Study of magnetic fabrics across the meta-granite of Hualien, eastern Taiwan

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OUTLINE

- **Introduction**
- **Field work**
- **Experiment**

  a. Anisotropy of magnetic susceptibility (AMS)

  b. Temperature-Function Magnetic susceptibility

  c. Hysteresis Loop
- **Results**
- **Discussion**
- **Conclusion**

INTRODUCTION

- Taiwan geologic map
- Hoping map


0112
0114
0101
0507
0501
1604
1601
1003
1101
1201
1501
0312
0401
0206
0307
0302
0315
0201
0601
0603
0613
0609
0612
0801
0701
0702
0901
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FIELD WORK

EXPERIMENT

EXPERIMENT

Anisotropy of magnetic susceptibility (AMS)

- To get the value of K1,K2, K3, intensity, anisotropy, lineation, foliation…
- Showing axes orientation of ellipsoids in stereonet

Magnetic susceptibility – Temperature

- For determining the kinds of minerals like magnetite, hematite, pyrrhotite…

Hysteresis Loop

- To understand the magnetic mineral size in samples
- Type of magnetic domain wall

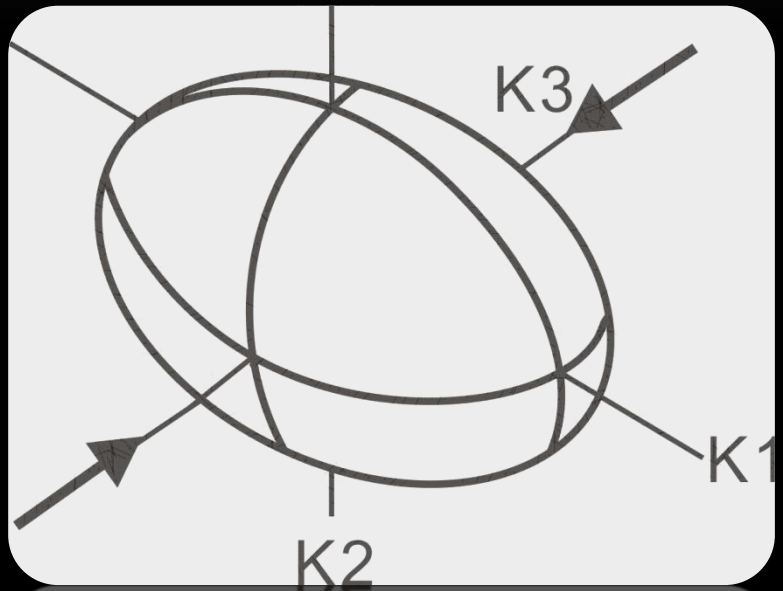
WHAT'S ANISOTROPY OF MAGNETIC SUSCEPTIBILITY (AMS) ?

- Anisotropy of magnetic susceptibility (AMS)
- M = *k*H

  M = magnetization

  H = additional magnetic field

  K = susceptibility
- Magnetic susceptibility ellipsoid

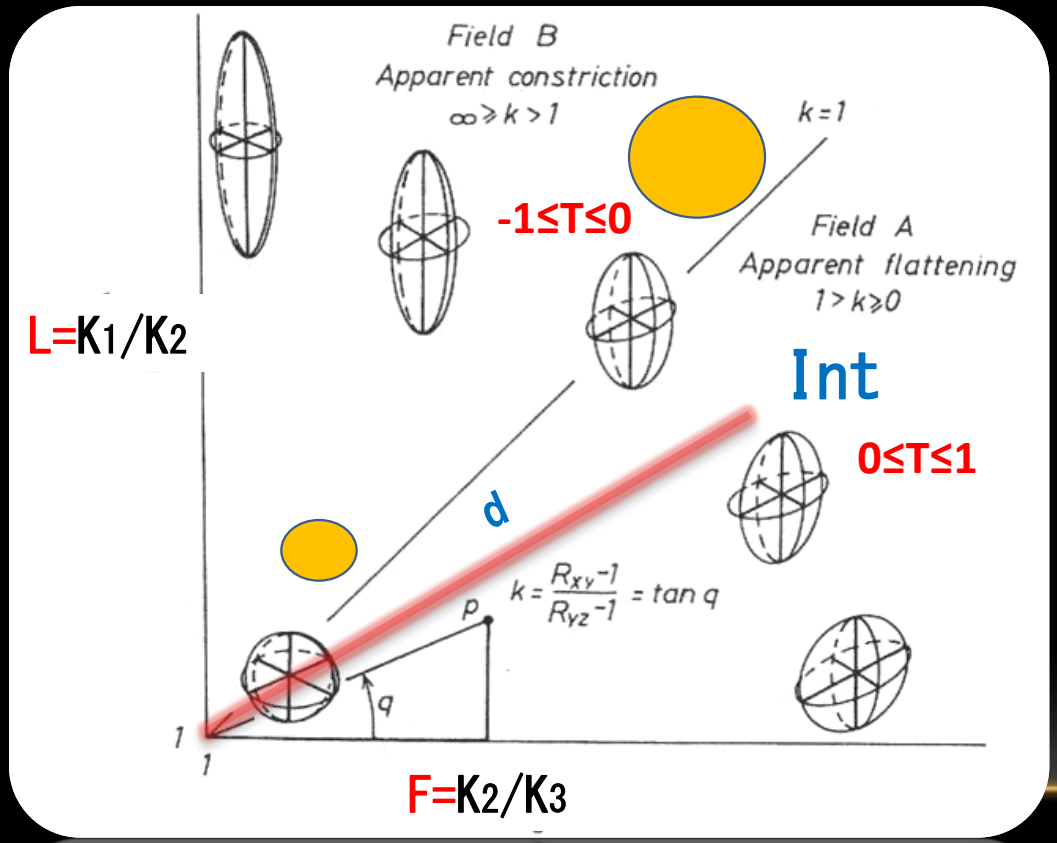


- **K1 > K2 > K3**

  Kmean = (K1+K2+K3)/3

MAGNETIC SUSCEPTIBILITY ELLIPSOID

- Flinn diagram (Ellipsoid)



Shape and intensity of magnetic susceptibility

Lineation (L) = K_1/K_2

Foliation (F) = K_2/K_3

Anisotropy (P) = K_1/K_3

Shape parameter (ellipsoid)(T)

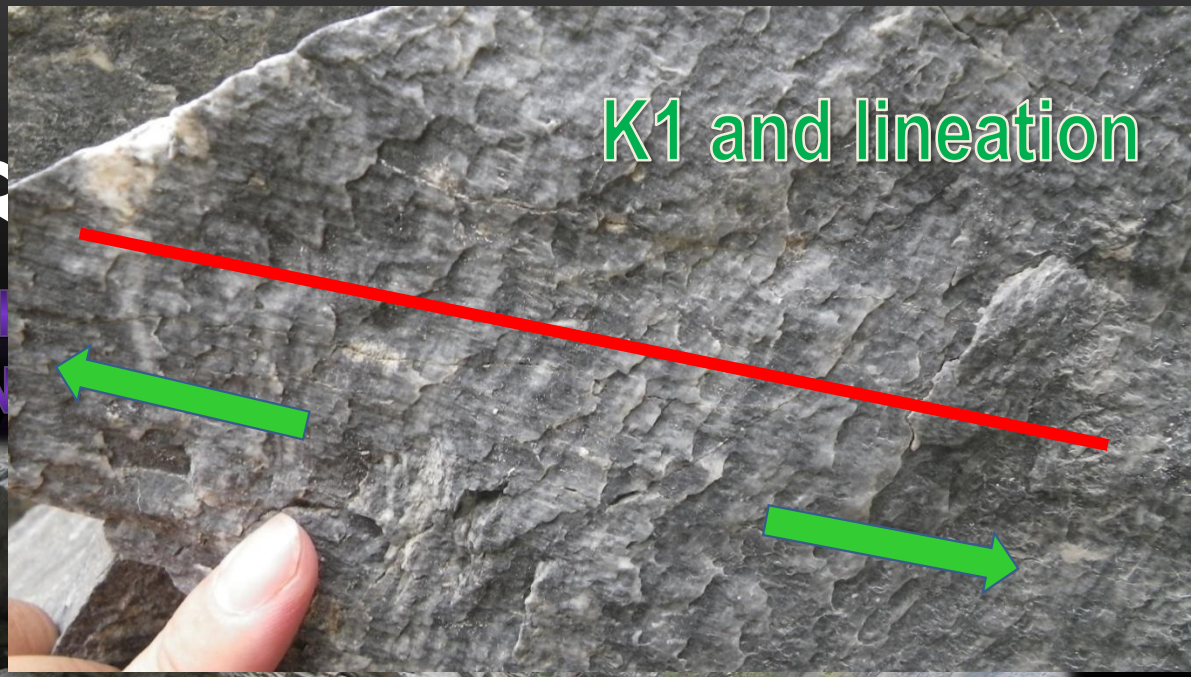
$$T = \frac{\ln(K_2/K_3) - \ln(K_1/K_2)}{\ln(K_2/K_3) + \ln(K_1/K_2)}$$

Intensity (Int) $i = \sqrt{(F-1)^2 + (L-1)^2}$

- prolate (cigar-shaped)
- oblate (disc-shaped)

AMS - STEP

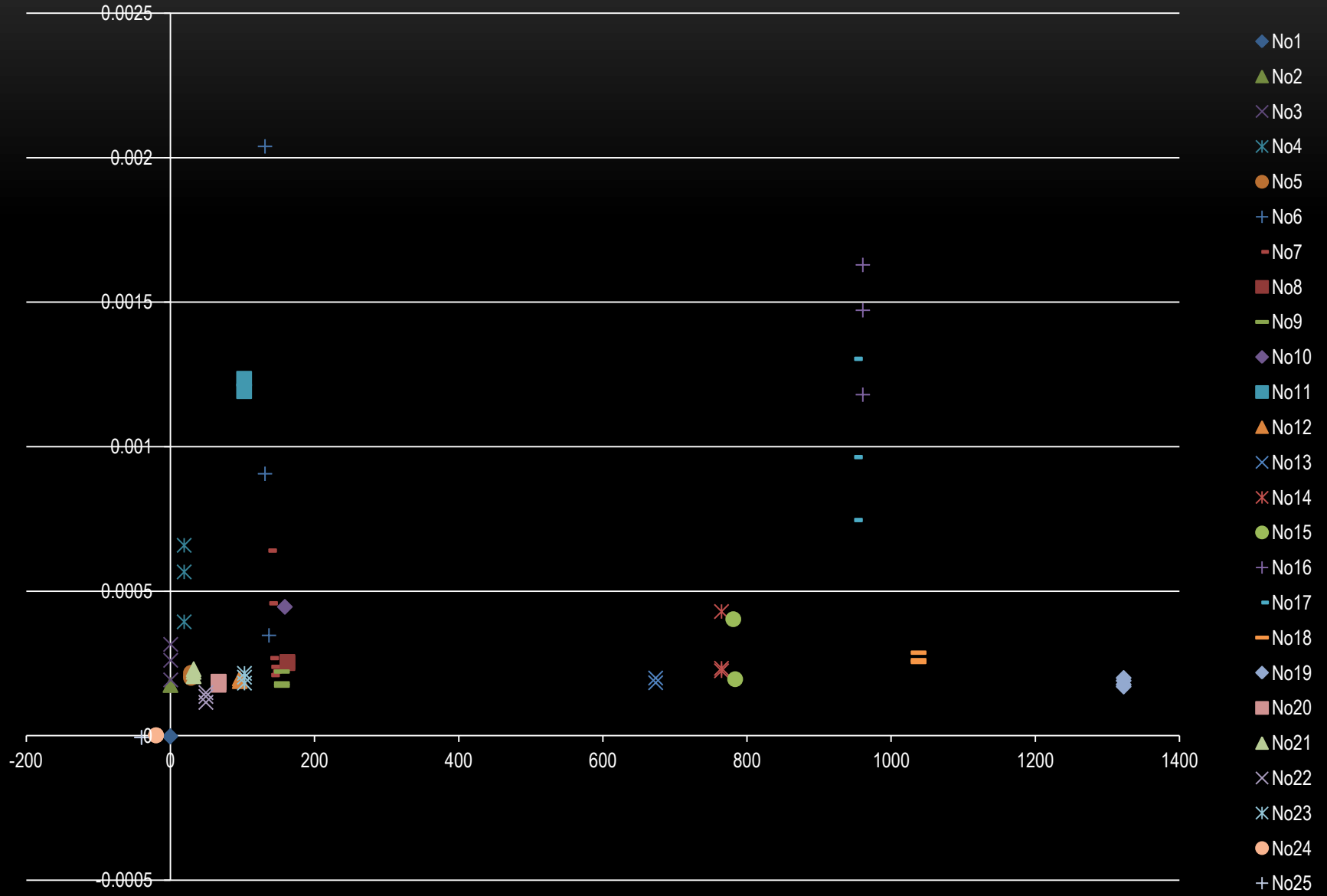
THE DIRECTION OF K1,
STRIKE AND LINEATION



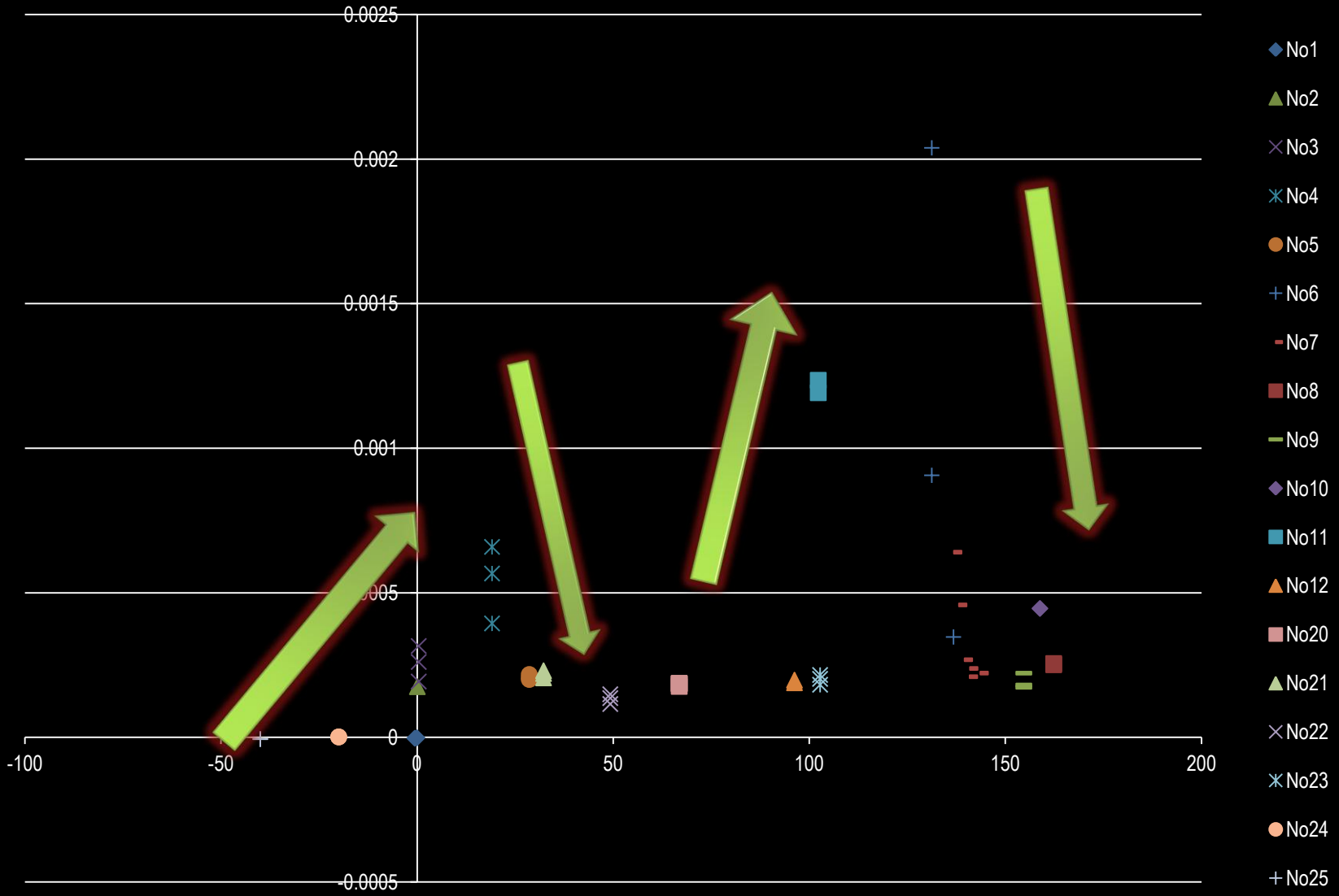
270°

Equal
lower

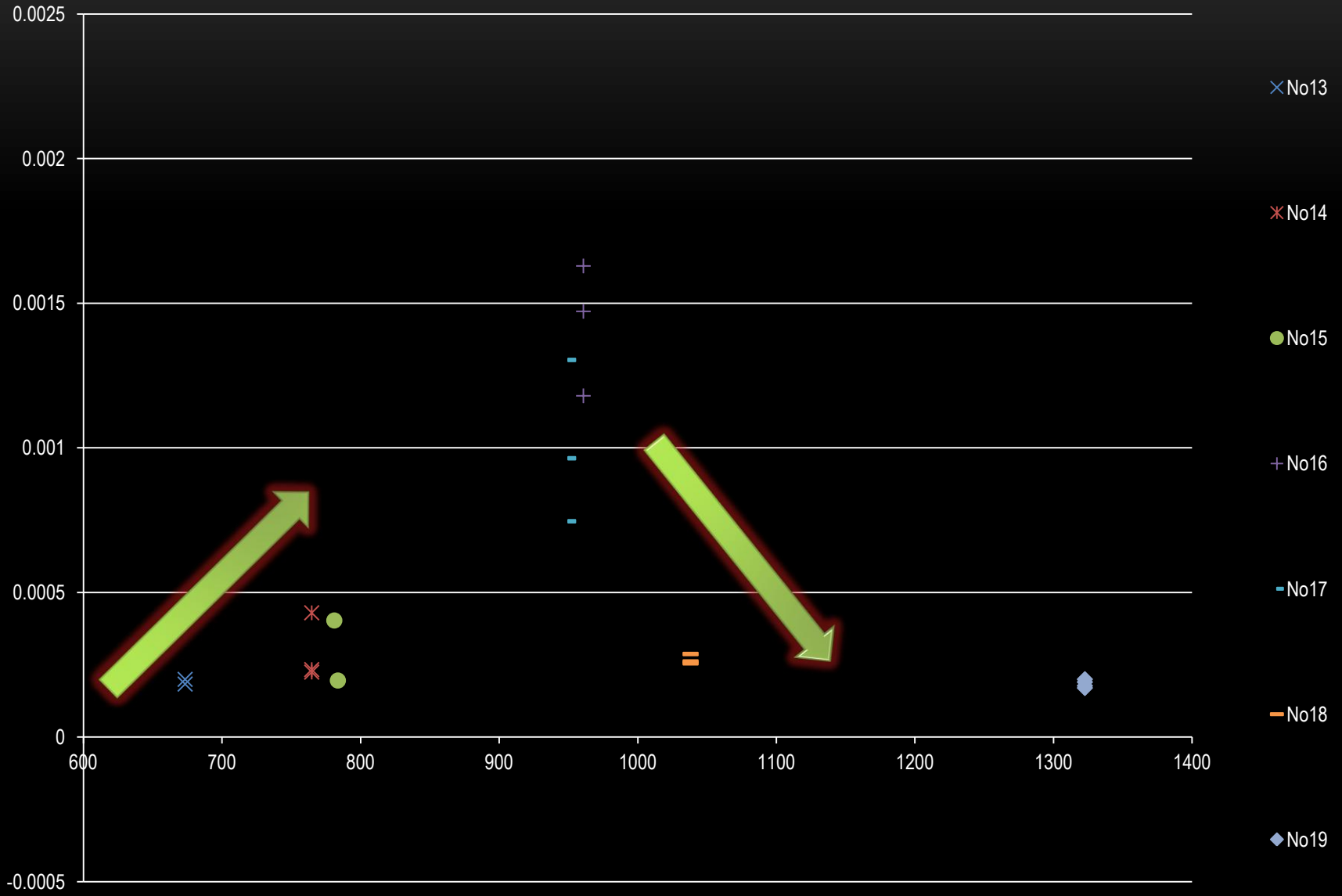
DISTANCE — P


0.0025
0.002
0.0015
0.001
0.0005
-0.0005
-200
0
200
400
600
800
1000
1200
1400
No1
No2
No3
No4
No5
No6
No7
No8
No9
No10
No11
No12
No13
No14
No15
No16
No17
No18
No19
No20
No21
No22
No23
No24
No25

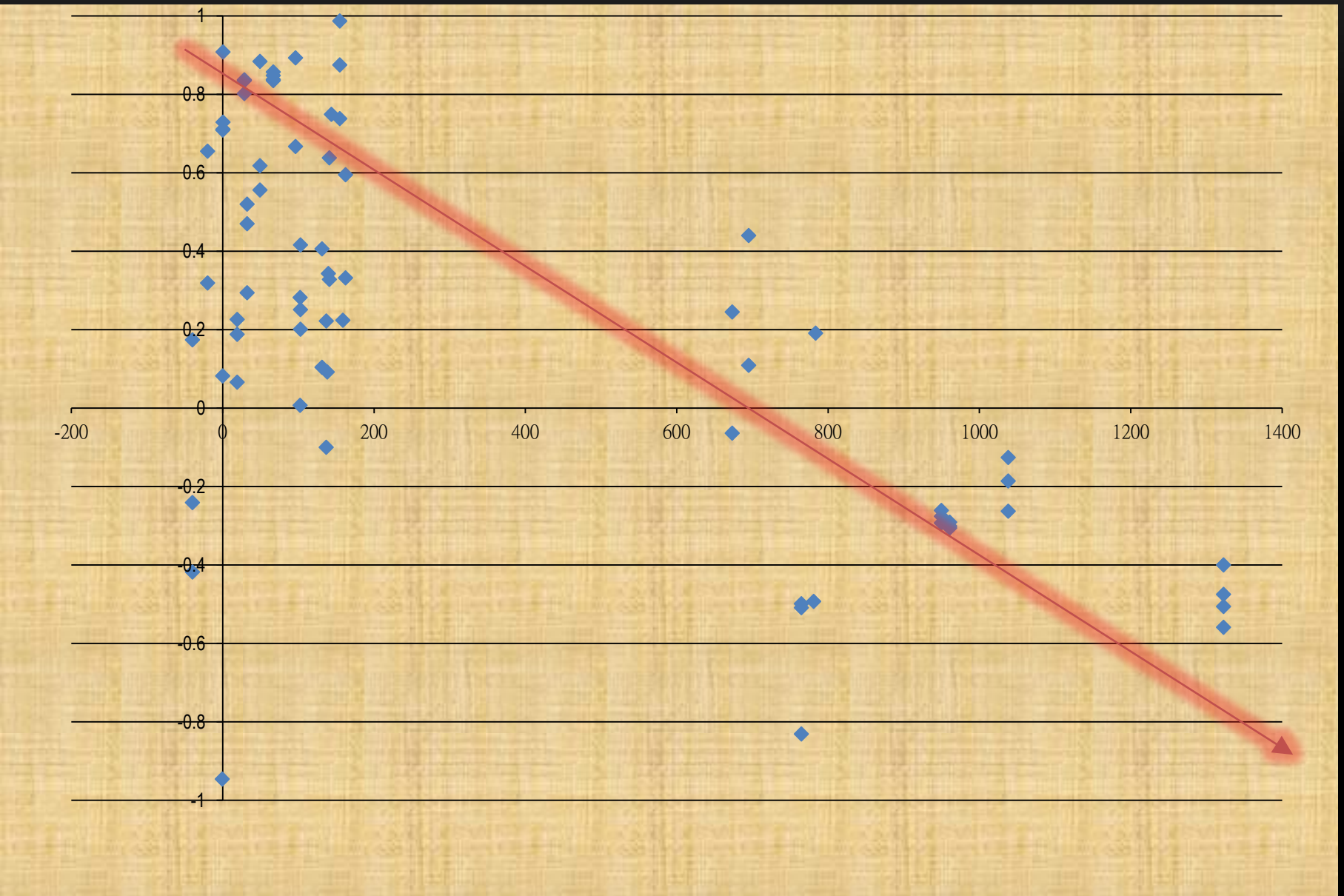
DISTANCE — P (-100~200M)



DISTANCE — P (600~1400M)



DISTANCE – T



DISCUSSIONS

- Magnetic mineral
  - Type--Temperature

Magnetic susceptibility - Temperature

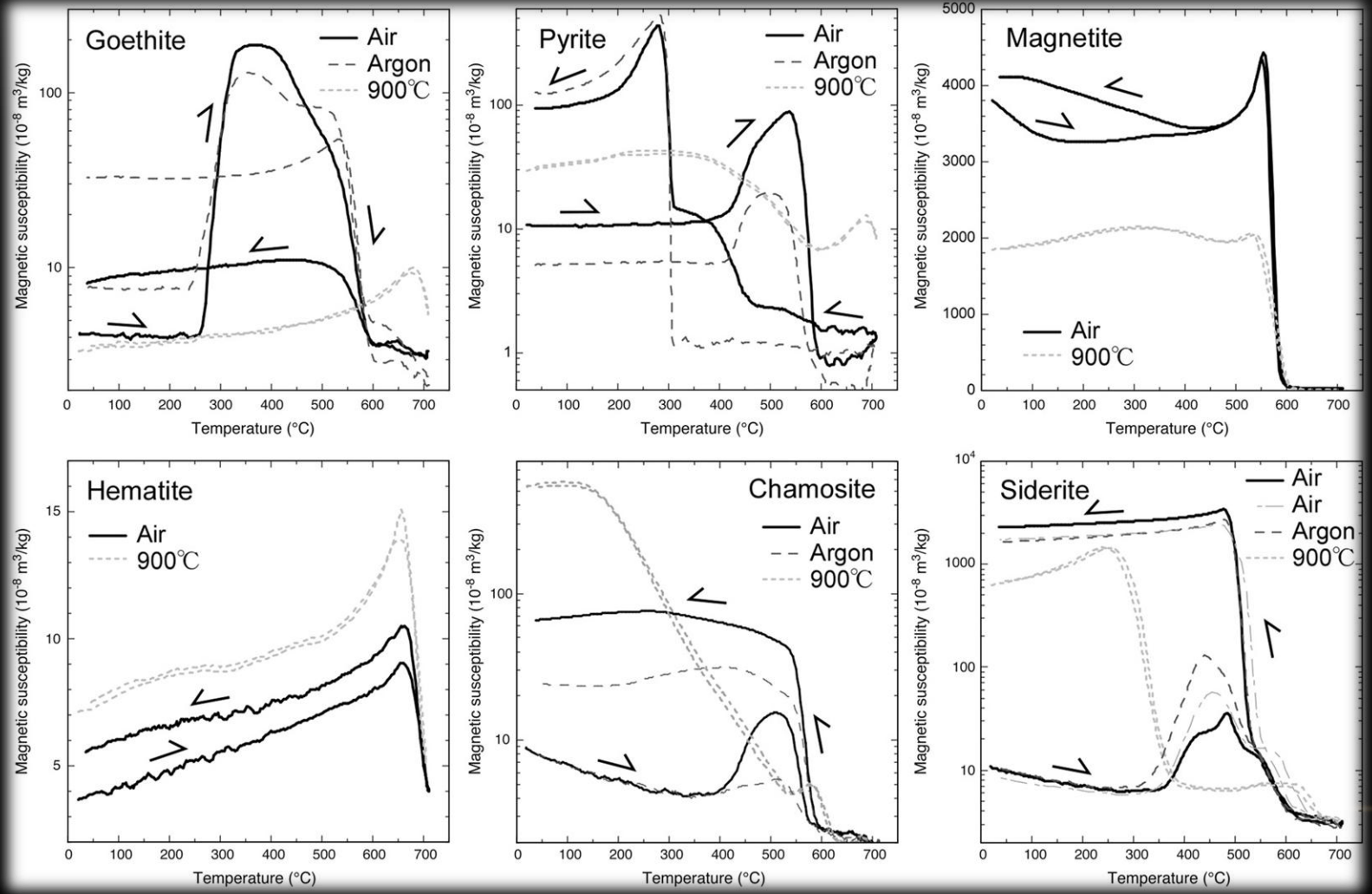
- For determining the kinds of minerals like magnetite, hematite, pyrrhotite…

  - Grain size--

Hysteresis Loop

- To understand the magnetic mineral size in samples
- Type of magnetic domain wall

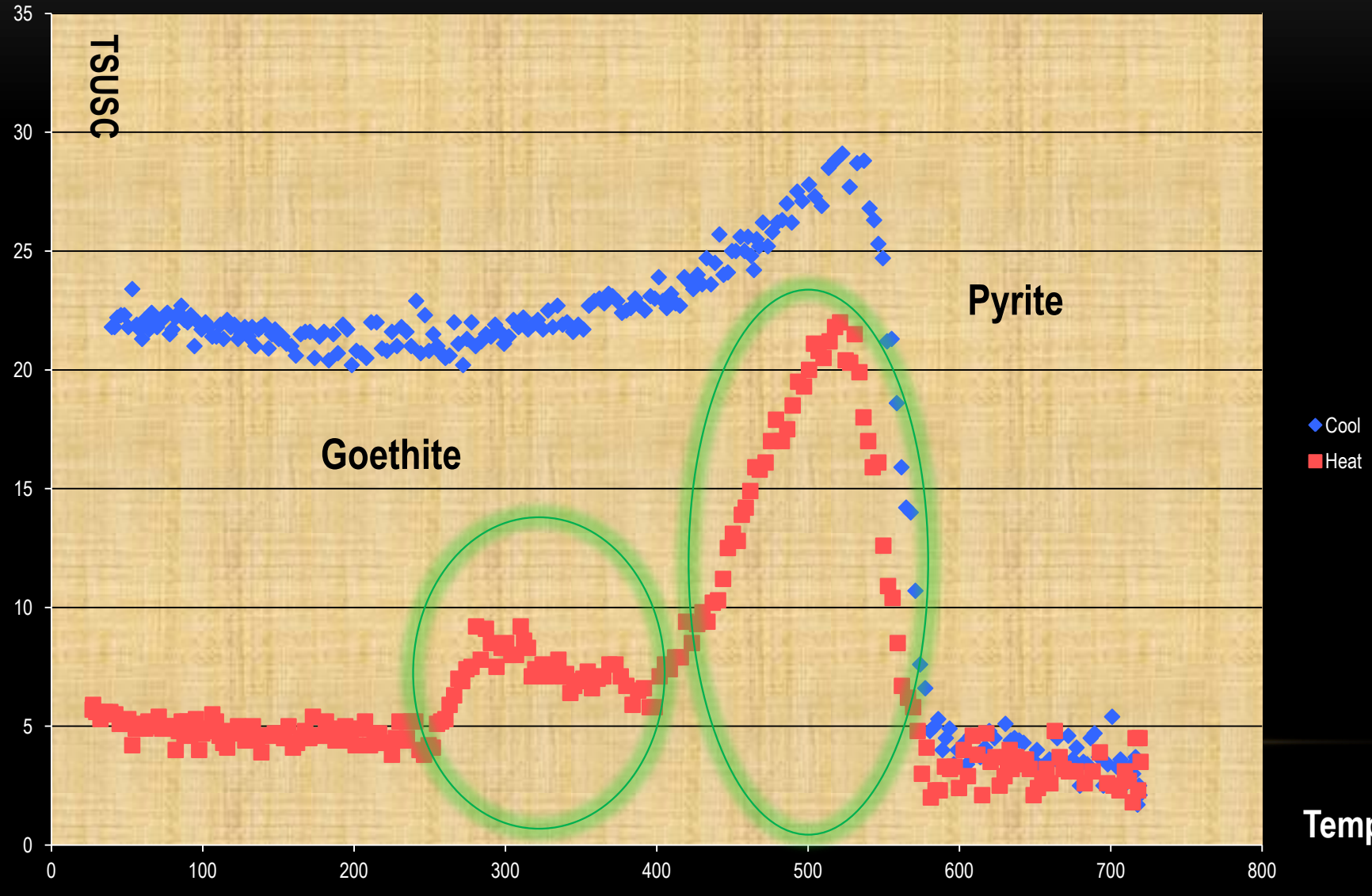
TEMPERATURE-FUNCTION MAGNETIC SUSCEPTIBILITY



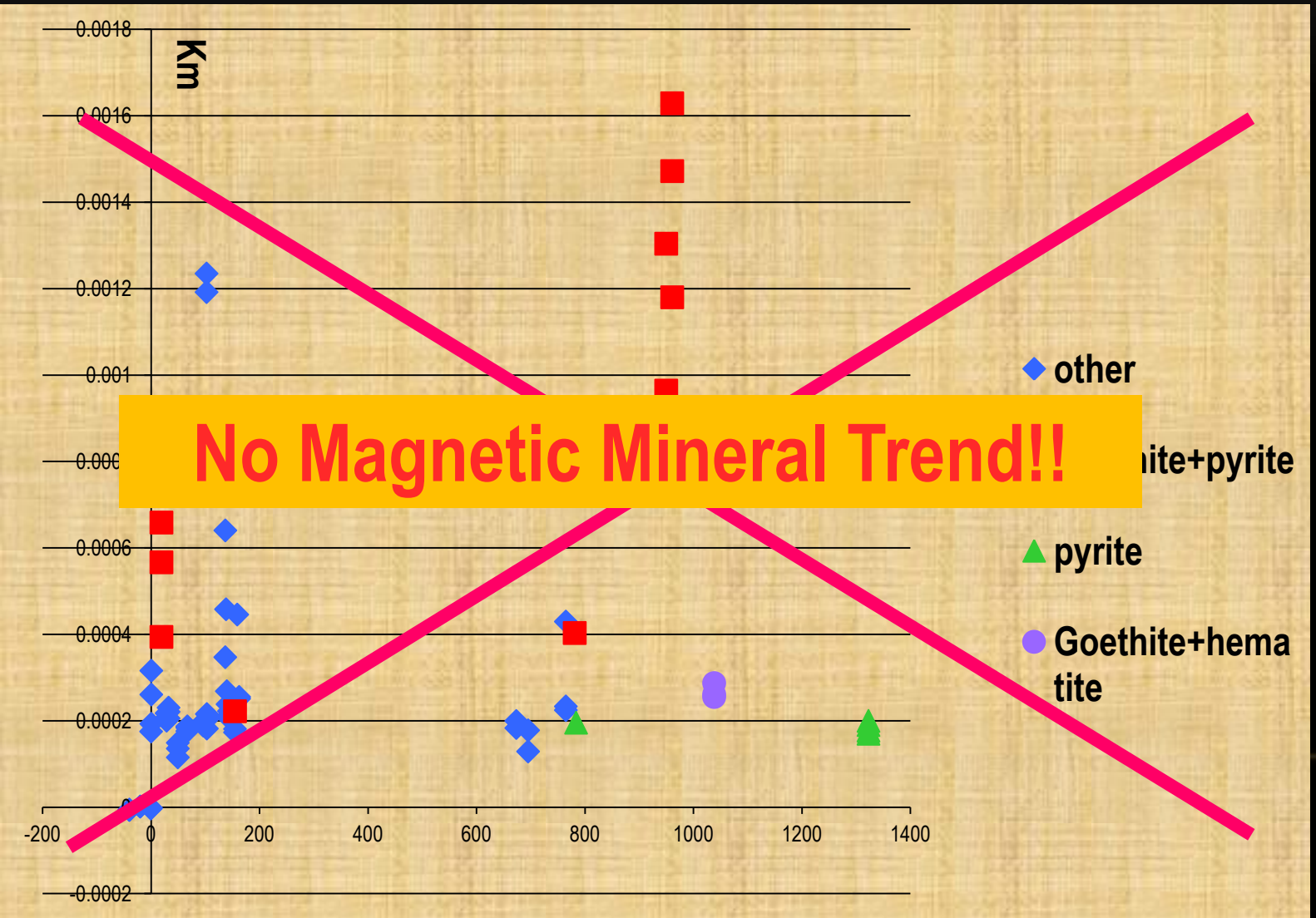
Tanikawa-2008-EPSL

DISCUSSIONS

TEMPERATURE-FUNCTION MAGNETIC SUSCEPTIBILITY (40~700)



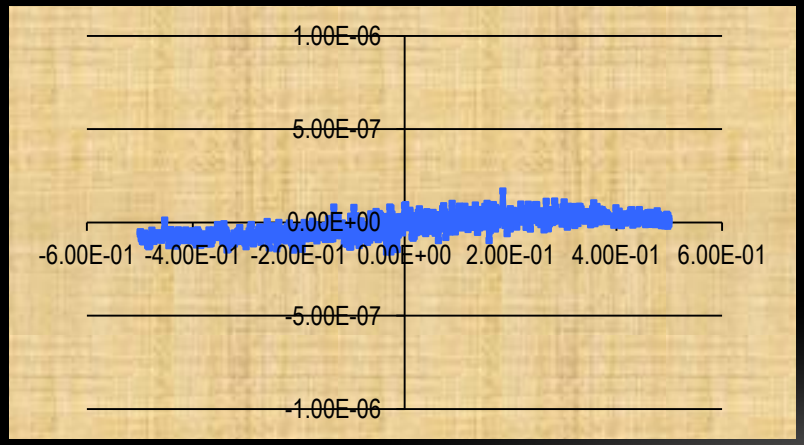
DISCUSSIONS



HYSTERESIS LOOP

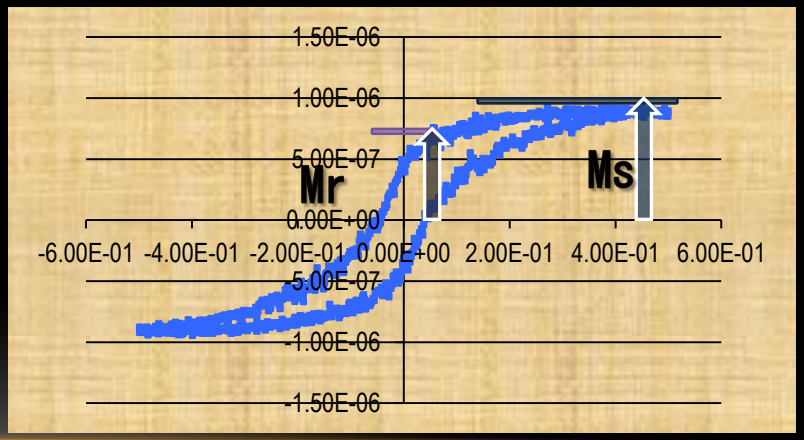
- According to hysteresis loop, ferromagnetic can classify as single- domain , pseudo-single-domain , and multi-domain.

Smaller lense, Larger grain

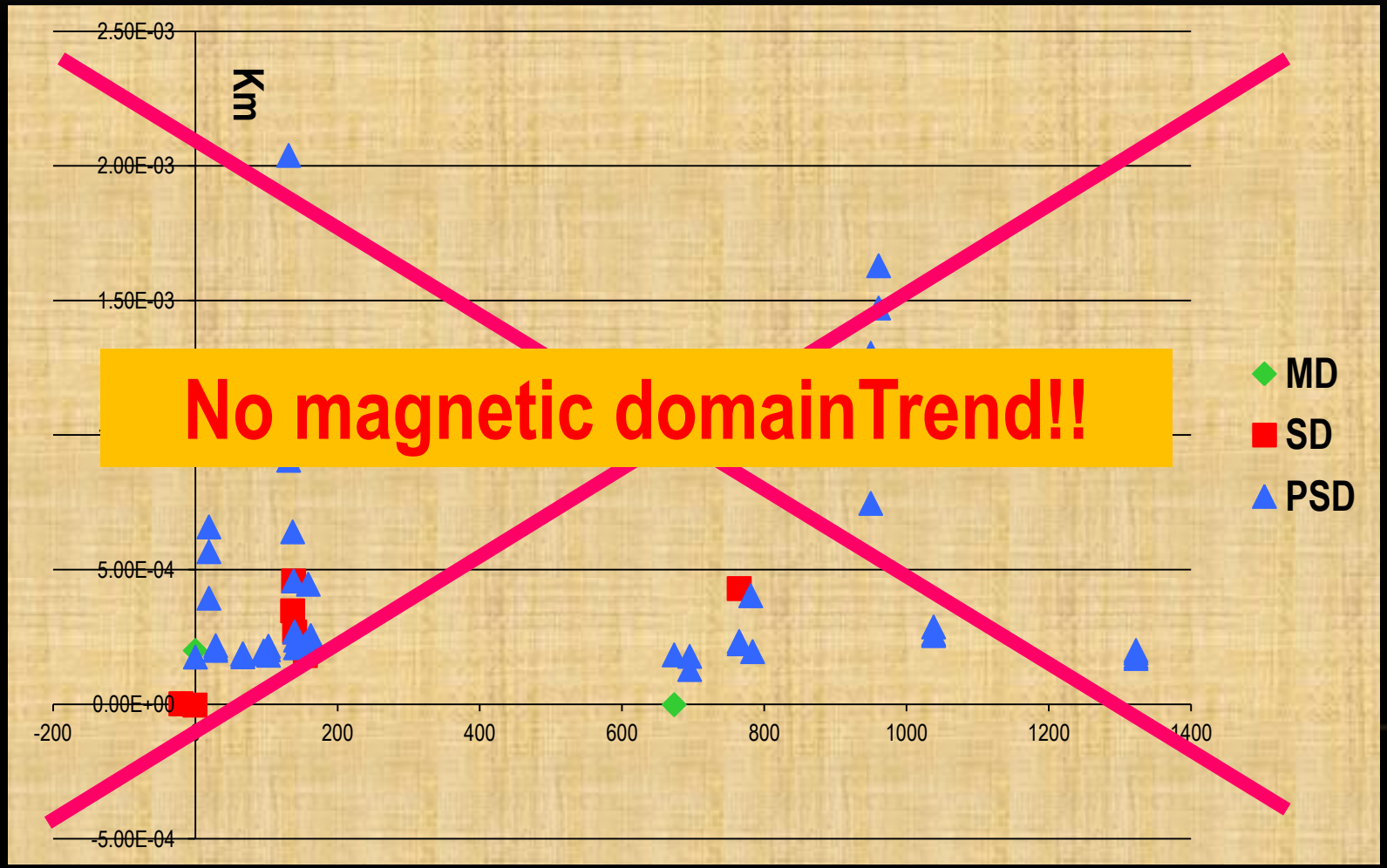


Mr/Ms

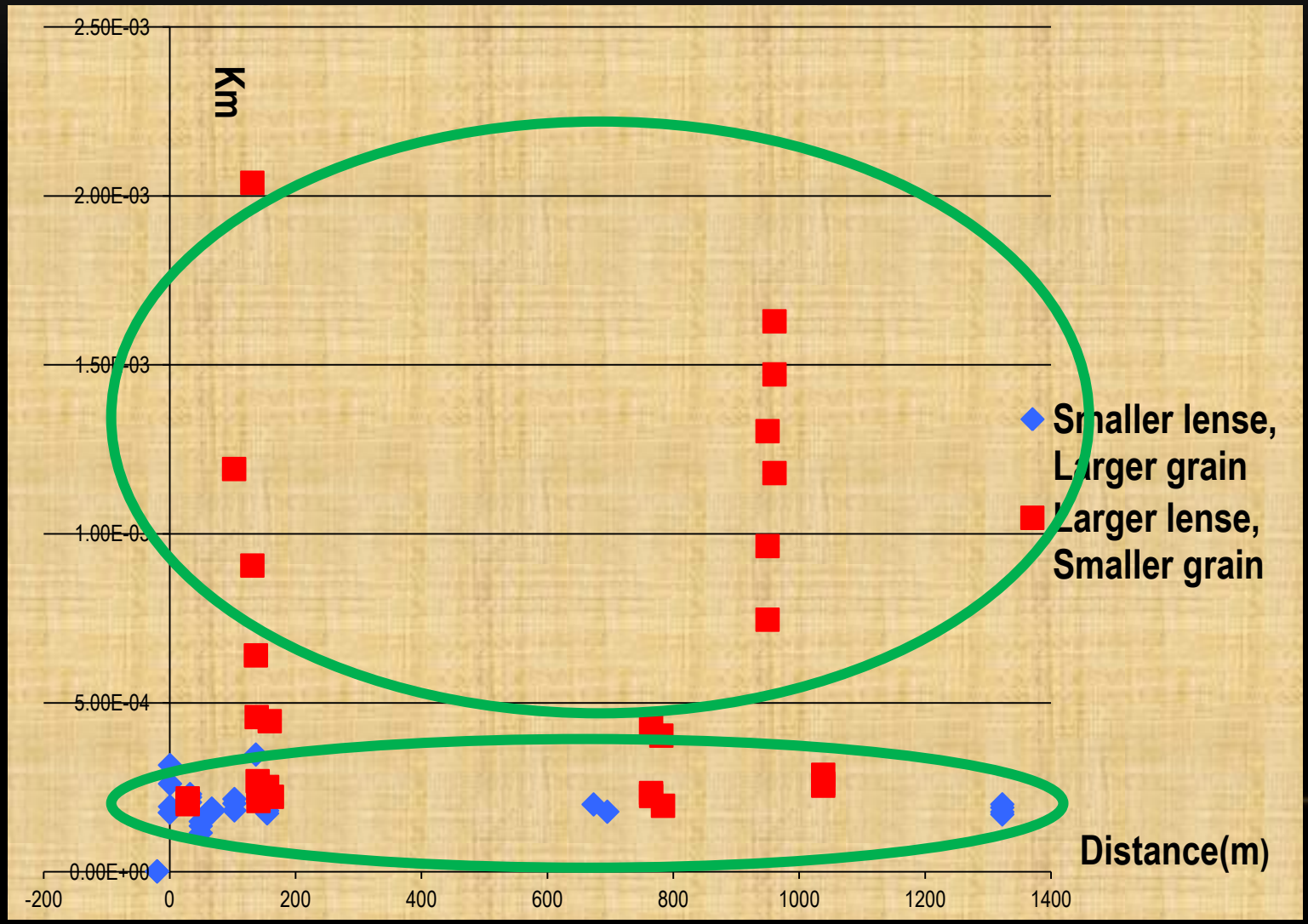
Larger lense, Smaller grain



DISCUSSIONS



DISCUSSION


2.50E-03
2.00E-03
1.50E-03
1.00E-03
5.00E-04
0.00E+00
Km
-200
0
200
400
600
800
1000
1200
1400
Distance(m)
Smaller lense, Larger grain
Larger lense, Smaller grain

CONCLUSION

Spec Name		AMS	Hysteresis Loop	ISM	Temp
HP0102		V	V	V	
HP0103		V	V	V	
HP0104		V	V		
HP0107	A	V	V		
	B	V			
	C	V			
HP0112	A	V	V	V	V
	B	V			
	C	V			
HP0114	A	V	V		
	B	V			
	C	V			
HP0201		V	V	V	V
HP0204		V	V		
HP0206		V	V		
HP0302		V	V		
HP0303		V	V	V	
HP0304		V	V		
HP0305		V	V		
HP0307		V	V	V	
HP0308		V	V		
HP0312		V	X		
HP0313		V	V		
HP0315		V	V	V	
HP0316		V	V		
HP0317		V	V	V	V
HP0401		V	V		
HP0502		V	V		
HP0503		V	X		
HP0507		V	X		
HP0508		V	V		
HP0601		V	X		
HP0602		V	V	V	
HP0603		V	V	V	
HP0604		V	X		
HP0609	A	V	V		
	B	V			
HP0610		V	V		
HP0612		V	V	V	V

Spec Name		AMS	Hysteresis Loop	ISM	Temp
HP0613		V	V	V	V
HP0701	A	V	V	V	V
	B	V			
	C	V			
HP0702	A	V	V	V	V
	B	V			
	C	V			
HP0801	A	V	V		V
	B	V			
	C	V			
HP0901	A	V	V		V
	B	V			
	C	V			
	D	V			
HP1003	A	V	V		
	B	V			
	C	V			
	D	V			
HP1101	A	V	V		
	B	V			
	C	V			
HP1201	A	V	V		
	B	V			
	C	V			
HP1501	A	V	V		
	B	V			
	C	V			
HP1601	A	V	V		
	B	V			
	C	V			
HP1604	A	V	V		
	B	V			
	C	V			
HP1701	A	V	X		
	B	V			
	C	V			
HP1702	A	V	X		
	B	V			
	C	V			

Core
30/56
31specimens
Orienteering
15/30
47specimens

CONCLUSION

- Orientations of magnetic fabrics are consistent with that of structural fabrics
- Inferred stress direction from AMS is consistent with plate motion
- Anisotropy of magnetic susceptibility that with intensity trend no related
- Anisotropy of magnetic susceptibility that with magnetic domain trend, magnetic domain trend no related
- Anisotropy of magnetic susceptibility that with magnetic mineral size Related

Thank you for your attention.