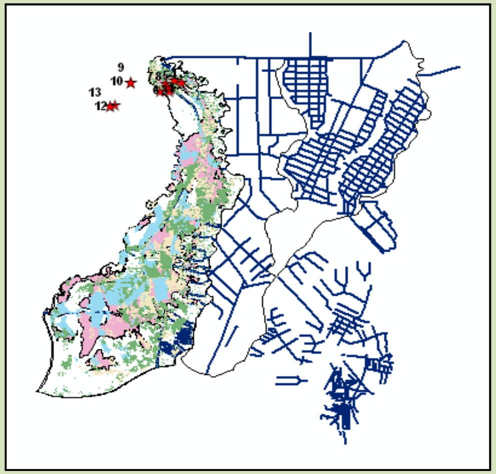
Research overview

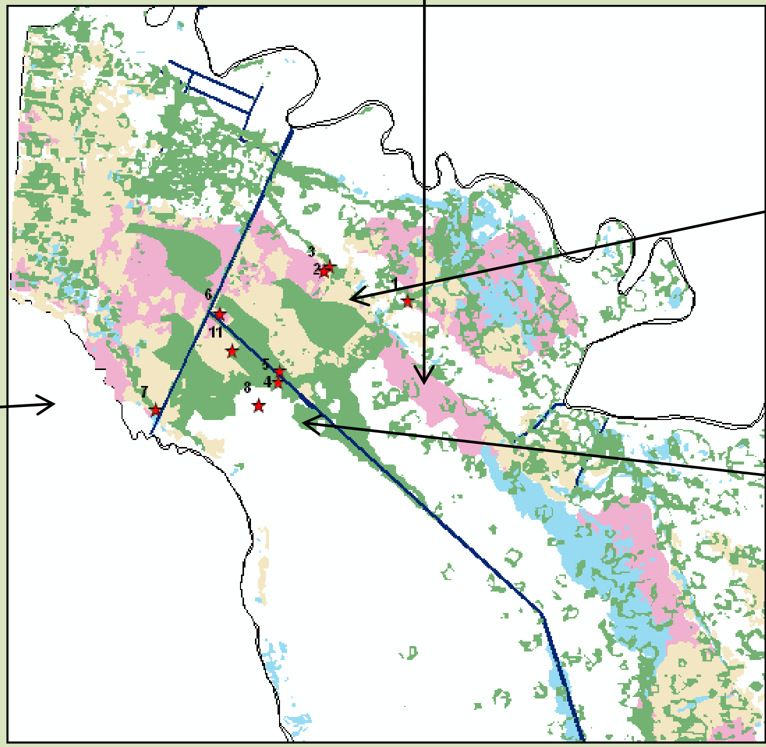
- Improve understanding of the effects of fire on carbon forms in tropical peat.
- Obtain a detailed fingerprint of the organic matter at the molecular level pre and post fire.
- Understand how fire alters peat nutrient status.
- Estimating the ‘black carbon’ content given different fire histories.

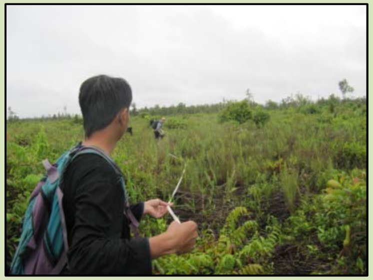
Methods & Sampling



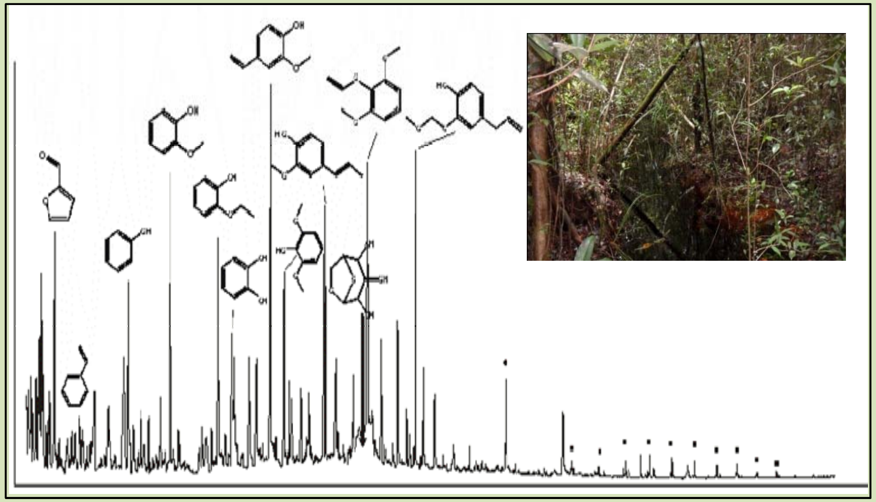
Legend

- ★ coordinates for 2011 sampling.csv Events
- 2009_burnedlandcover
- 2006_burnedarea_landcover
- burn_scars2002_ETM_AgH
- burn_scars1997_TM_AgH

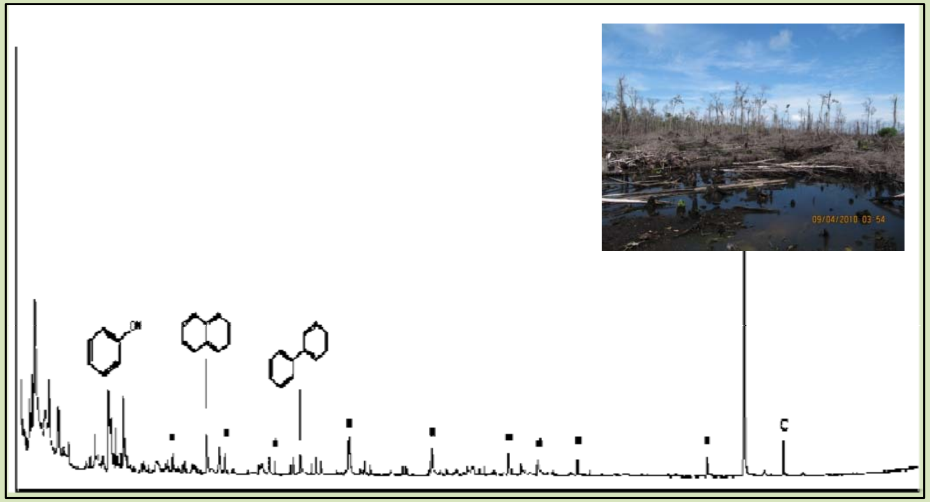




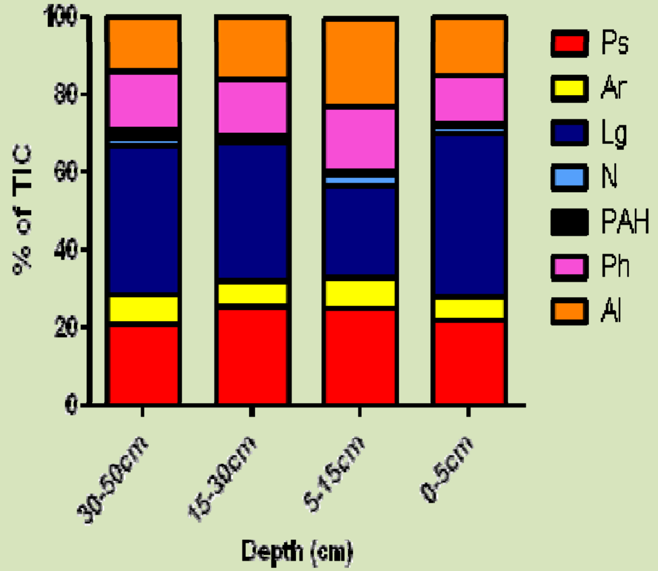
OM alteration- immediately post fire

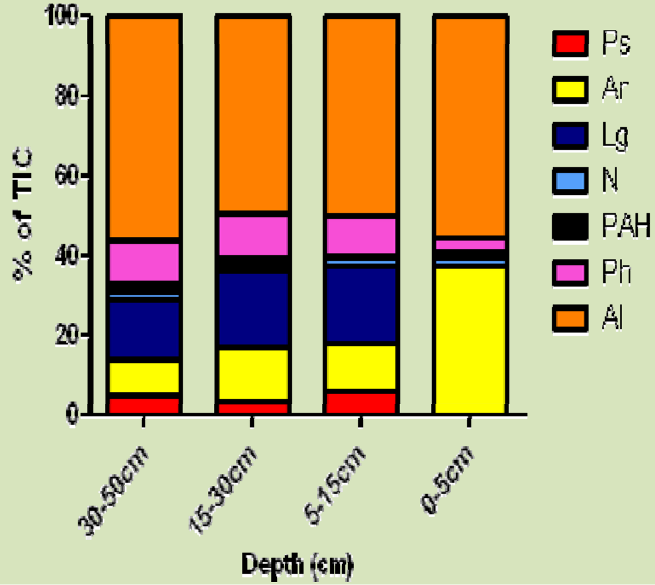


Pre -fire

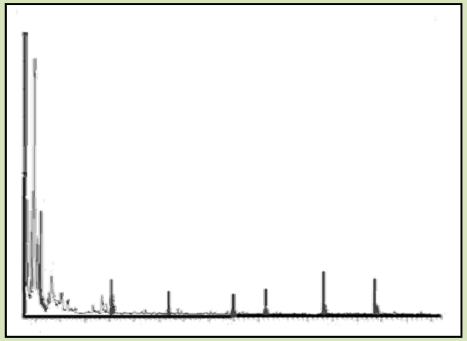


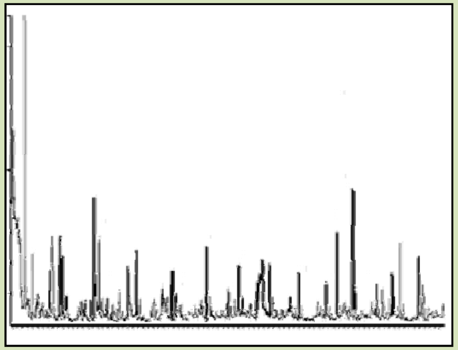
1 month post -fire

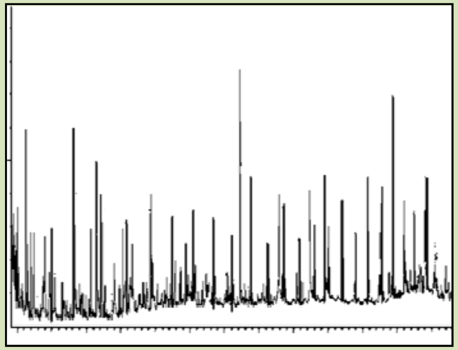


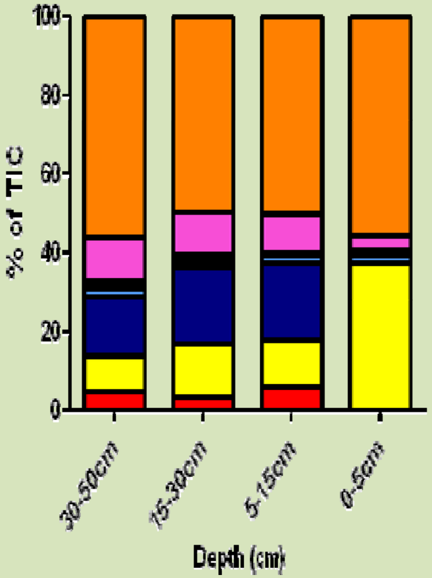


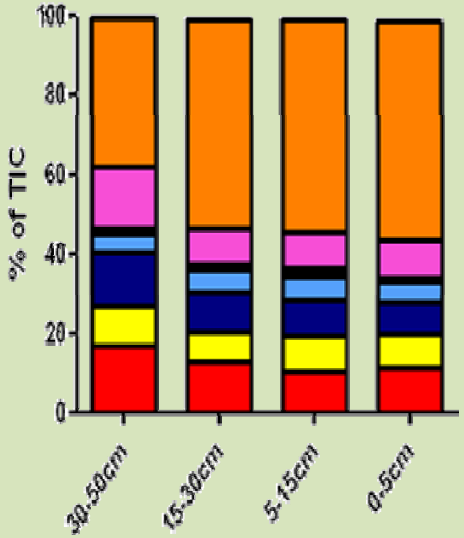
Organic matter alteration – 1 month to 13 years post fire

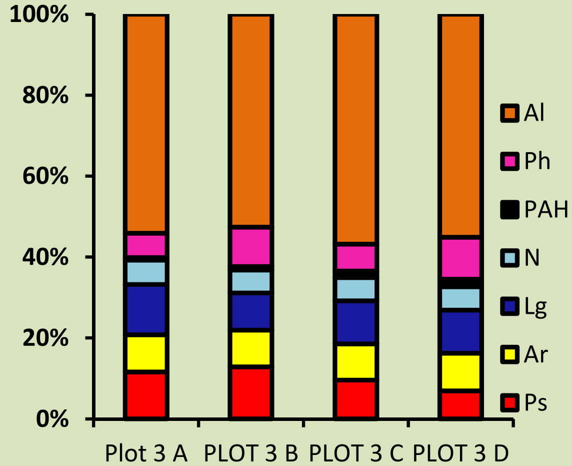










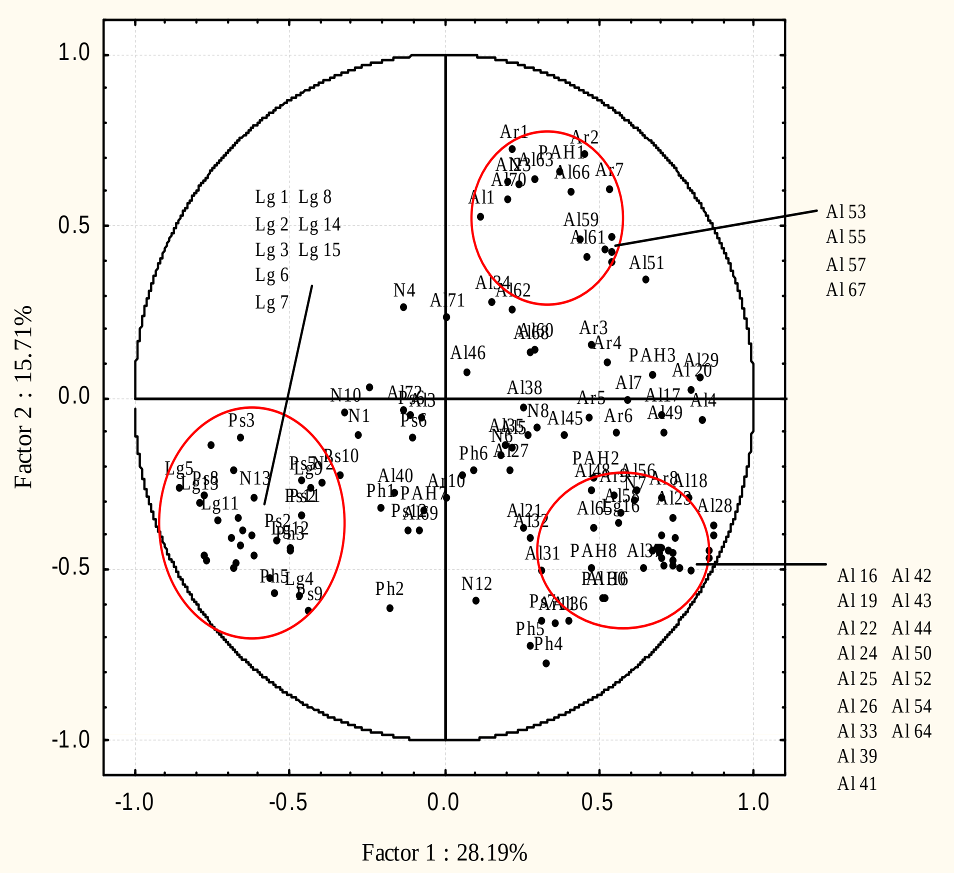


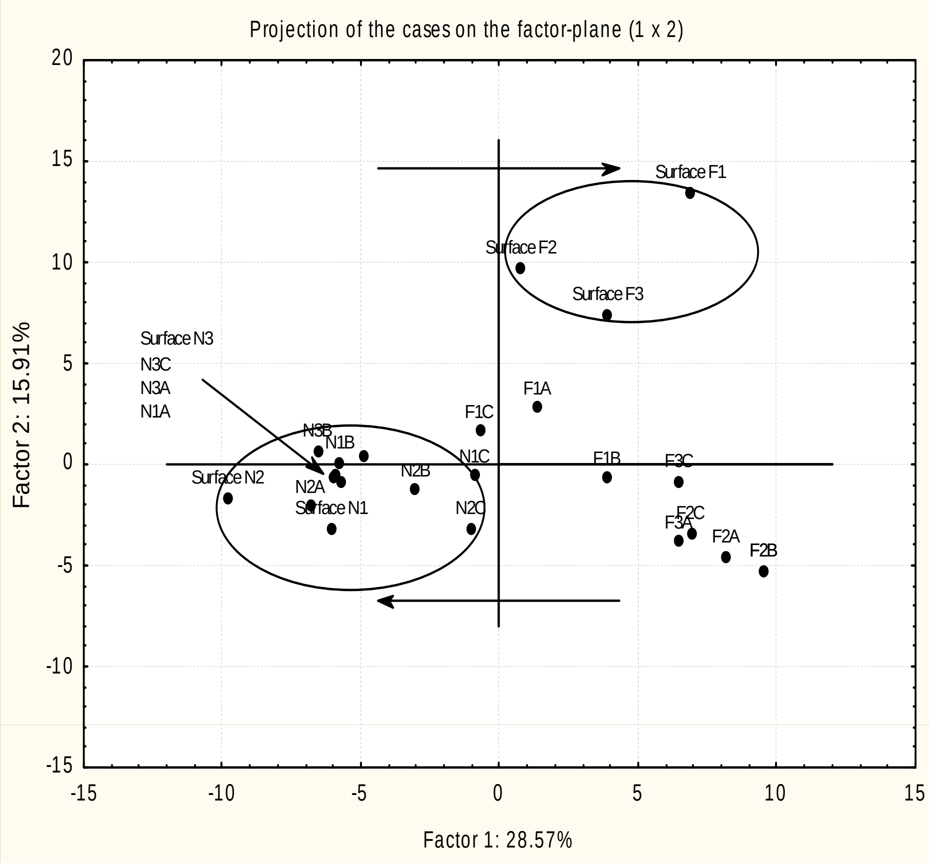
1 month

18 months

13 years

Time since fire





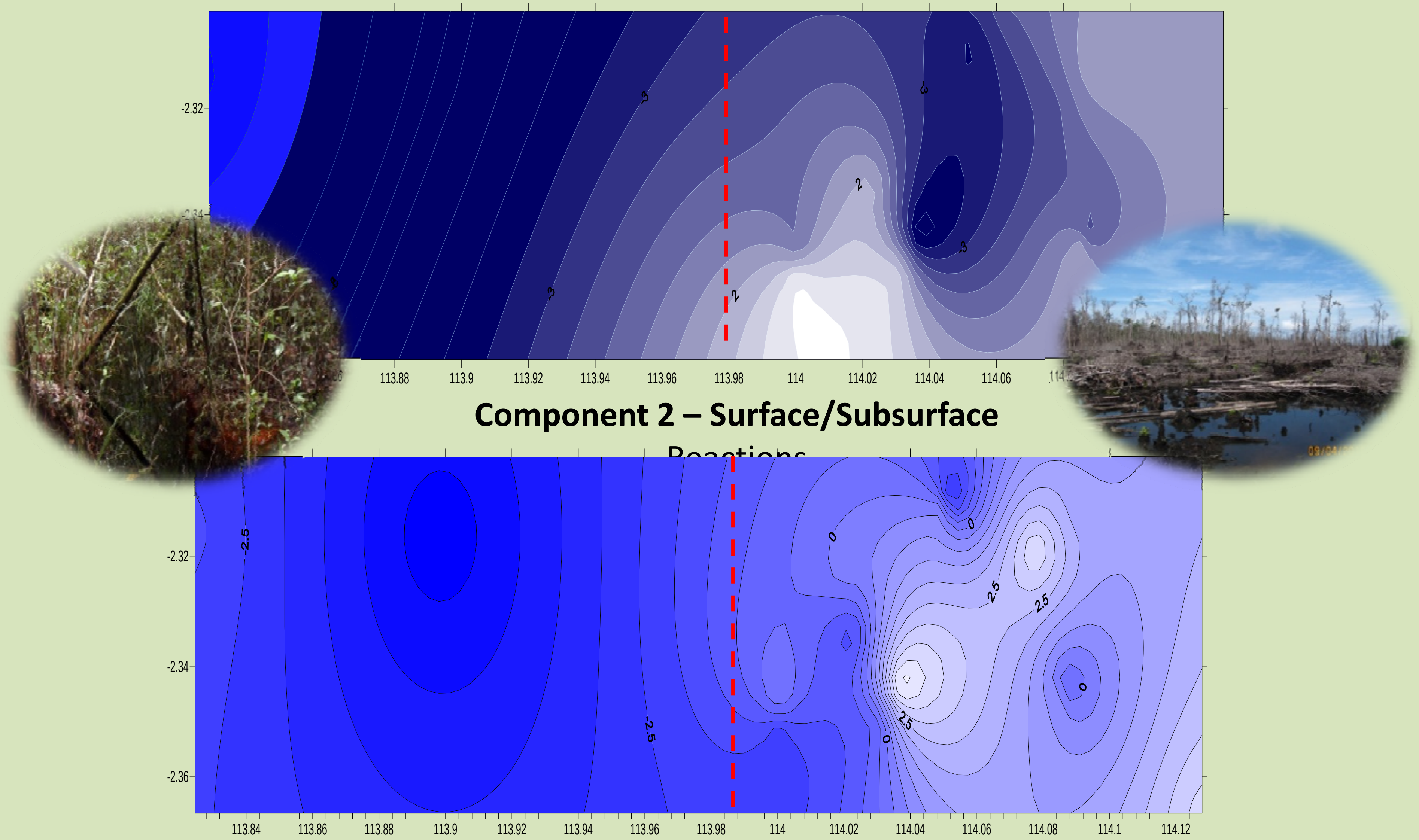
Milner et al – *(submitted 'Organic Geochemistry')*

Spatial variation in OM composition

Intact peat swamp forest

Component 1 - Fire

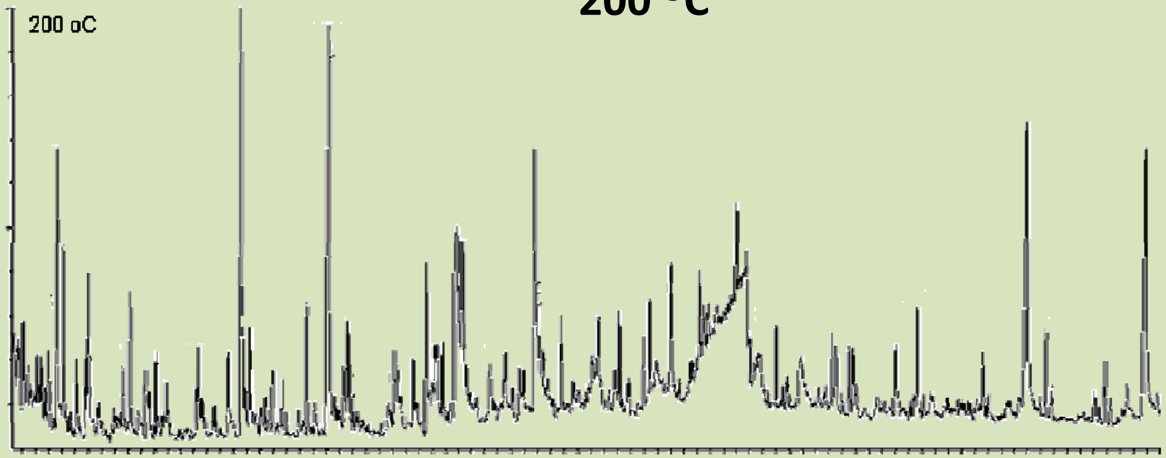
Degraded & Burnt peat



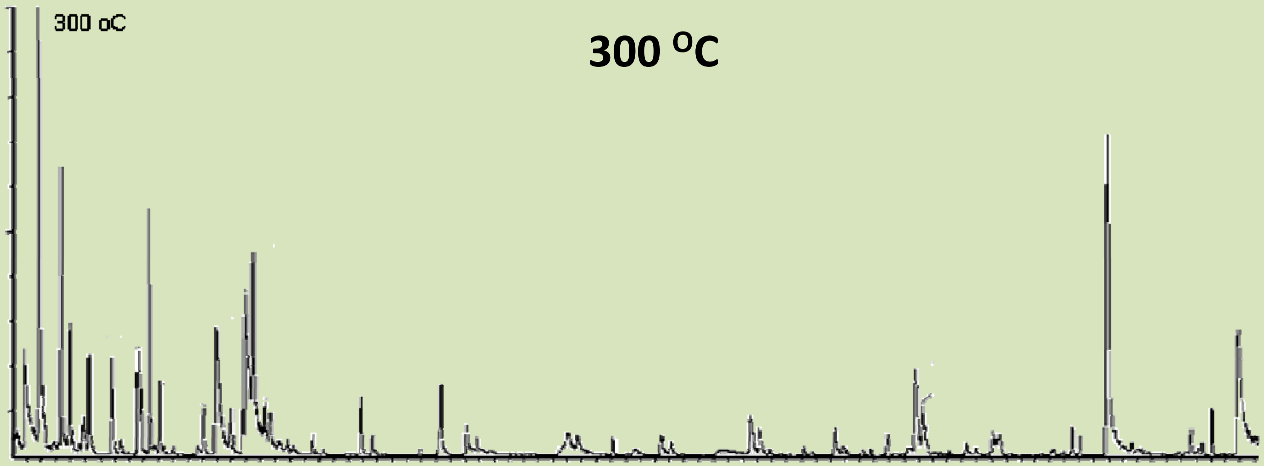
Component 2 – Surface/Subsurface Reactions

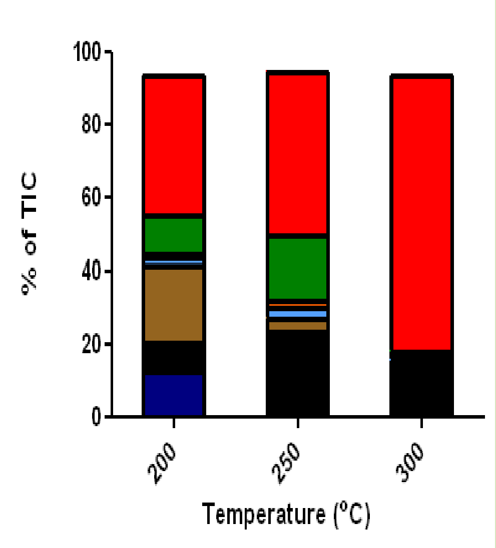
Estimating Burn Severity

200 ^{O}C

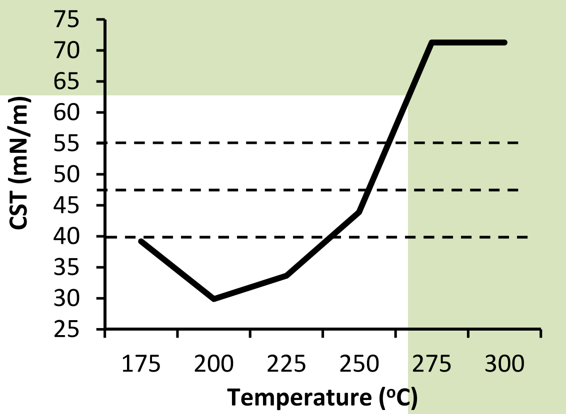


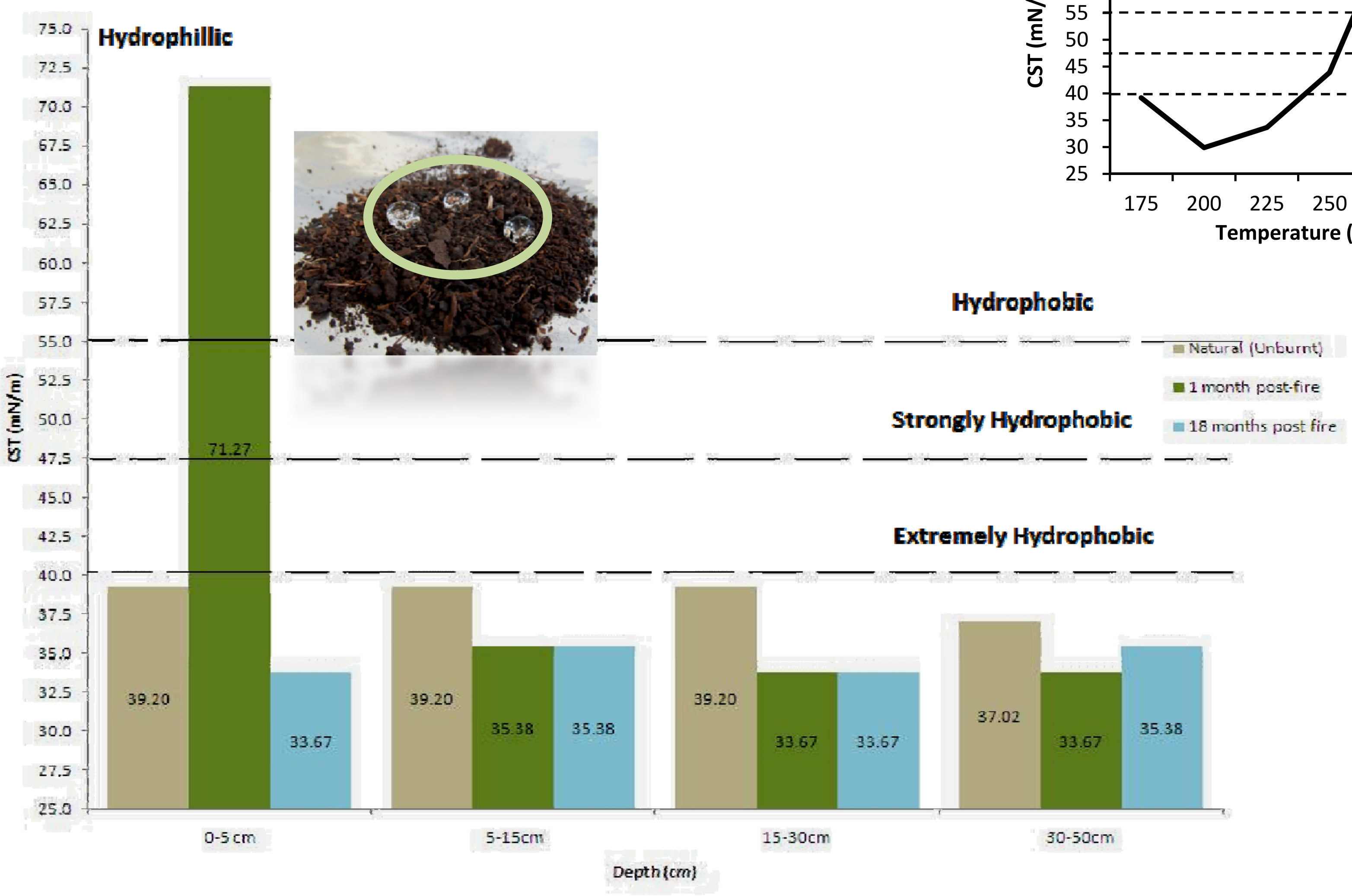
300 ^{O}C

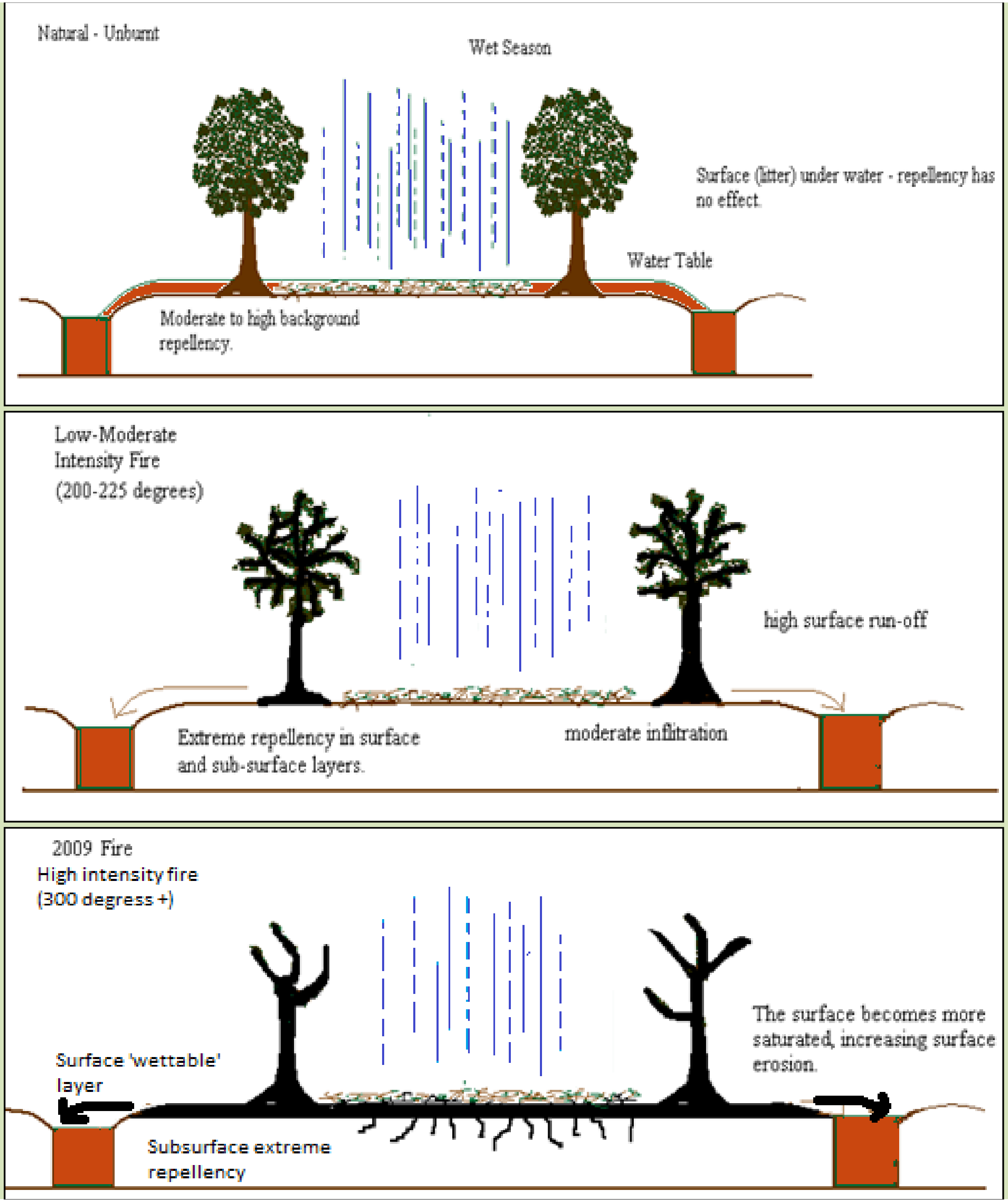




Fire enhances potential water repellence of tropical peat






Natural - Unburnt
Wet Season
Surface (litter) under water - repellency has no effect.
Water Table
Moderate to high background repellency.
Low-Moderate Intensity Fire (200-225 degrees)
high surface run-off
Extreme repellency in surface and sub-surface layers.
moderate infiltration
2009 Fire
High intensity fire (300 degress +)
The surface becomes more saturated, increasing surface erosion.
Surface 'wettable' layer
Subsurface extreme repellency

Sample	Time since burn	TC (%)	TN (%)	C:N	CEC
SN	/	39.26	1.22	39.26	107.93 ± 10.19
NC	/	28.02	1.93	28.02	104.73 ± 12.54
NB	/	29.65	1.86	29.65	106.12 ± 9.15
NA	/	29.95	1.82	29.95	102.51 ± 16.55
SF	1 month	78.63	0.73	107.72	75.84 ± 4.12
FC	1month	56.62	0.99	56.62	83.27 ± 6.89
FB	1 month	55.53	0.92	55.53	103.62 ± 7.16
FA	1 month	41.78	1.36	41.78	100.70 ± 3.25
S1.5	18 month	56.63	0.82	69.06	
1.5C	18 months	46.24	0.59	68.14	
1.5B	18months	49.02	0.76	64.09	
1.5A	18 months	53.37	0.76	69.93	
S13	13 years	56.85	1.12	50.70	
13C	13 years	56.28	1.12	50.28	
13B	13 years	55.24	0.99	51.16	
13A	13 years	54.60	1.07	55.91	

Estimating the 'Black Carbon' content

- Currently no estimates of BC content in tropical peatland systems.

Black Carbon ????

- BC is a potential sink of C that is inert and low susceptibility to microbial decomposition.

<u>Method to estimate BC content</u>

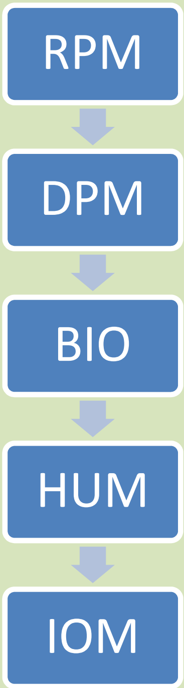
- **Hydrogen Peroxide/Weak nitric acid digestion.**
- **Spike unburnt samples with a known amount of charcoal.**
- **Use Py-GC/MS to identify the nature of the remaining material.**

Determining C pools pre/post fire

C:LOI ratio

Surface Natural	Subsurface Natural	Surface 1 month Post-fire	Subsurface 1 month Post-fire	Surface 18 months Post-fire	Subsurface 18 months Post-fire	Surface 13 years Post-fire	Subsurface 13 years Post-fire
0.40	0.38	0.80	0.56	0.57	0.50	0.57	0.56

- Chemical fractionation to determine C pools.



Physical & Chemical separation to fractionate into each C pool.

Relate results to different 'fire histories' determined by Py-GC/MS data and remote sensing data.

Conclusions

- Organic composition is modified during burning as well as thermal alteration at depth to a minimum of 50cm below the surface- burnt peat is more recalcitrant.

- Increase relative contributions of apolar (hydrophobic) compounds enhances background levels of water repellence in subsurface.

- % C content increase from (47- 55 %) to (71- 55 %) after burning. C:N ratios increase post-fire from (29 – 40) to (107 – 49).

- Determining black carbon/ other C pools can be utilised for C modelling under a range of fire scenarios.