

Depositional Characteristics of Organic Materials in Mangrove Swamp in Tamsui

淡水紅樹林沼澤有機質沉積特性研究

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Outline

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- Purpose
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- Materials and Analytical Methods
- Preliminary Results
- Conclusion
- Future Work

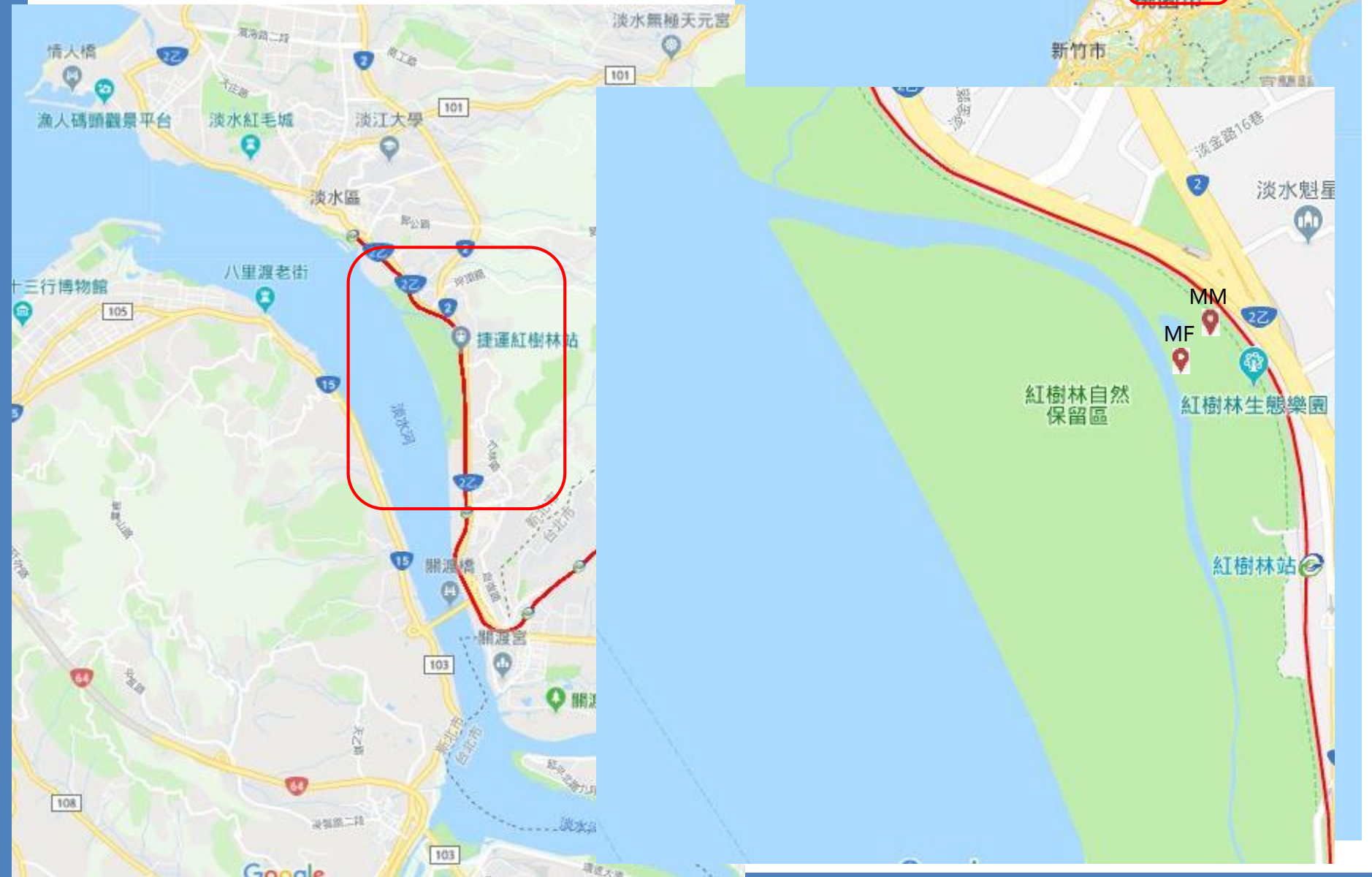
Introduction

- Mangrove swamp is an important intertidal wetland ecosystem with **high primary productivity, abundant detritus, rich organic carbon** and **anoxic/reducing** conditions.
- Coalification :
plant → peat → lignite → sub-bituminous coal → bituminous coal → semi-anthracite → anthracite
- Few studies were concentrated on **peat** research.

Purpose

- To understand the process and mechanism of organic material during burial and preservation processes in a mangrove swamp.

Sample Collection



Sample Preparation

- Samples were collected from different depths (0-5cm, 5-15cm, 15-30cm, 30-40cm)

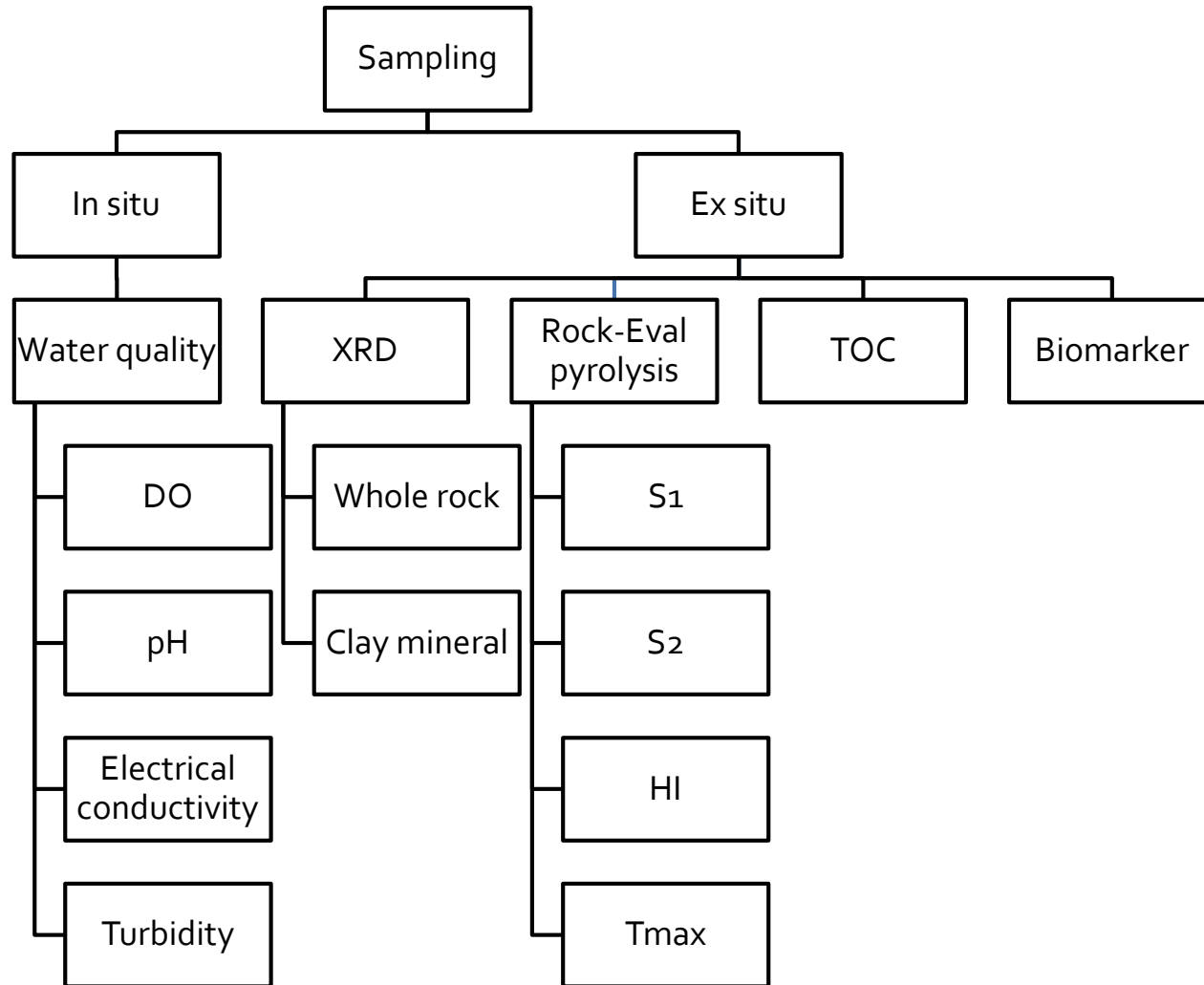
	Dissolved oxygen	pH	Electrical conductivity	Turbidity	Temperature
MF	5.08	7.93	3.69 S/m	74 NTU	28.1 °C
MM	4.65	7.5	1.68 S/m	44 NTU	27.6 °C

Sample Preparation

1. Place samples in an oven at 40°C until dry.
2. Crushed and pass #40 sieve (0.42 mm mesh) to clay size.

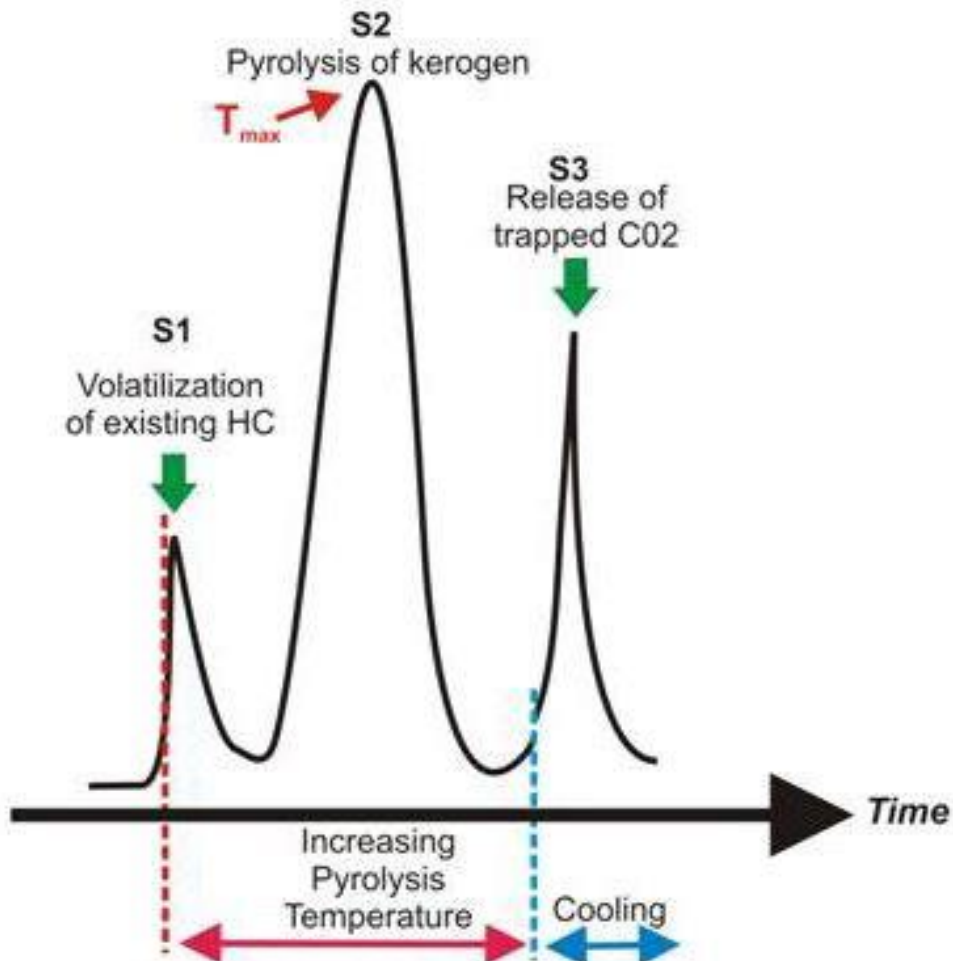


Materials and Analytical Methods



Materials and Analytical Methods

(a) Rock-Eval pyrolysis



- S₁
- S₂
- S₃
- T_{max}
- $HI = S_2 / TOC$

http://docs.dcnr.pa.gov/topogeo/econresource/oilandgas/marcellus/sourcerock_index/sourcerock_quantity/index.htm

	TOC	S ₁	S ₂
Poor	<0.5	<0.5	<2.5
Fair	0.5-1	0.5-1	2.5-5
Good	1-2	1-2	5-10
Very good	2-4	2-4	10-20
Excellent	>4	>4	>20

	T _{max} (°C)
Immature	<435
Mature	435-470
Over mature	>470

Type	HI
I	>600
II	300-600
II/III	200-300
III	50-200

- Kerogen type
 Type I : algal
 Type II : phytoplankton zooplankton
 Type III : terrestrial plant

(Peters & Cassa, 1994)

Materials and Analytical Methods

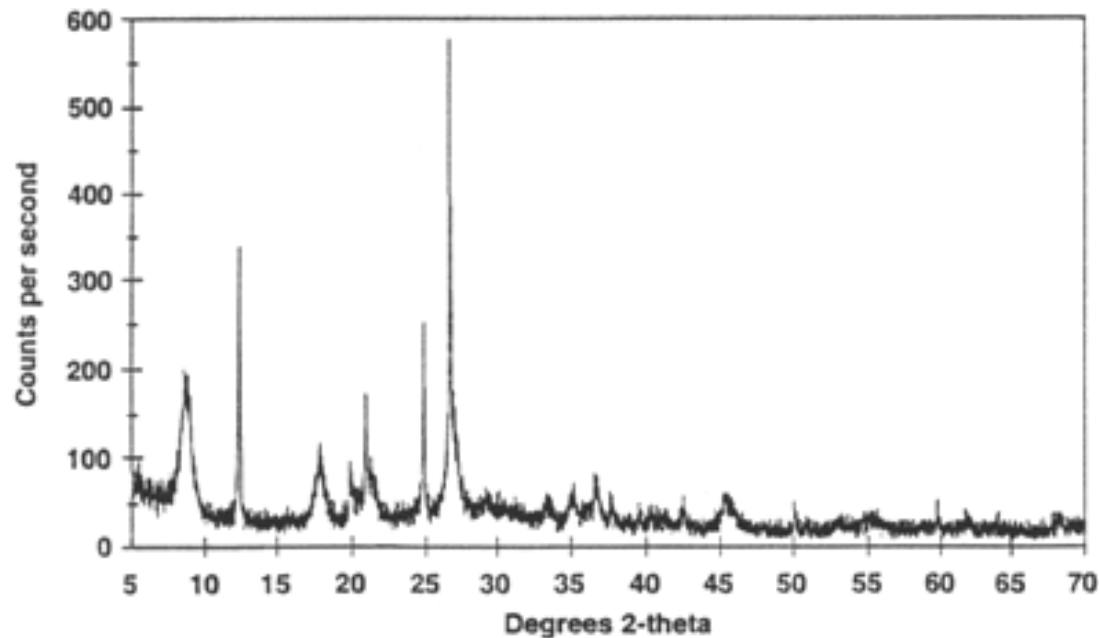
(b) Mineralogical analysis



Bruker D2 Phaser

https://www.google.com.tw/search?q=bruker+D2&source=Inms&tbn=isch&sa=X&ved=oahUKEwiBm8eDhPrZAhXKbrwKHQ4IDHYQ_AUICigB&biw=1517&bih=653#imgrc=FMdn5LoGsuZ9wM:

XRD(X-ray Diffraction)



https://www.google.com.tw/search?q=XRD&source=Inms&tbn=isch&sa=X&ved=oahUKEwj64u--hPrZAhXly7wKHZveD7kQ_AUICigB&biw=1517&bih=653#imgrc=w1F7MzmcDpaOaM:

Materials and Analytical Methods

(b)Mineralogical analysis

1. Whole rock analysis
2. Clay mineral composition analysis
 - ① Air-dried
 - ② Ethylene glycol-solvated state
 - ③ Slow scan

Materials and Analytical Methods

(c) Biomarker

Pr/Ph > 1 oxic condition

Pr/Ph < 1 anoxic condition

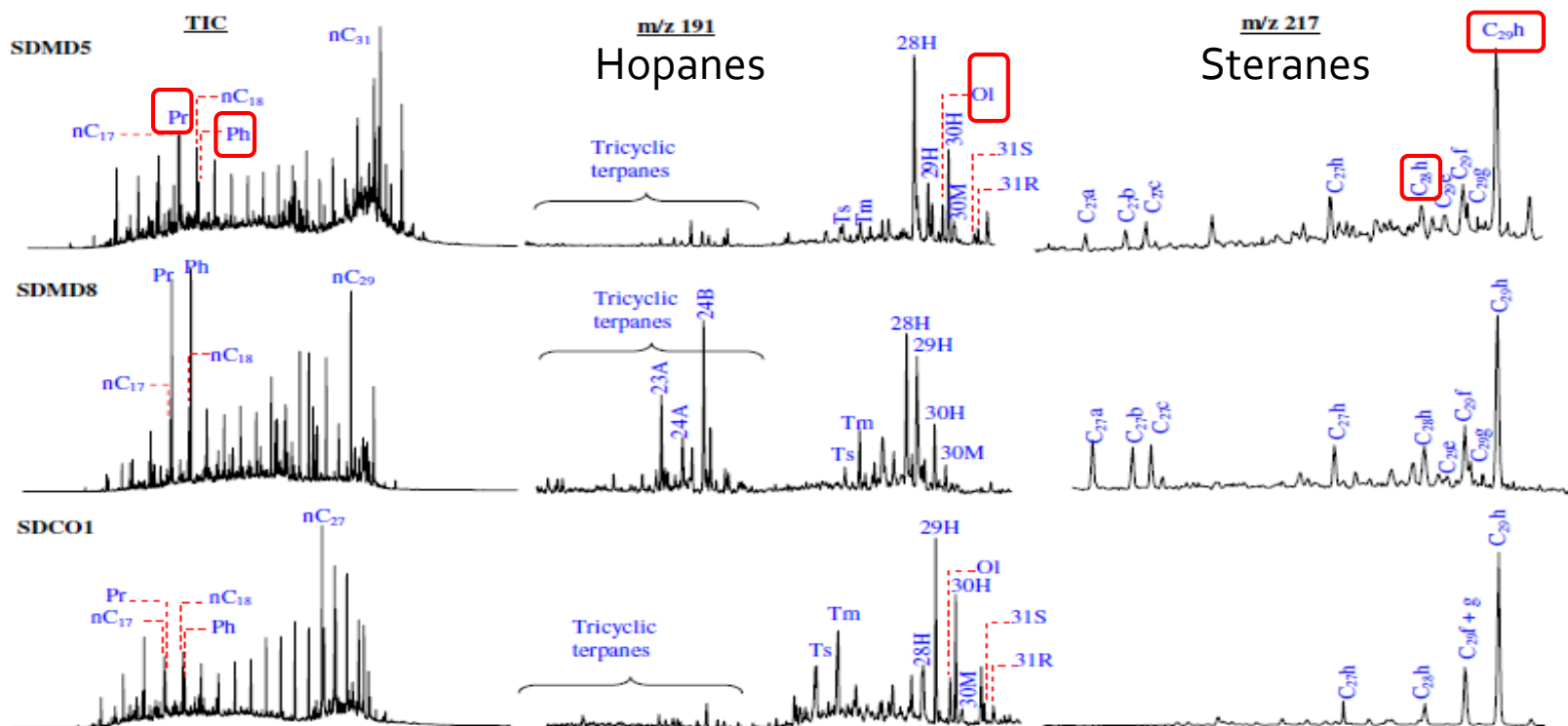


Fig. 6. The gas chromatograms of *n*-alkanes and isoprenoids (TIC) with hopanoid (*m/z* 191) and steranes (*m/z* 217) biomarkers of selected samples. All samples display bimodal distribution skewed towards higher molecular weight carbon number with the odd/even number predominance.

(Peters & Moldowan, 1994)

Oleanane – terrestrial angiosperm flowering plant

C₂₇ Steranes - algae

C₂₉ Steranes – terrestrial land plants

Preliminary Results

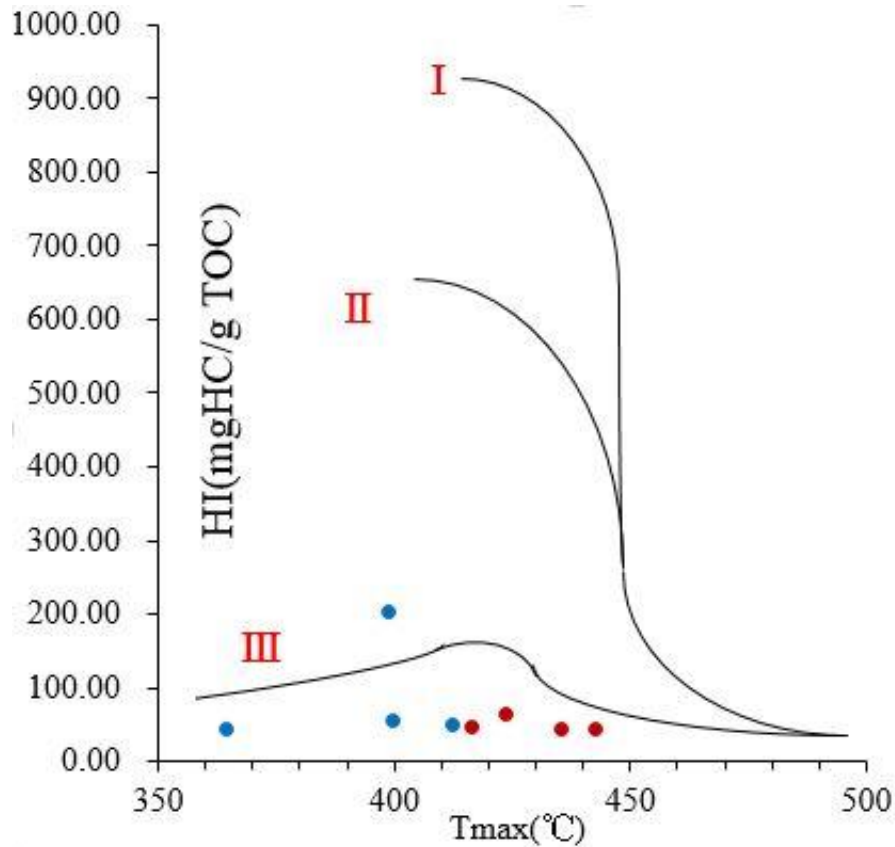
(a) Rock-Eval pyrolysis & TOC

MF

Depth(cm)	TOC(%)	S ₁ (mg HC/g Rock)	S ₂ (mg HC/g Rock)	T _{max} (°C)	HI(mg HC/g TOC)	
0~5	0.804	0.19	0.36	417	44.78	
5~15					61.25	
		Type	HI	Kerogen type	S₁	S₂
15~30						
30~40	Immature	I	>600	algal	<0.5	<2.5
MM	Mature	II	300-600	phytoplankton zooplankton	0.5-1	2.5-5
Dept	Over mature	III/III	200-300		1-2	5-10
0~5					2-4	10-20
5~15		III	50-200	terrestrial plant		
					>4	>20
15~30	0.490	0.13	0.23	413	46.94	
30~40	0.176	0.08	0.07	365	39.77	

Preliminary Results

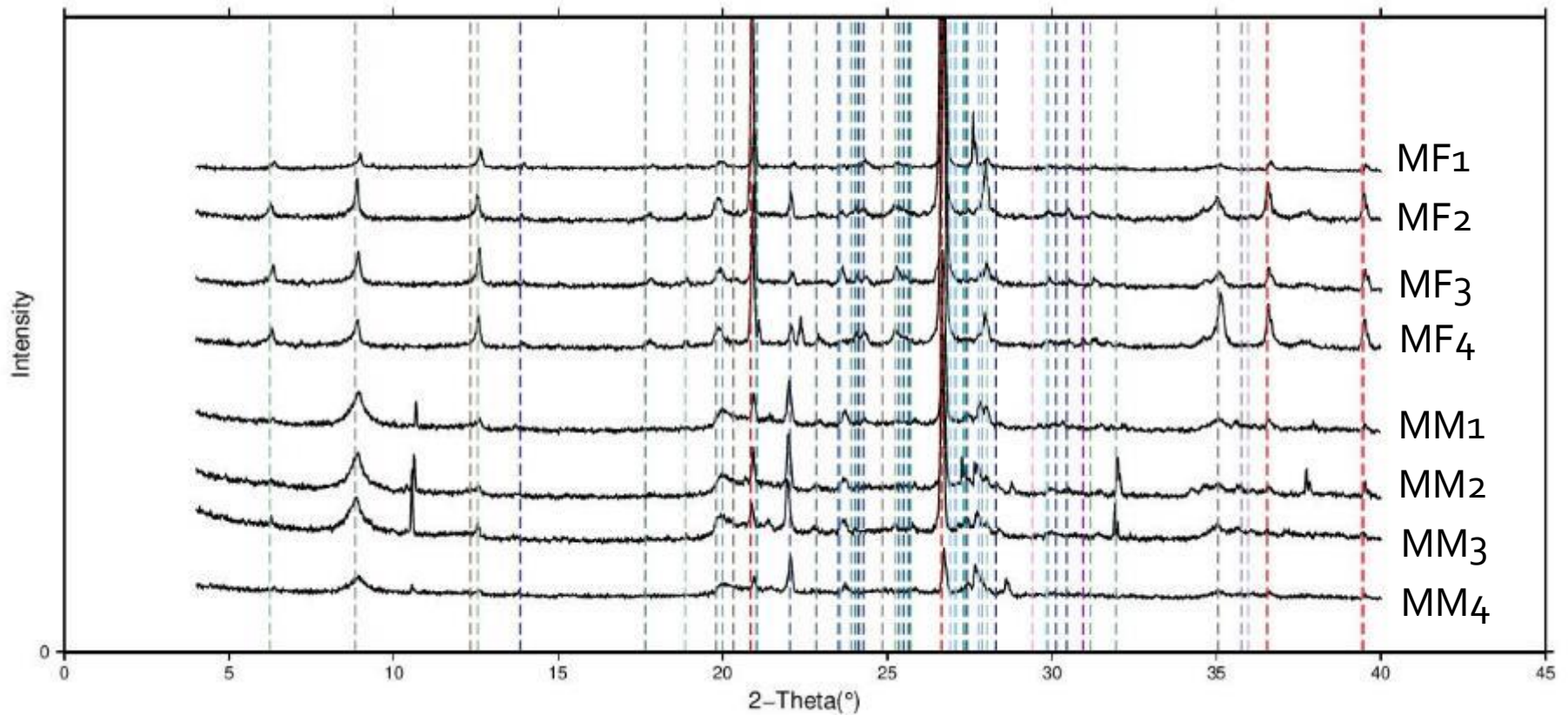
(a) Rock-Eval pyrolysis



- Kerogen type
Type I : algal
Type II : phytoplankton zooplankton
Type III : terrestrial plant

Preliminary Results

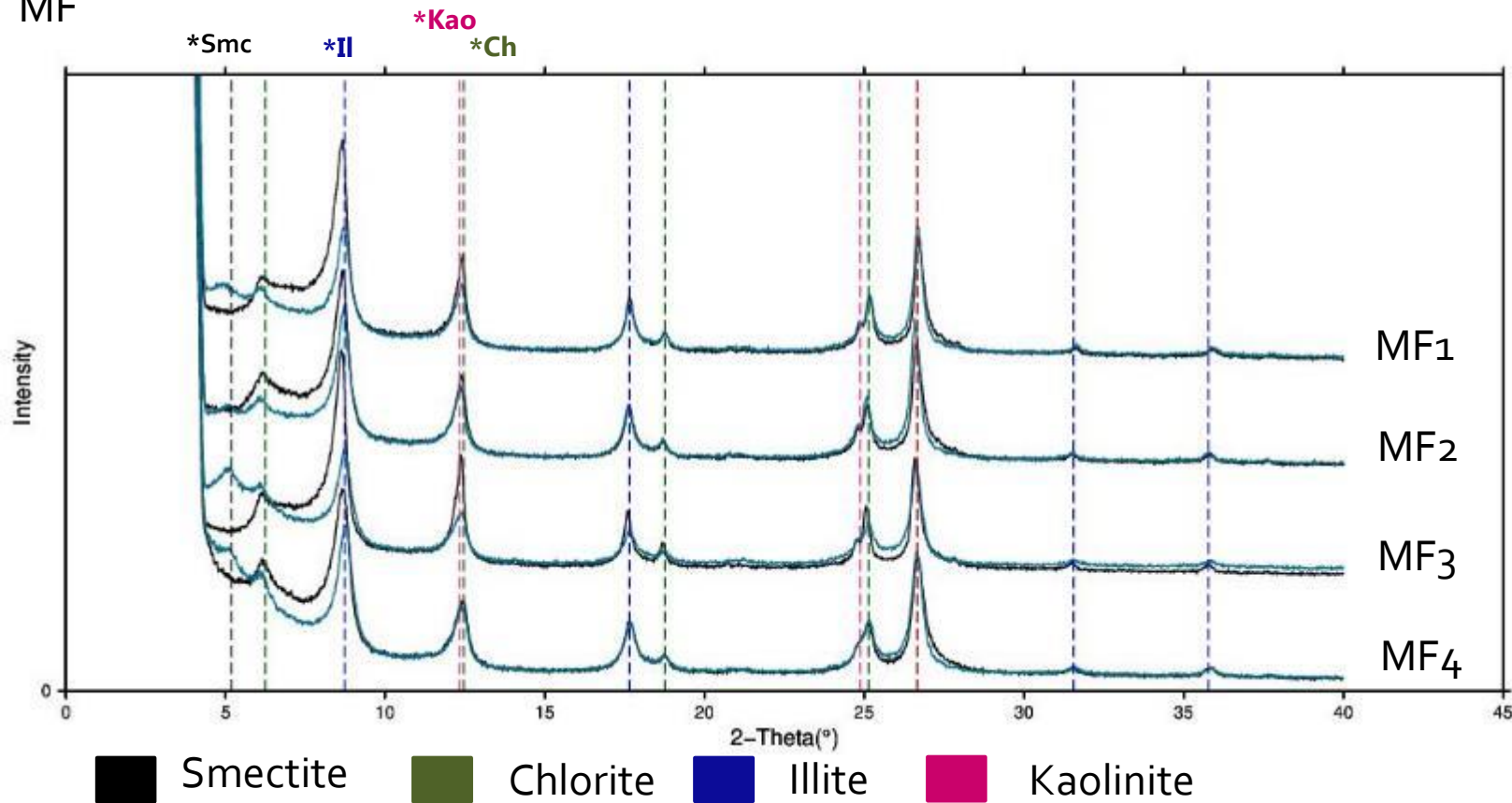
(b) Mineralogical analysis



Preliminary Results

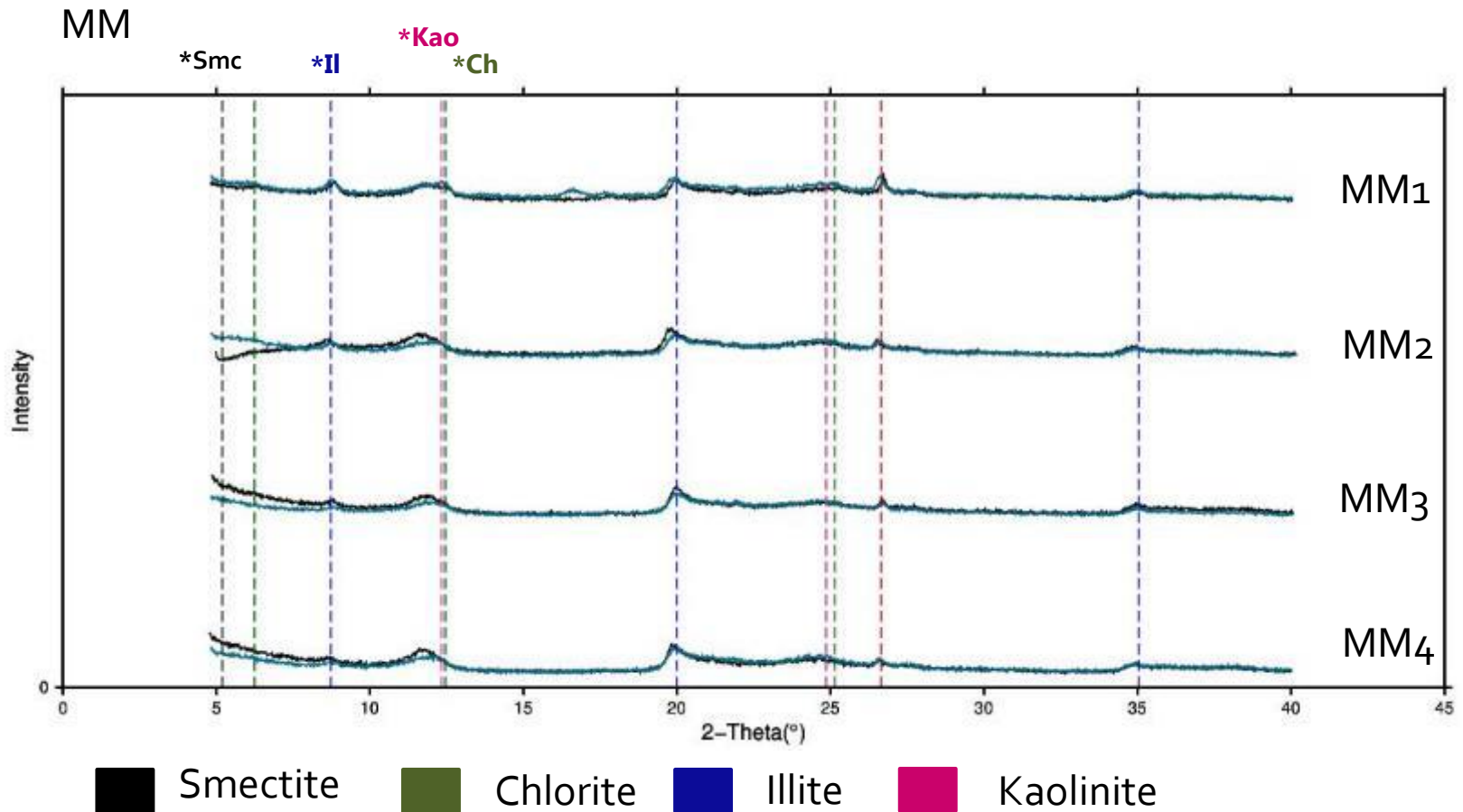
(b) Mineralogical analysis

MF



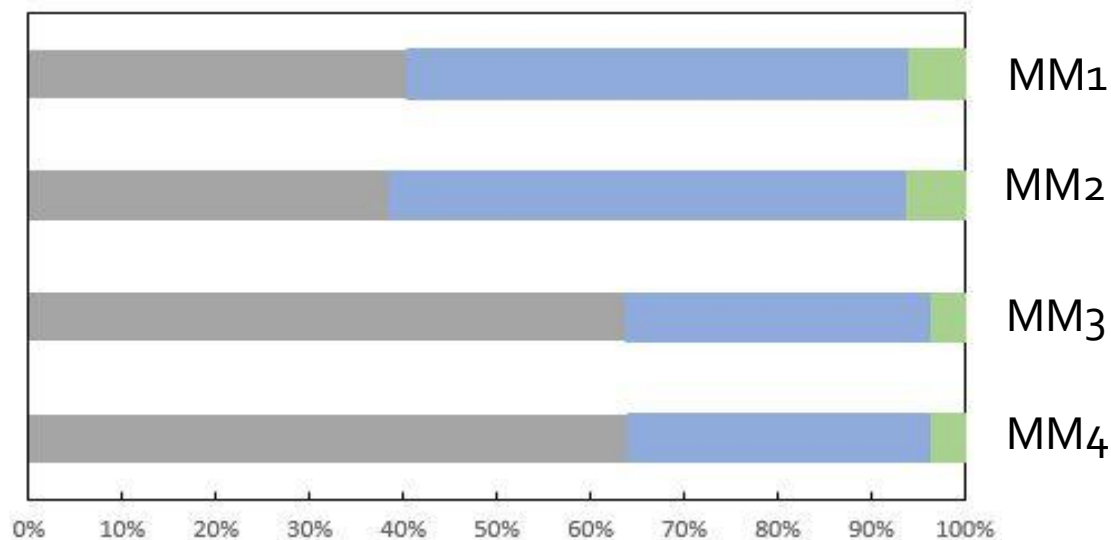
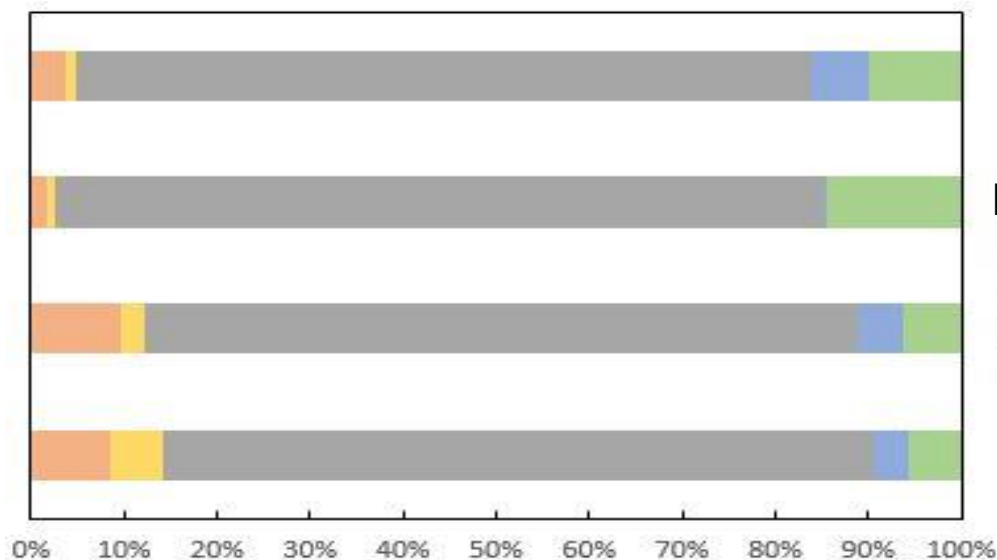
Preliminary Results

(b) Mineralogical analysis



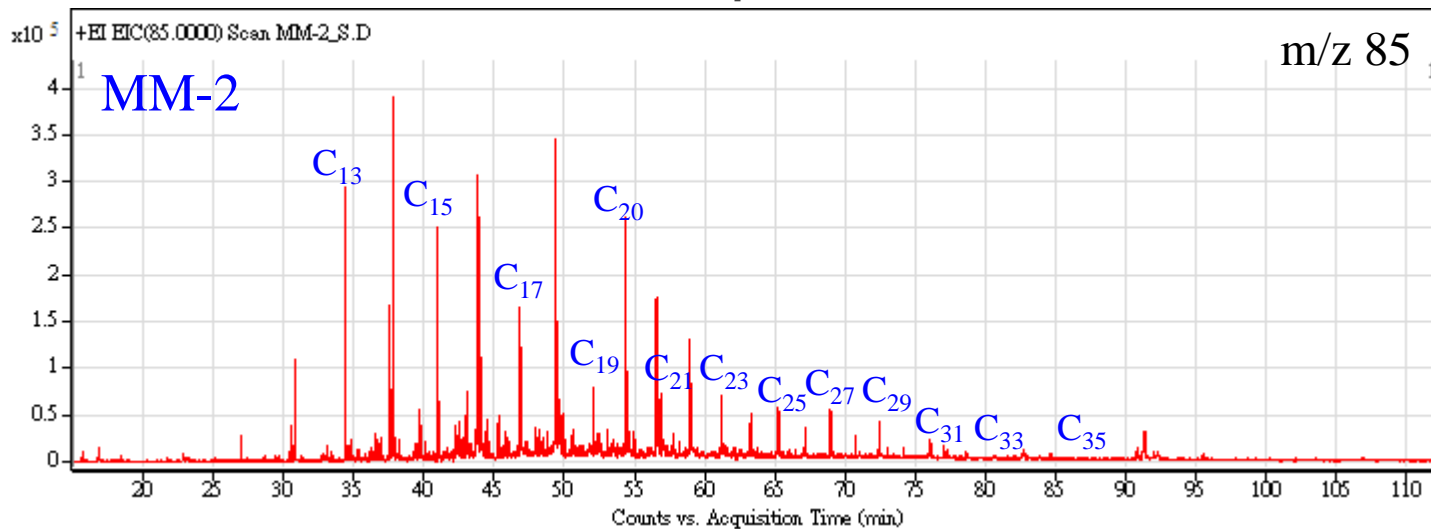
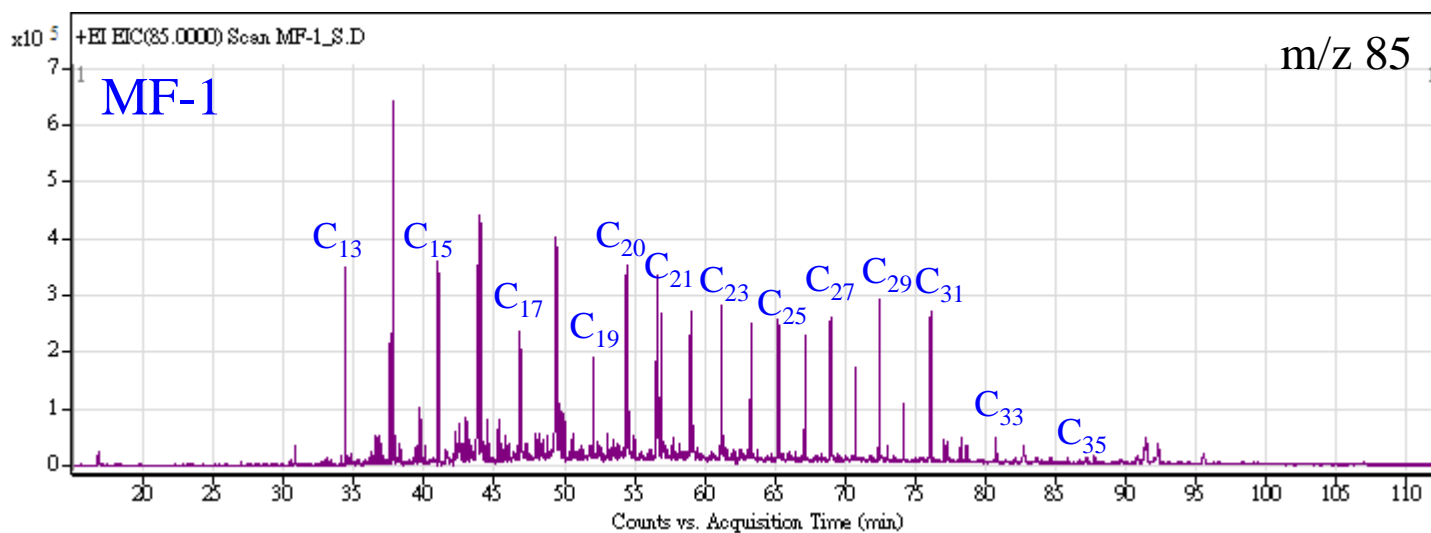
Clay mineral composition analysis

Preliminary Results (b) Mineralogical analysis



Preliminary Results

(c) Biomarker

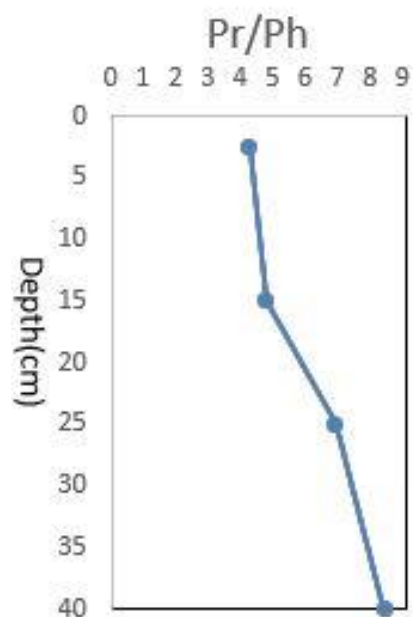


Preliminary Results

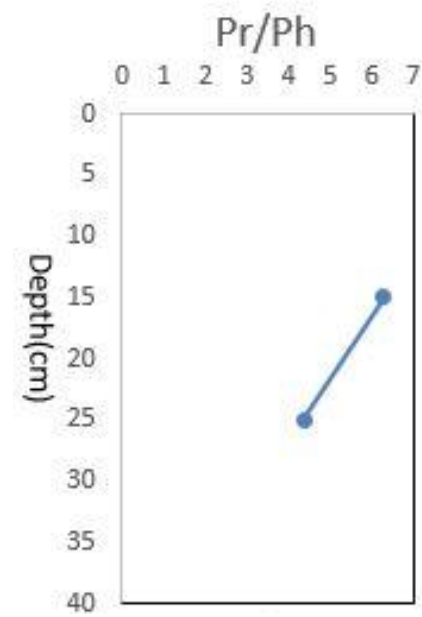
(c) Biomarker

	Pr/Ph
MF ₁	4.19
MF ₂	4.70
MF ₃	6.84
MF ₄	8.33
MM ₁	
MM ₂	6.29
MM ₃	4.37
MM ₄	

MF



MM



Pr/Ph > 1 oxic condition
 Pr/Ph < 1 anoxic condition

Conclusion

- Both locations are affected by **marine water**.
- **All samples** possess **poor to fair hydrocarbon potential** based on Rock-Eval pyrolysis.
- Organic matter types analyzed are dominated in **Type III**.
- All samples are **immature** in organic maturity.
- All of the soils are characterized by **quartz and feldspar**.
- The major clay mineral in MF samples is **Illite**.
- **Illite and Kaolinite** are major clay minerals in MM samples.

Future Work

- Biomarker analysis
- Synthetic evaluation

Thanks for listening.