

STABILITEIT VAN STORTSTEEN
NA UITSTROOMKONSTRUKTIES

Figuren D 1 t/m 111, RUN 1 t/m 18

M. Fokkens
P. Küppers

TECHNISCHE HOGESCHOOL DELFT

afd. der CIVIELE TECHNIEK

vakgroep WATERBOUWKUNDE

Stabiliteit van stortsteen
na uitstroomkonstrukties

Figuren D1 t/m D111

Figuren RUN 1 t/m RUN 18

M. Fokkens

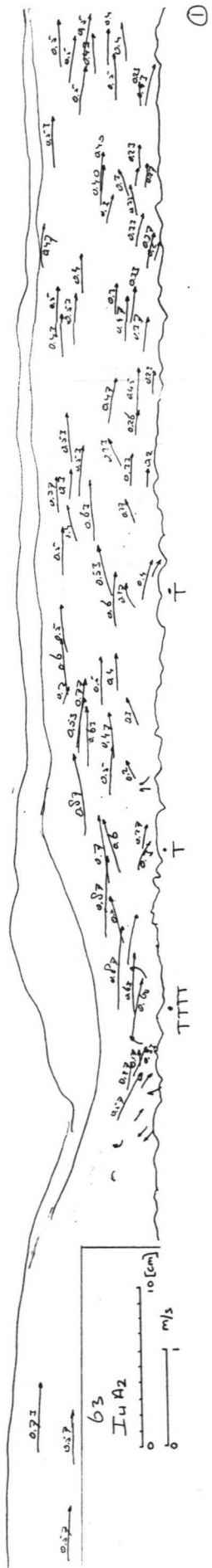
P. Küppers

Lijst van figuren van stroombeelden (D 1 t/m 111)

	no.	proef		no.	proef
- verlaagde vloer (sprong)	1	I4A2	- rechte drempel	21	IIa4B2
	2	I4B2		22	IIa4C2
	3	I4C2		23	IIa8A2
	4	I4D2		24	IIa8B2
	5	I4A3		25	IIa8C2
	6	I4B3		26	IIa8D2
	7	I4C3		27	IIa8A3
	8	I4D3		28	IIa8C3
	9	I8A2		29	IIa12B2
	10	I8B2		30	IIa12B3
	11	I8C2		31	IIa12D3(2)
	12	I8D2		- korte zigzag- drempel	32
	13	I12A2	33		IIb8D2
	14	I12E2(2)	34		IIb8D3
	15	I12A3(2)	35		IIb12B2
	16	I12B3(2)	36		IIb12C2
	17	I12C3(2)	37		IIb12D2(2)
	18	I12D3(2)	38		IIb12A3
	19	La8B2(2)	39		IIb12B3
	20	Lc8A2(2)	40	IIb12C3	
			41	IIb12D3	
			42	IIc8A2	
			43	IIc8C3	
			44	IIc8D3	
			45	IIc12B1	
			46	IIc12C1	
			47	IIc12D1	
			48	IIc12B2	
			49	IIc12C2	
			50	IIc12A3(2)	
			51	IIc12B3	
			52	IIc12C3(2)	
			53	IIc12D3(2)	

-opm. nummer op tekening
is voorzien van
cirkel bijv. ①

	no.	proef
- lage koker	54	IIIa4A1
	55	IIIa4B1
	56	IIIa4C1
	57	IIIa4D1
	58	IIIa4A2
	59	IIIa4B2
	60	IIIa4C2
	61	IIIa4D2
	62	IIIa8B1
	63	IIIa8C1
	64	IIIa8D1
	65	IIIa8A2
66	IIIa8B2	
67	IIIa8C2	
68	IIIa12A1(2)	
69	IIIa12B1(2)	
70	IIIa12C1(2)	
71	IIIa12D1(2)	
72	IIIa12A2(2)	
73	IIIa12B2(2)	
74	IIIa12C2(2)	
- hoge koker	75	IIIb4A1
	76	IIIb4B1
	77	IIIb4C1
	78	IIIb4D1
	79	IIIb4A2
	80	IIIb4B2
	81	IIIb4C2
	82	IIIb4D2
	83	IIIb8C1
	84	IIIb8A2
	85	IIIb8B2
	86	IIIb8C2
	87	IIIb12B1(2)
	88	IIIb12A2(2)
	89	IIIb12B2(2)



0.71

0.57

0.3

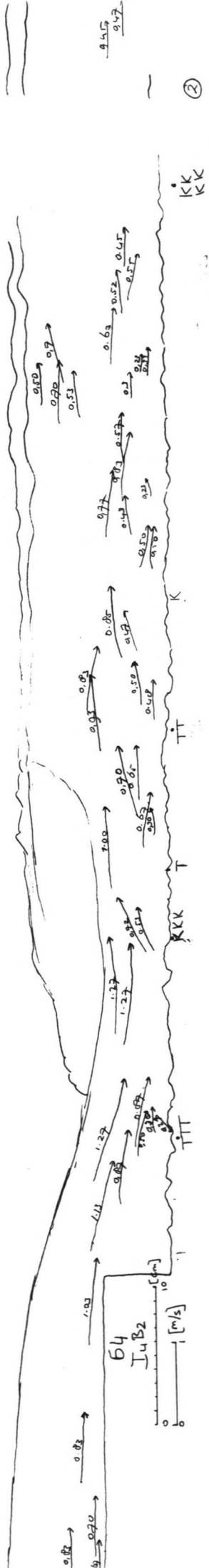
I4A2

0 10 [cm]

0 1 m/s

①

0.42
0.2
0.1
0.01



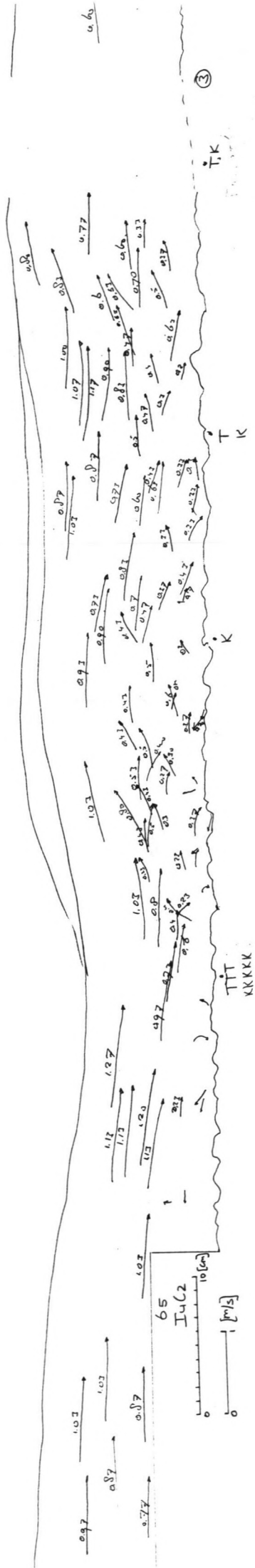
945
947

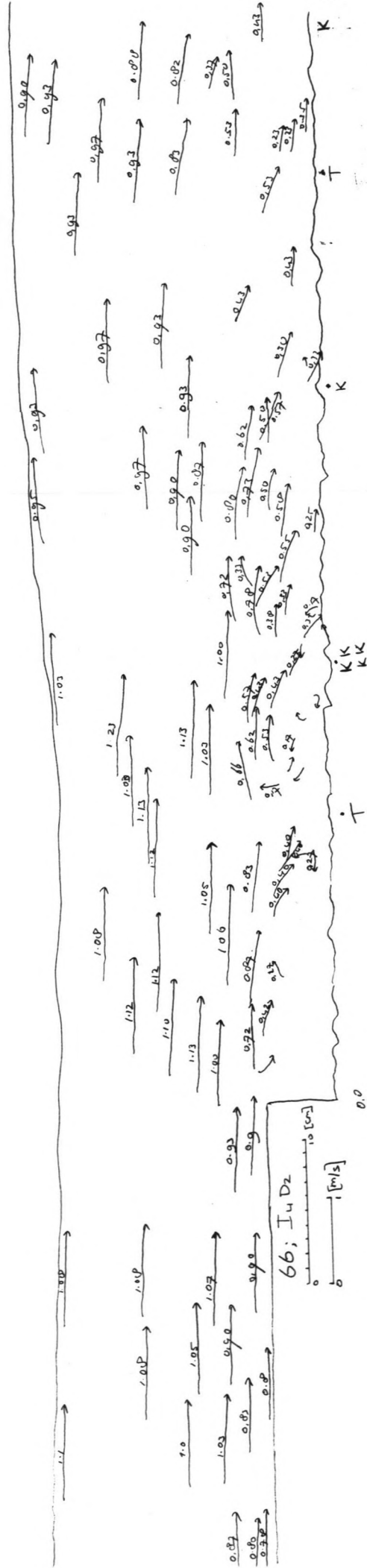
②

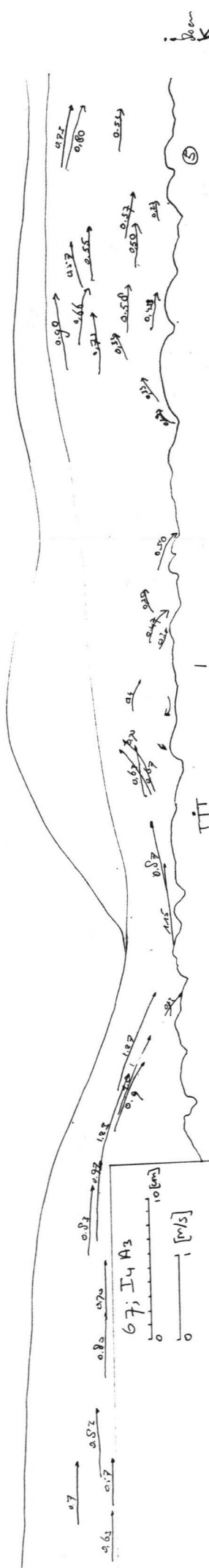
KK
KK

5.7

102



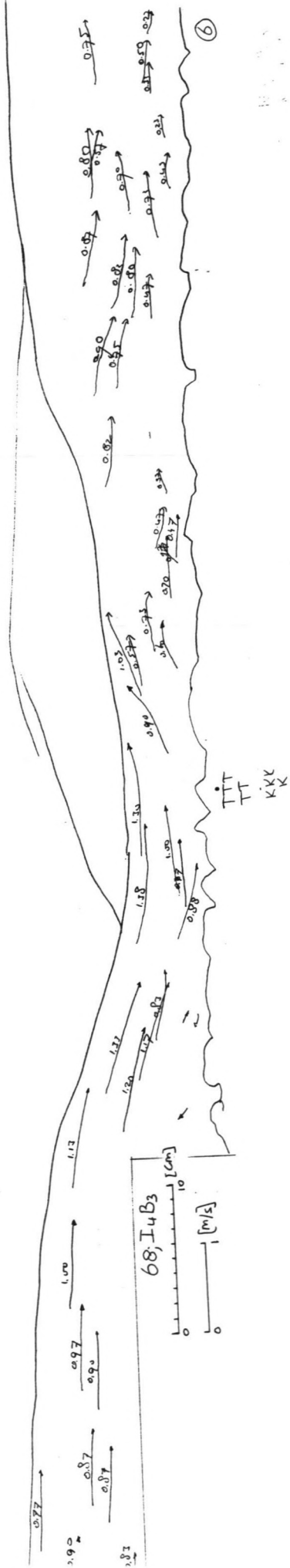


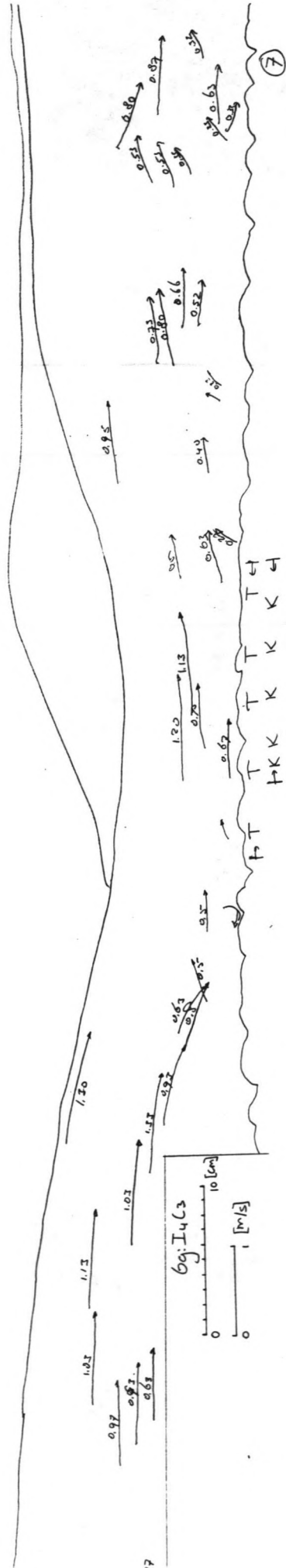


5

TTT
KXXX

67; I4 A3
0 10 [m]
0 1 [m/s]



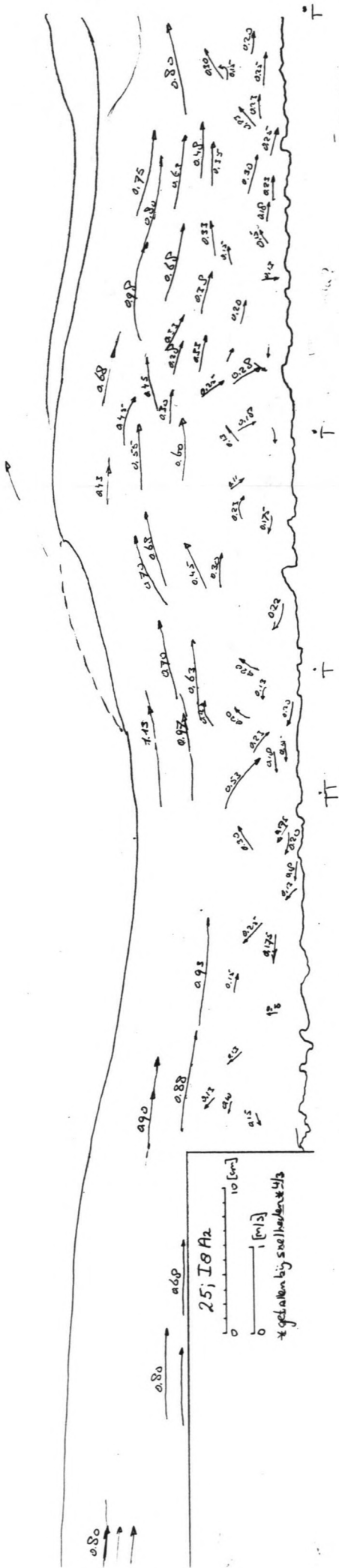


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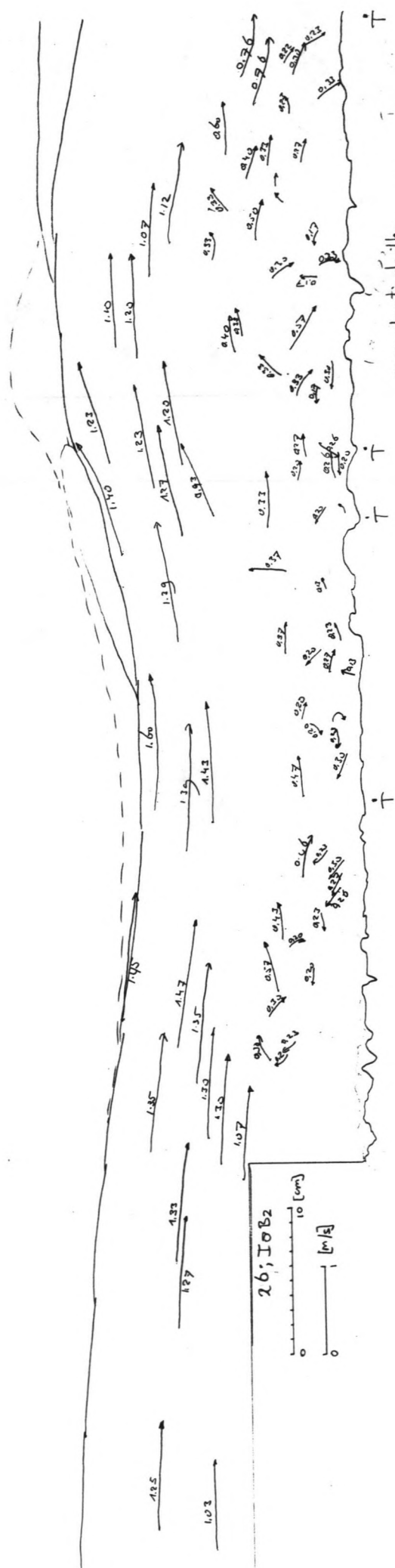
0g: I4C3

V_c

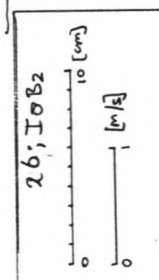
9



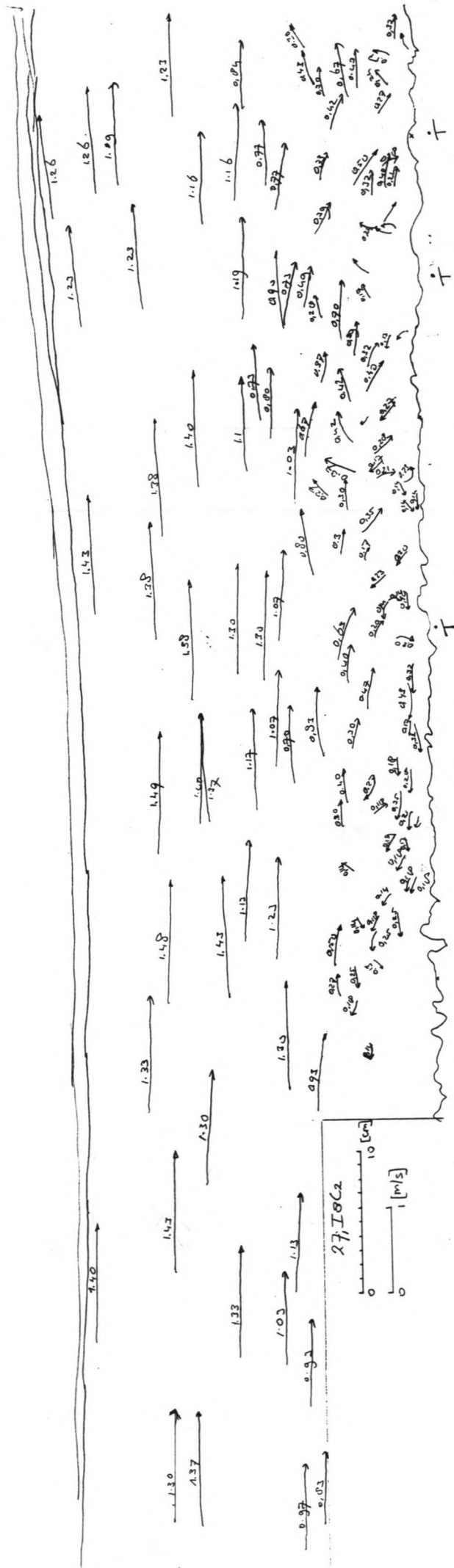
25
 10 A2
 1000



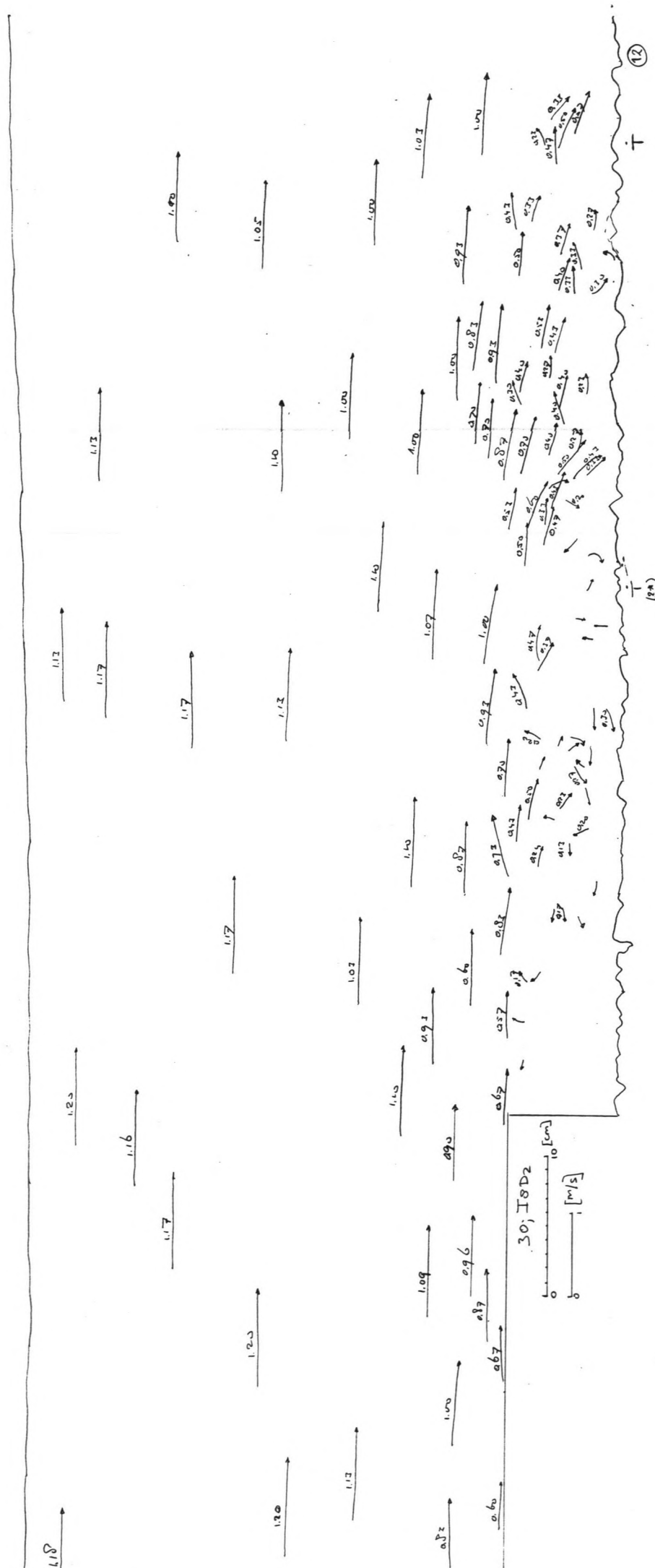
onreguliertes Tal



1.10
1.11
1.12

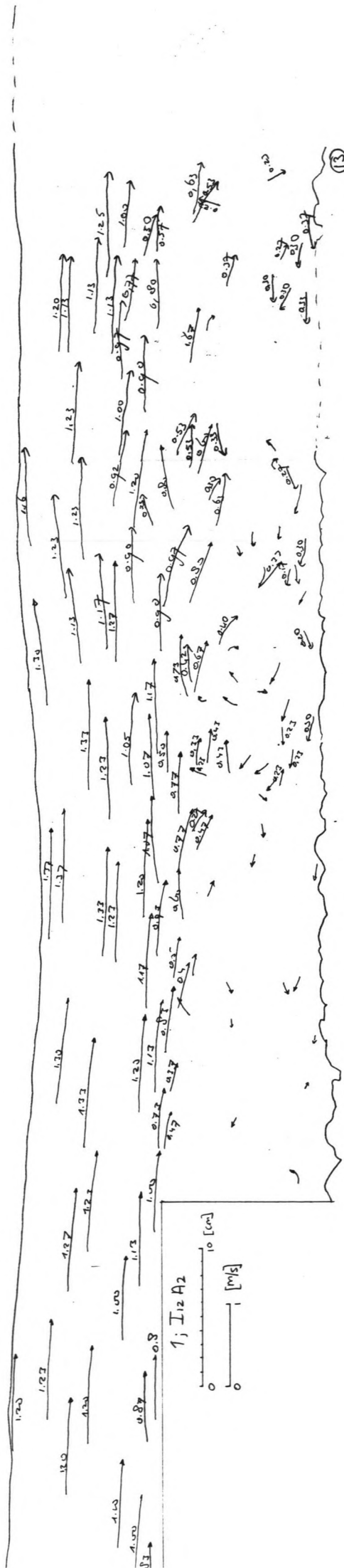


27.1062
 0 10 [m]
 0 1 [m]



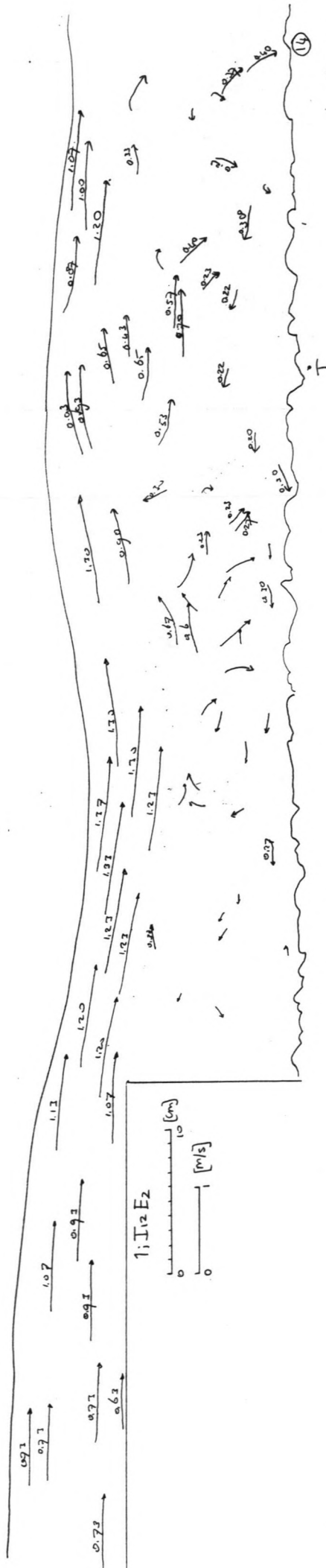
177

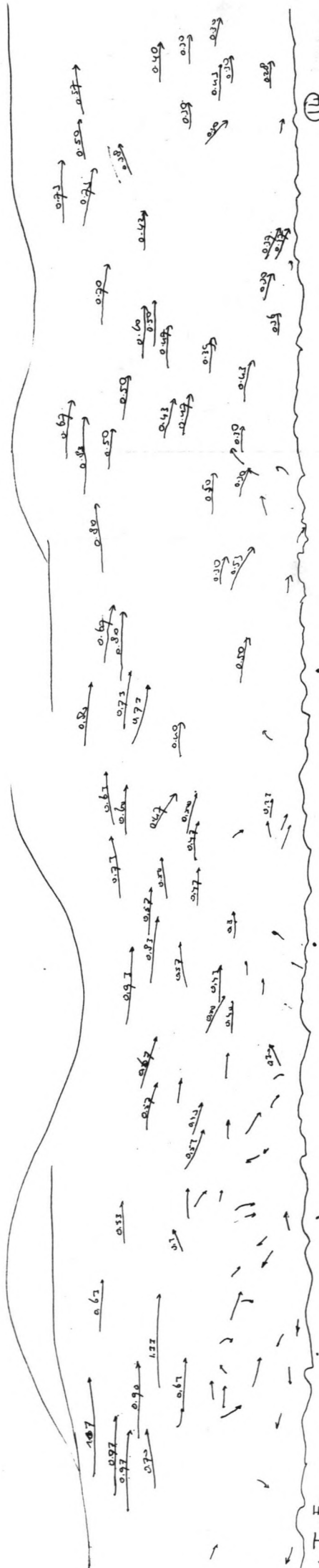
12



②

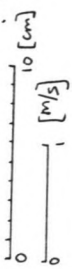
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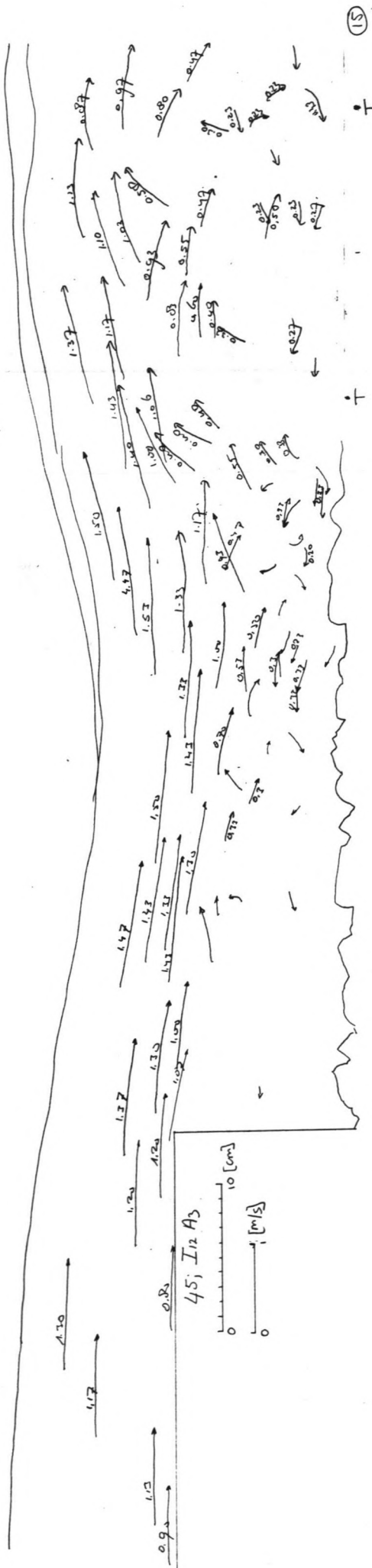




11

1, I₁₂ I₂



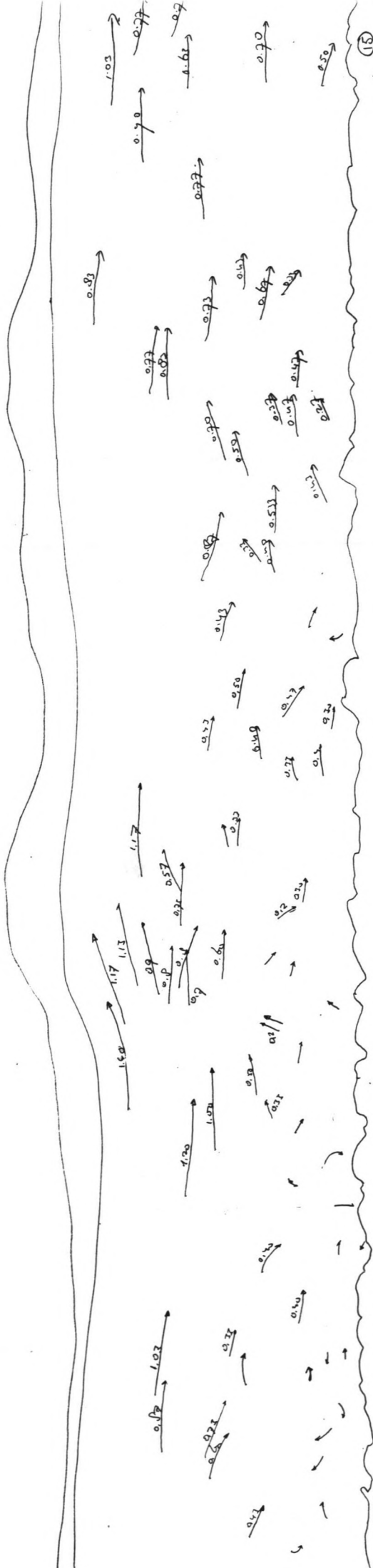


15

45, 12 A3

10 [cm]

10 [m/s]

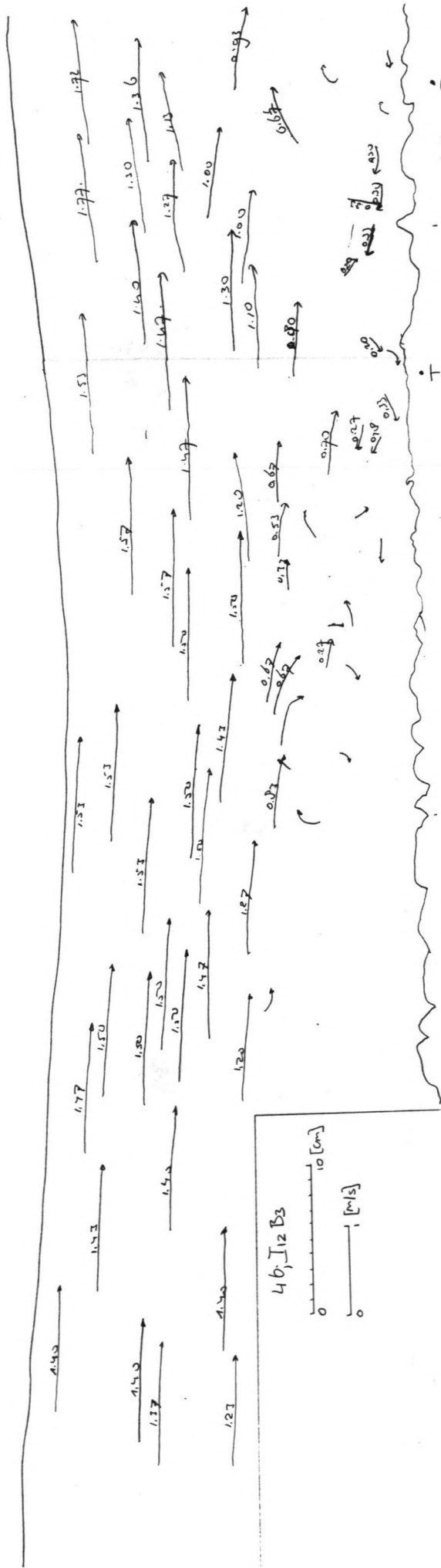


45, I12 A3

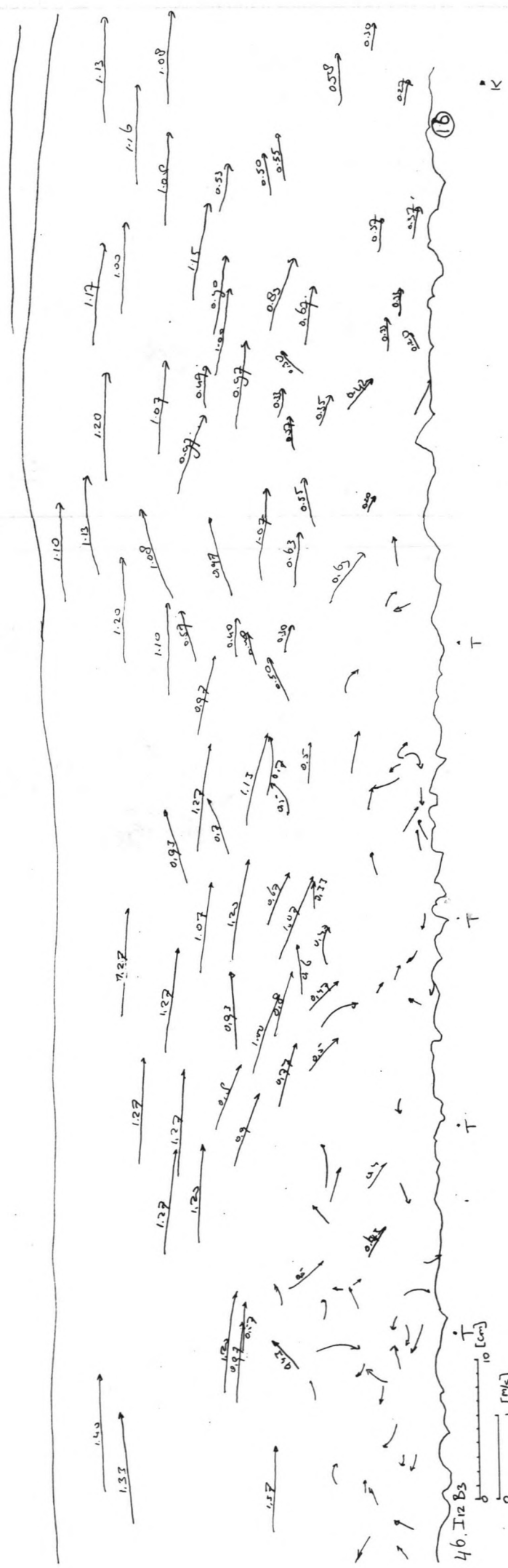
10 [cm]

1 [m/s]

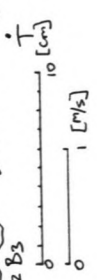
15



40, 12 B3
0 10 [cm]
0 1 [m/s]



46.112.83



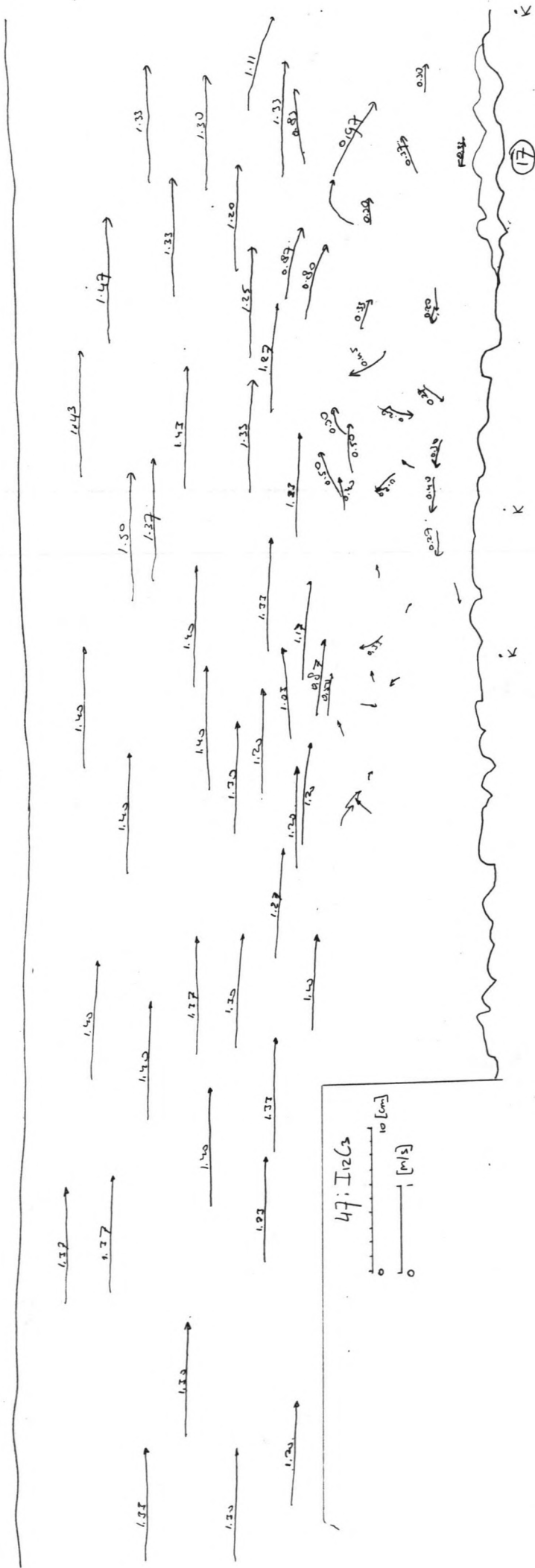
16

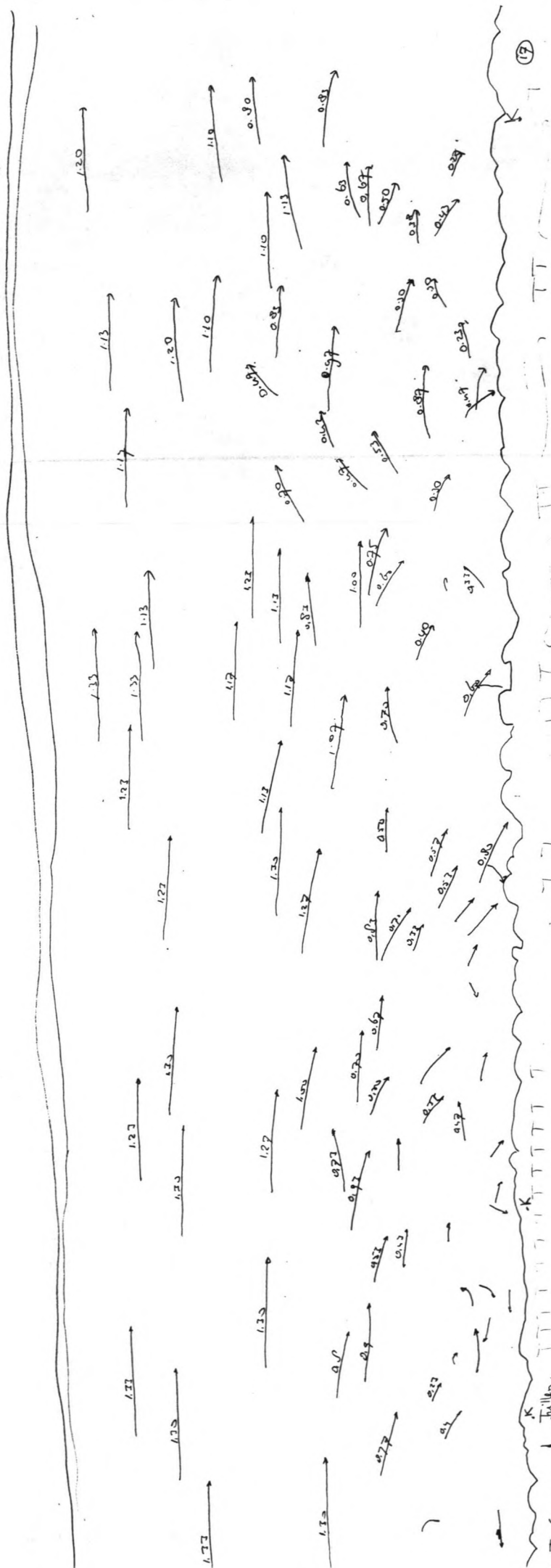
K

T

T

T

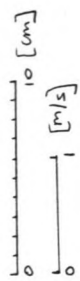


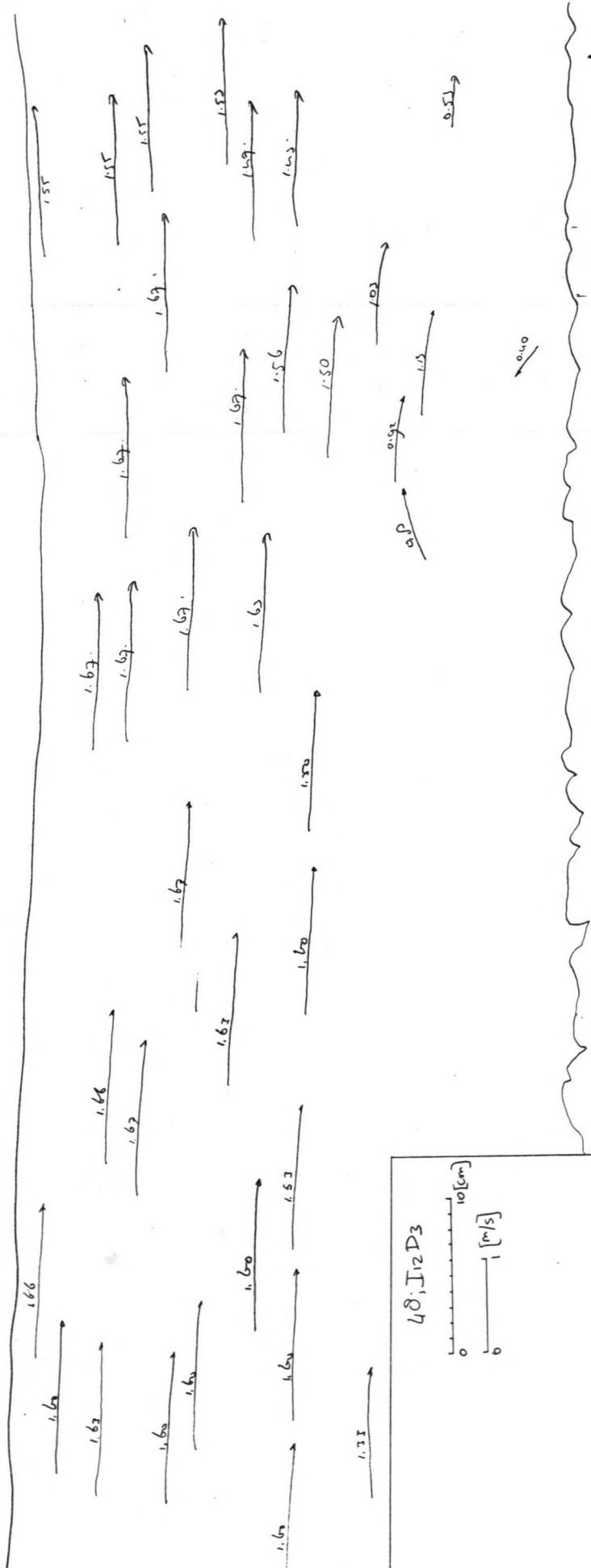


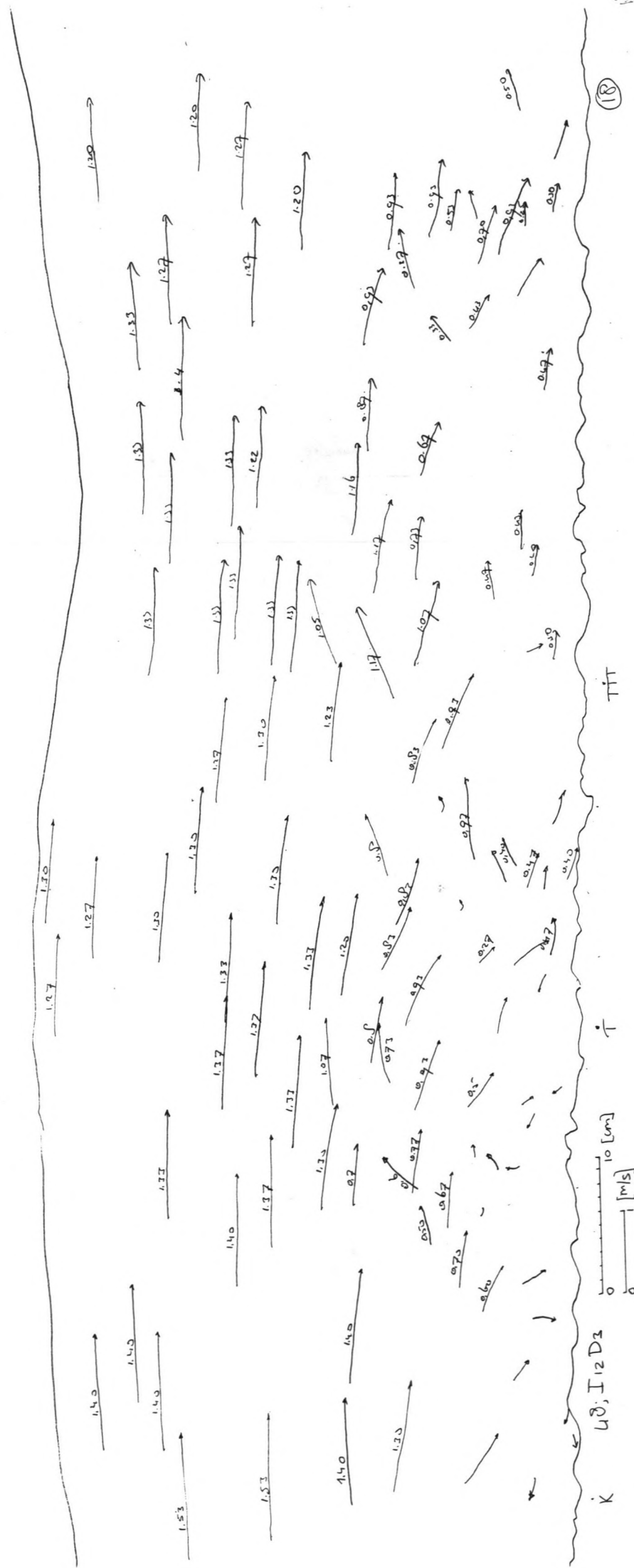
17

K

J; I₁₂ C₃





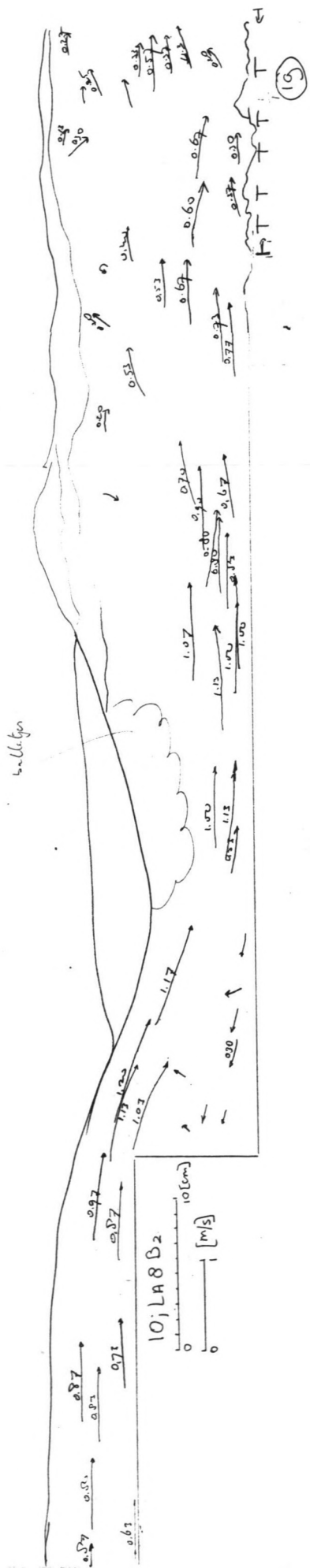


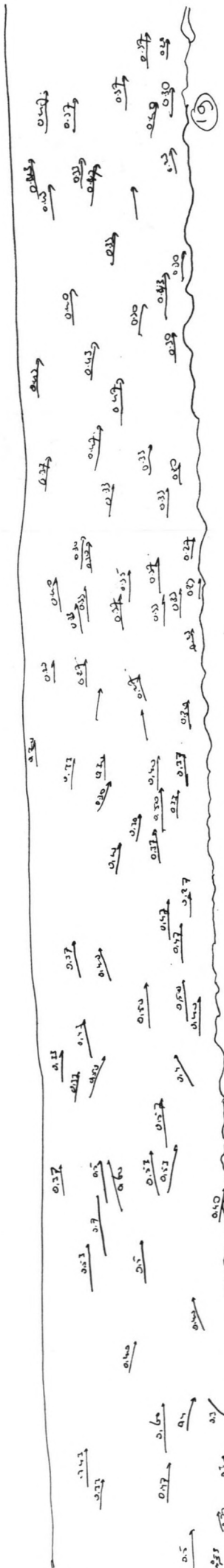
\vec{u} ; \vec{v} ; \vec{w}

0 10 [cm]
 0 1 [m/s]

TIT

18

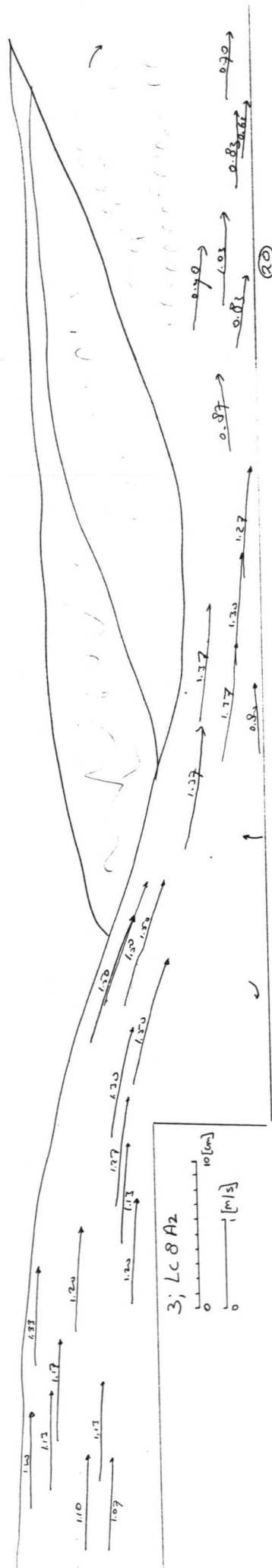




0 10 [cm]

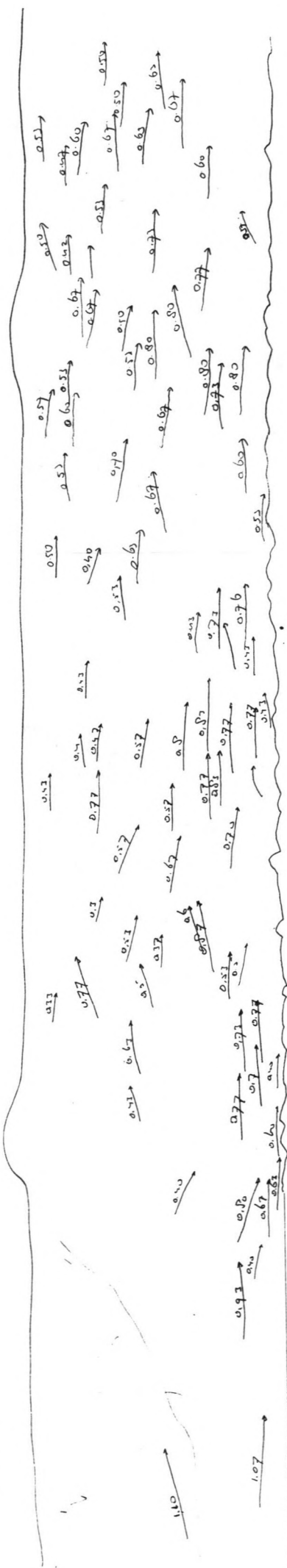
10; LA 8 B 2

(19)

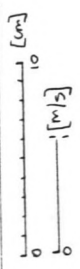


3; LC 8 A2
 0 10 [m]
 0 1 [m/s]

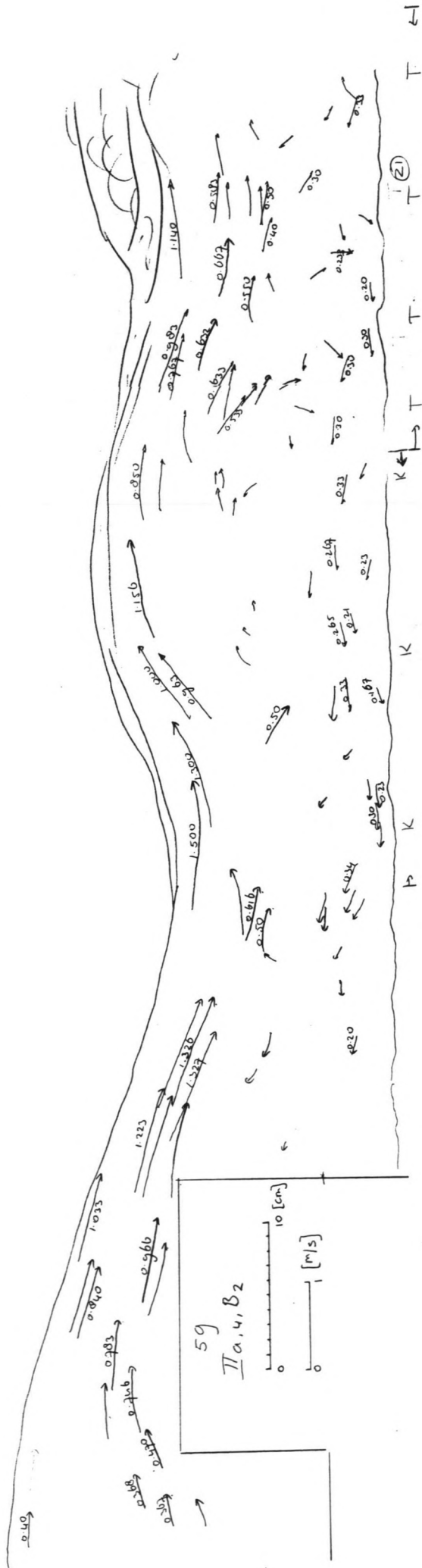
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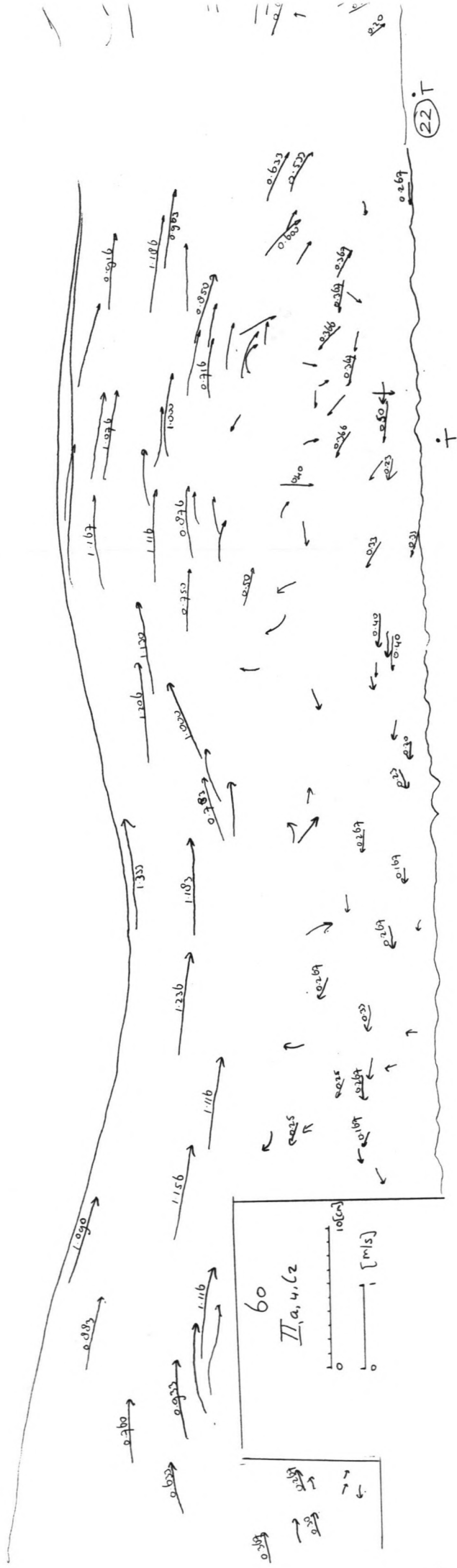
3, LC & A2



20



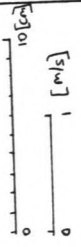
50
 100

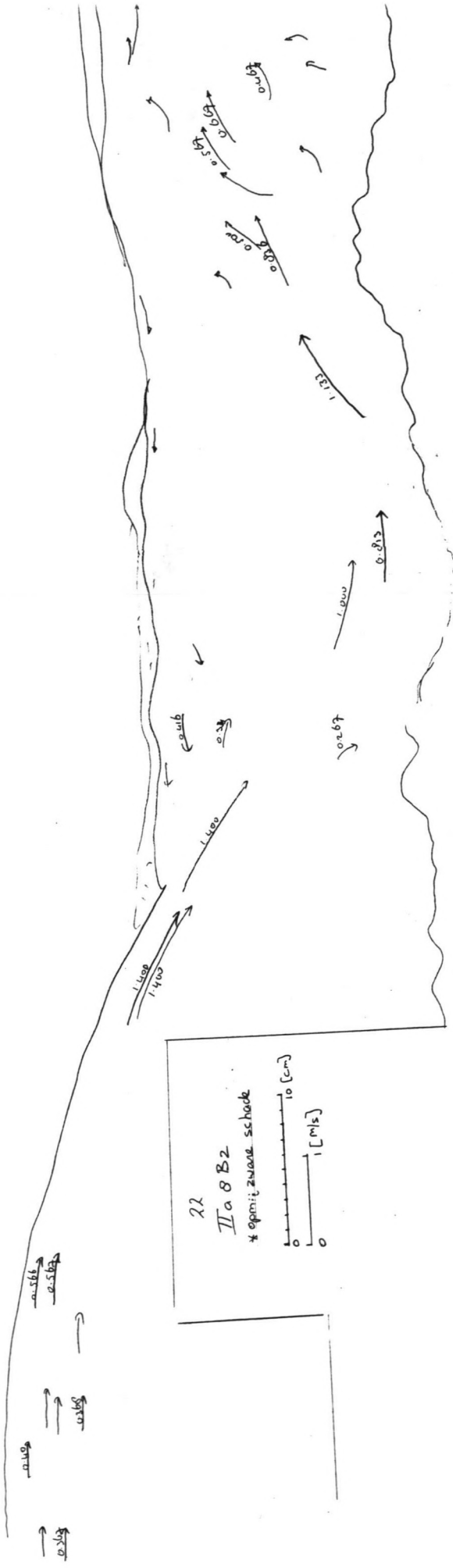


111
 711



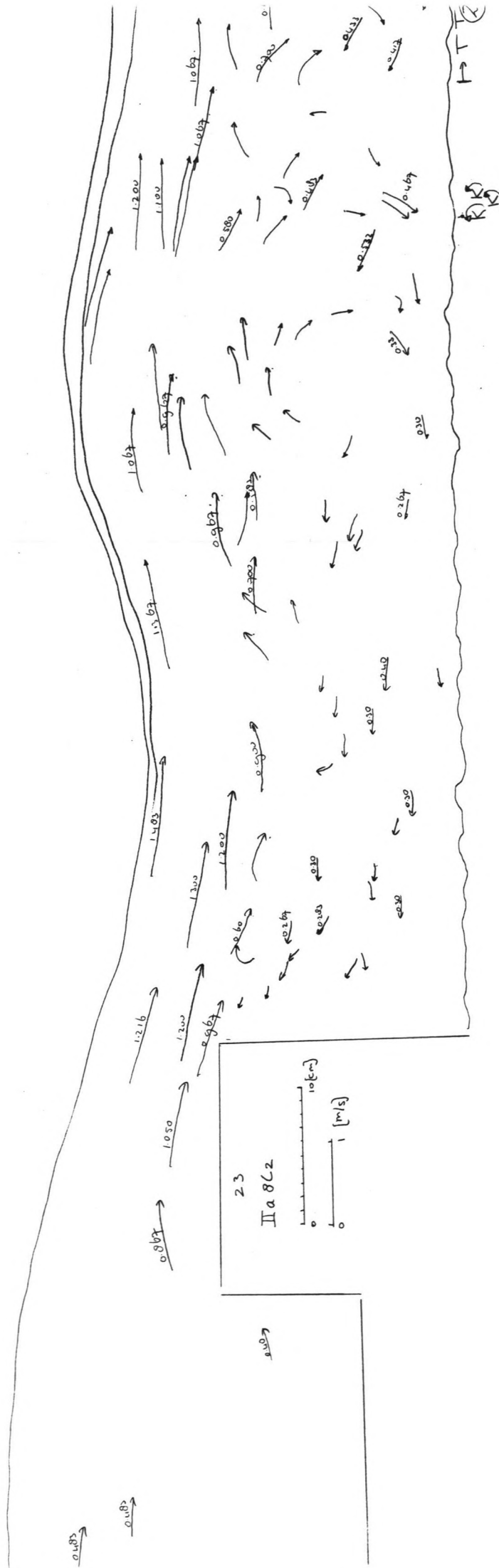
21
II a8 Az



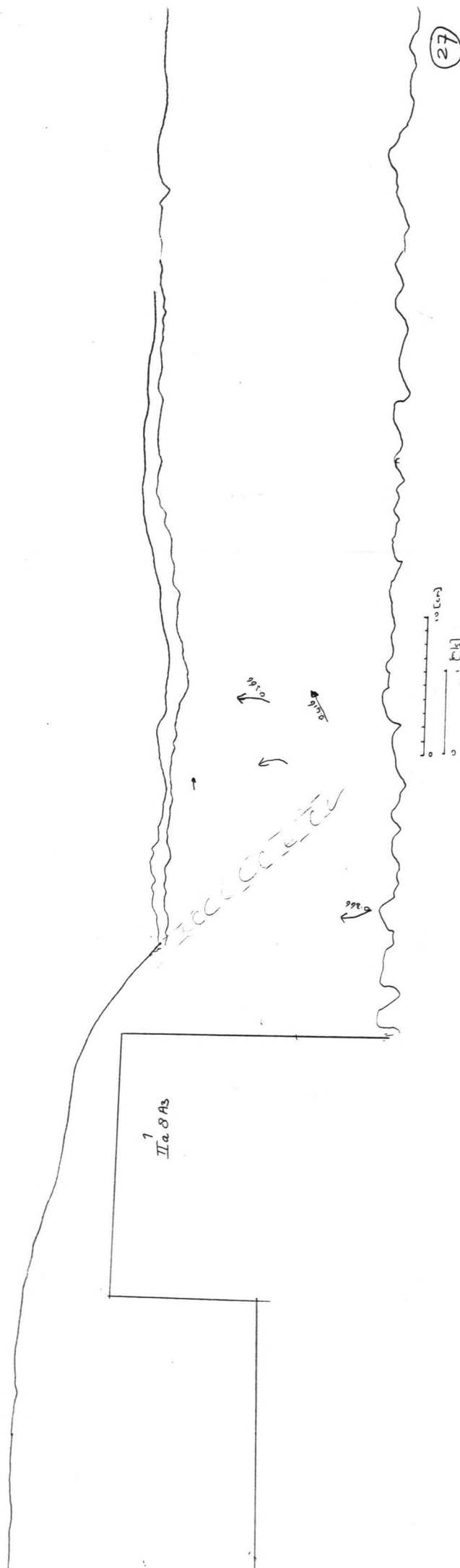


22

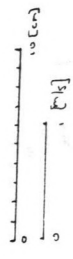
Hydrodynamic



Handwritten notes or labels in the upper right corner of the page.



IIa 8 A3

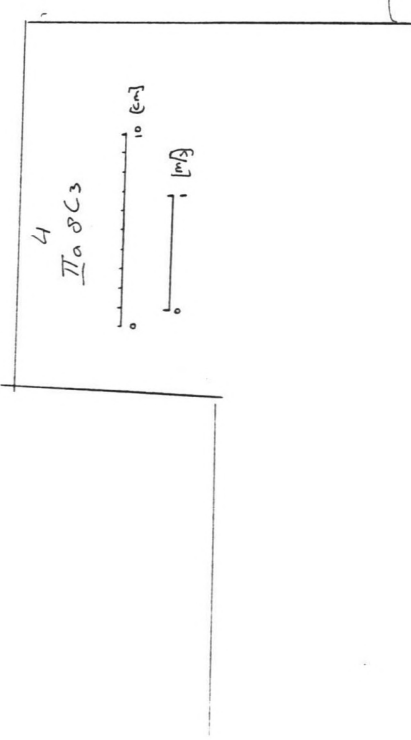
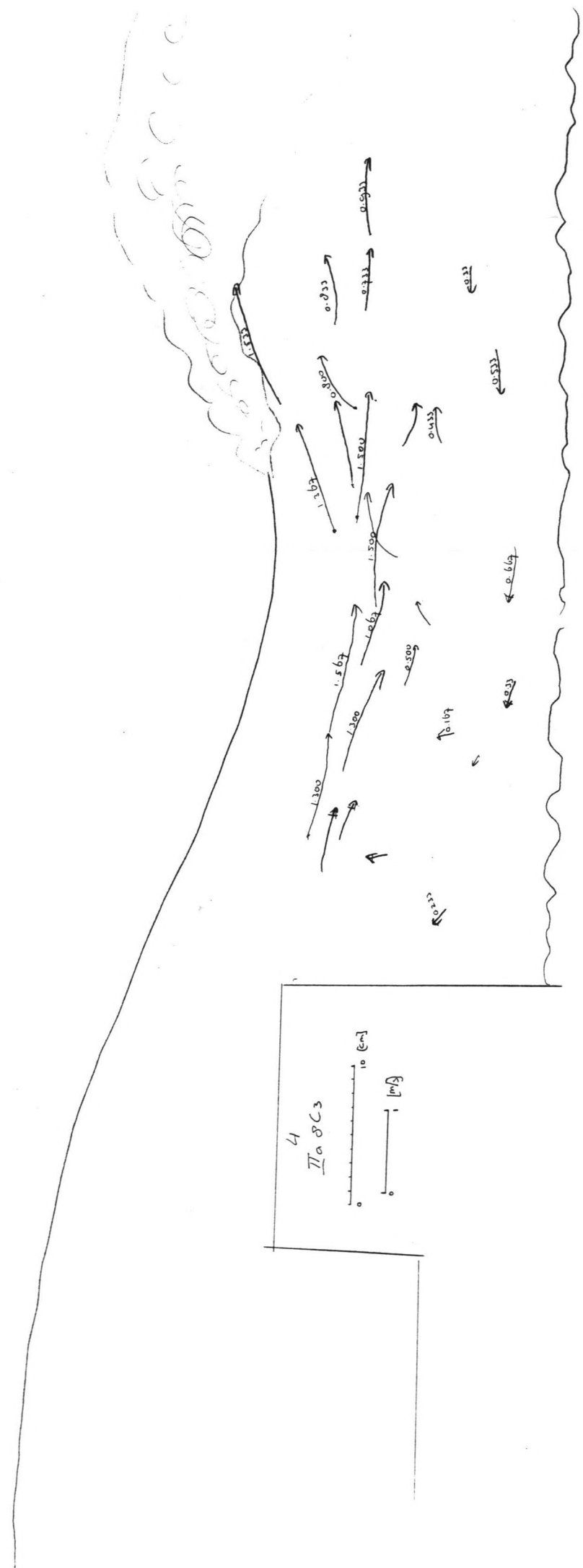


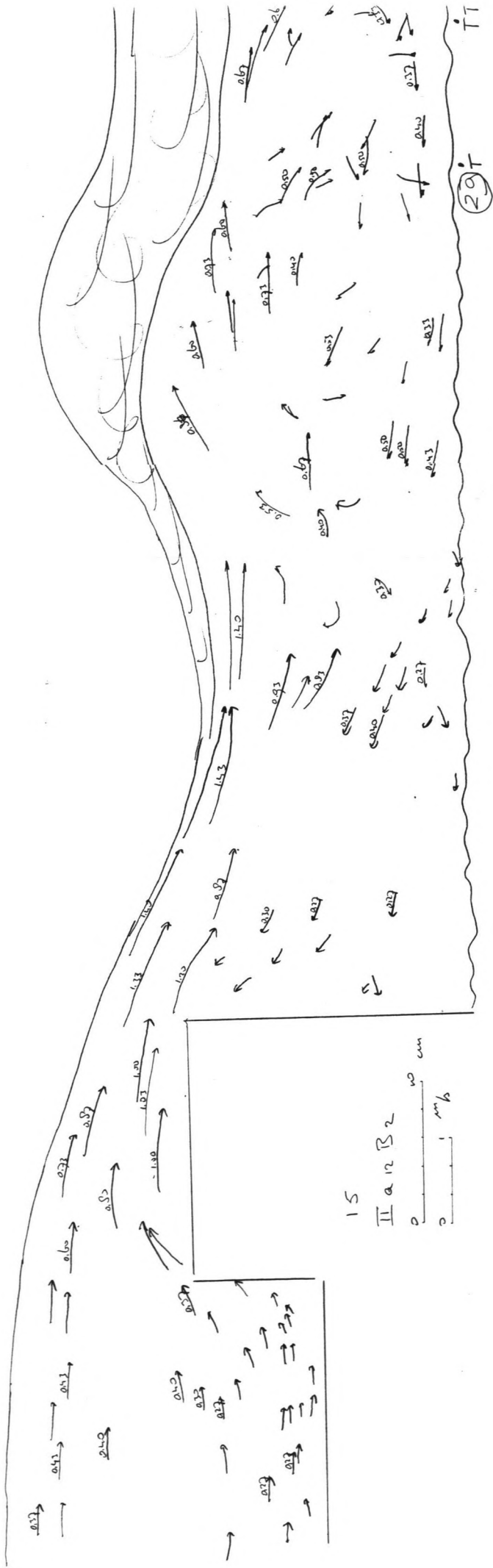
1000

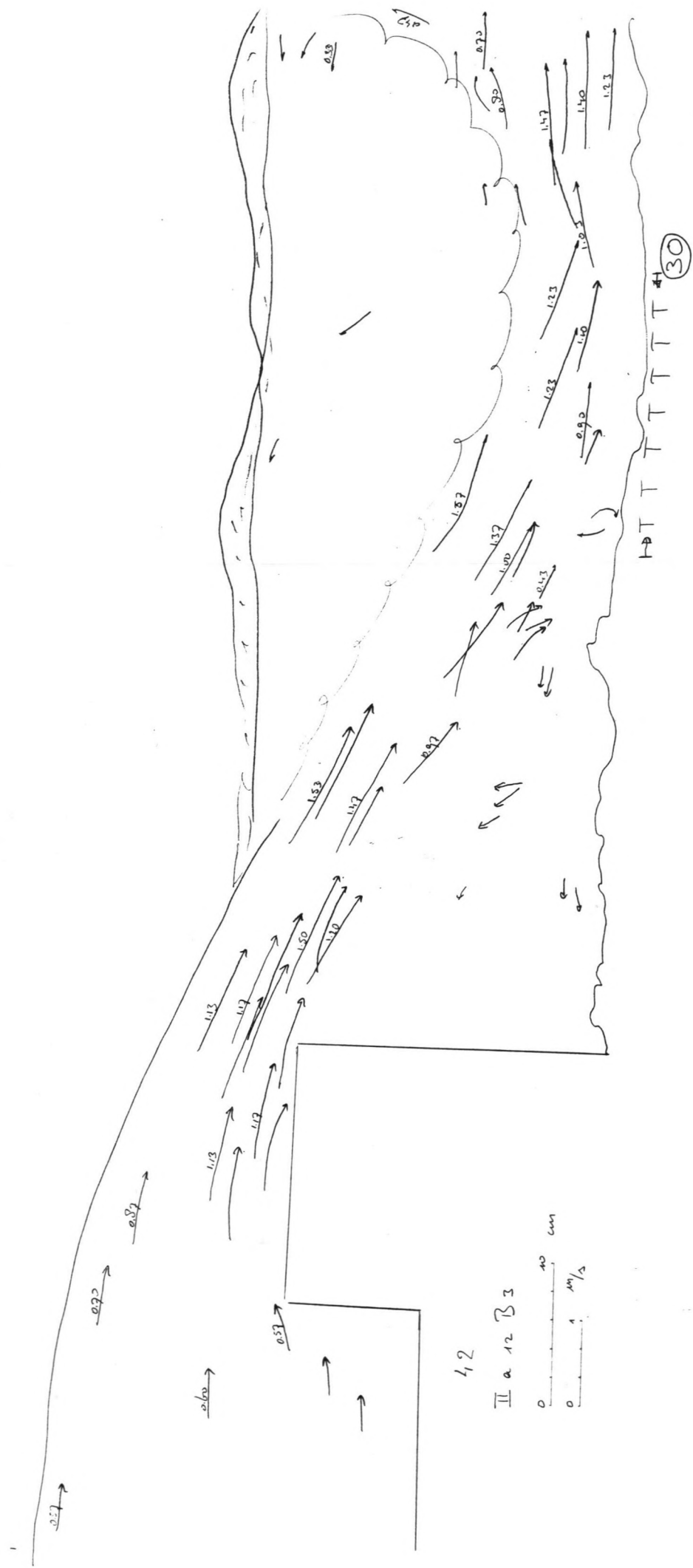
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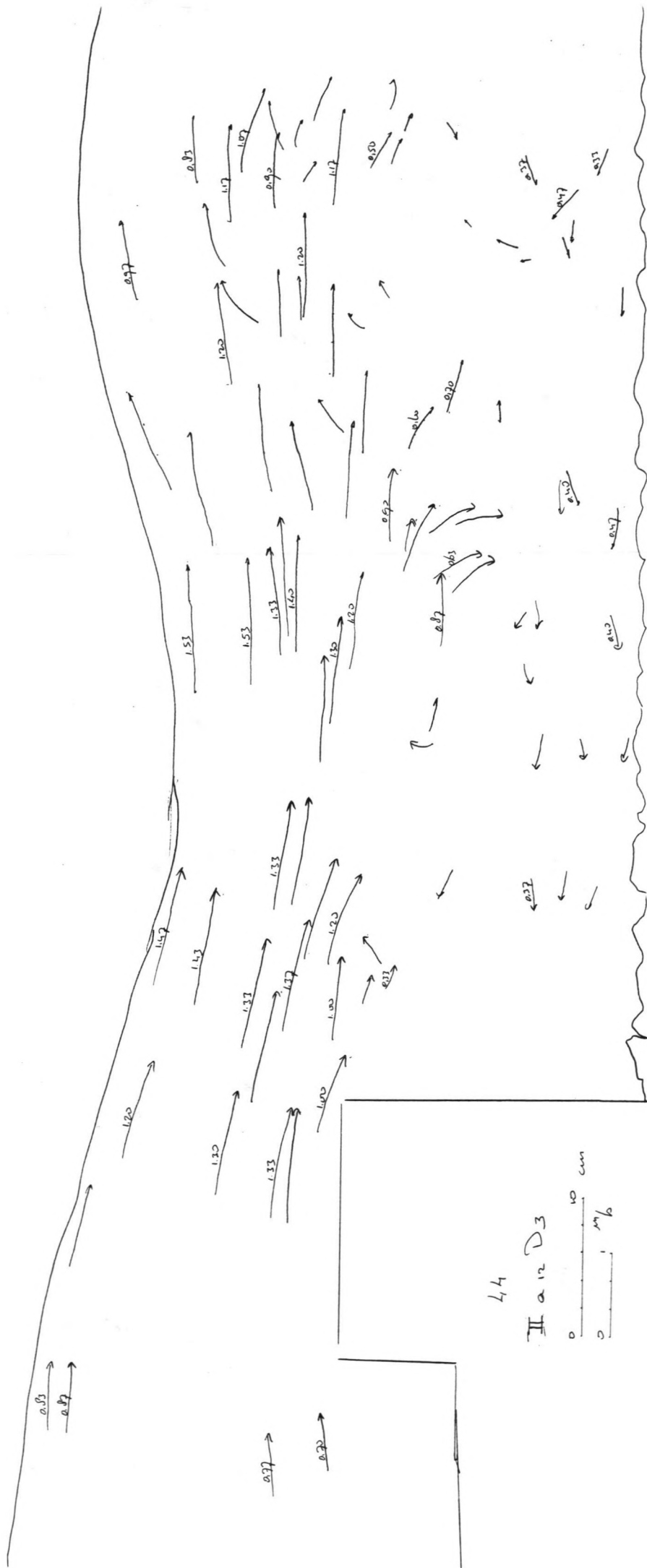
1000

1000





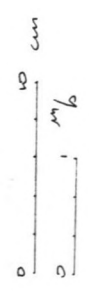




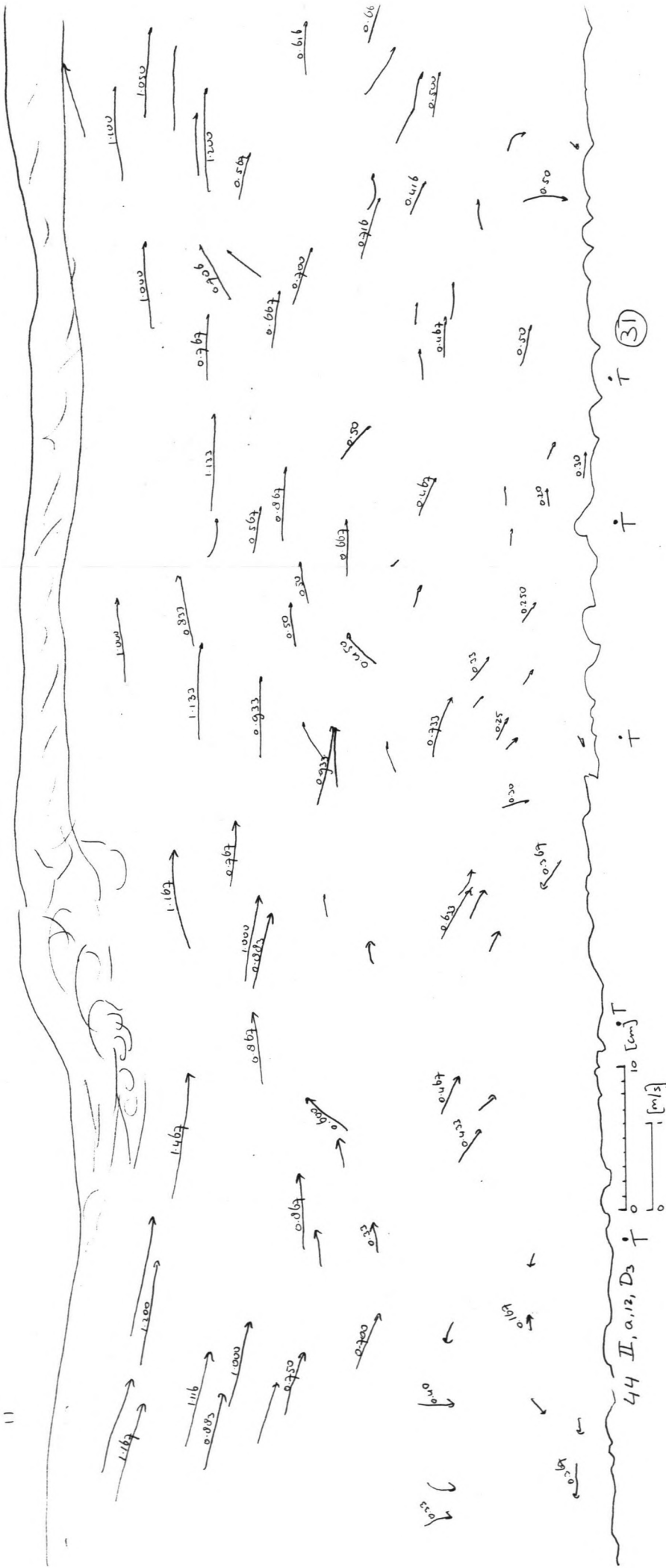
(31)

44

II a n D 3

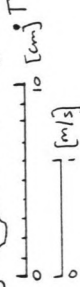


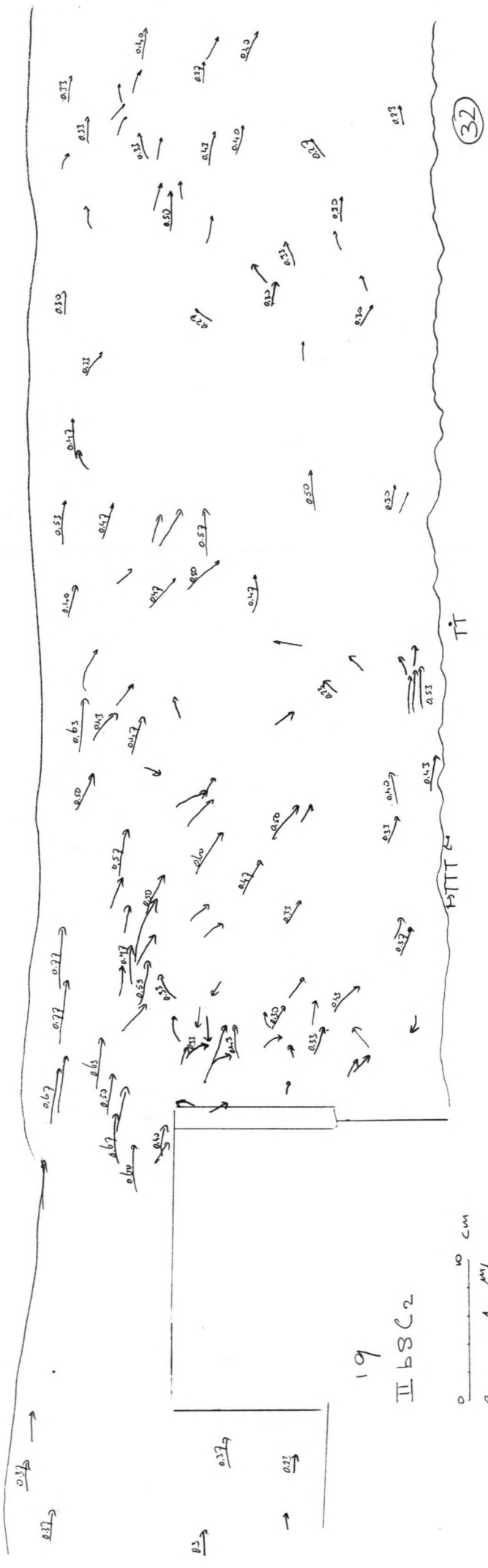
11



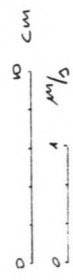
31

44 II, a, 12, D3

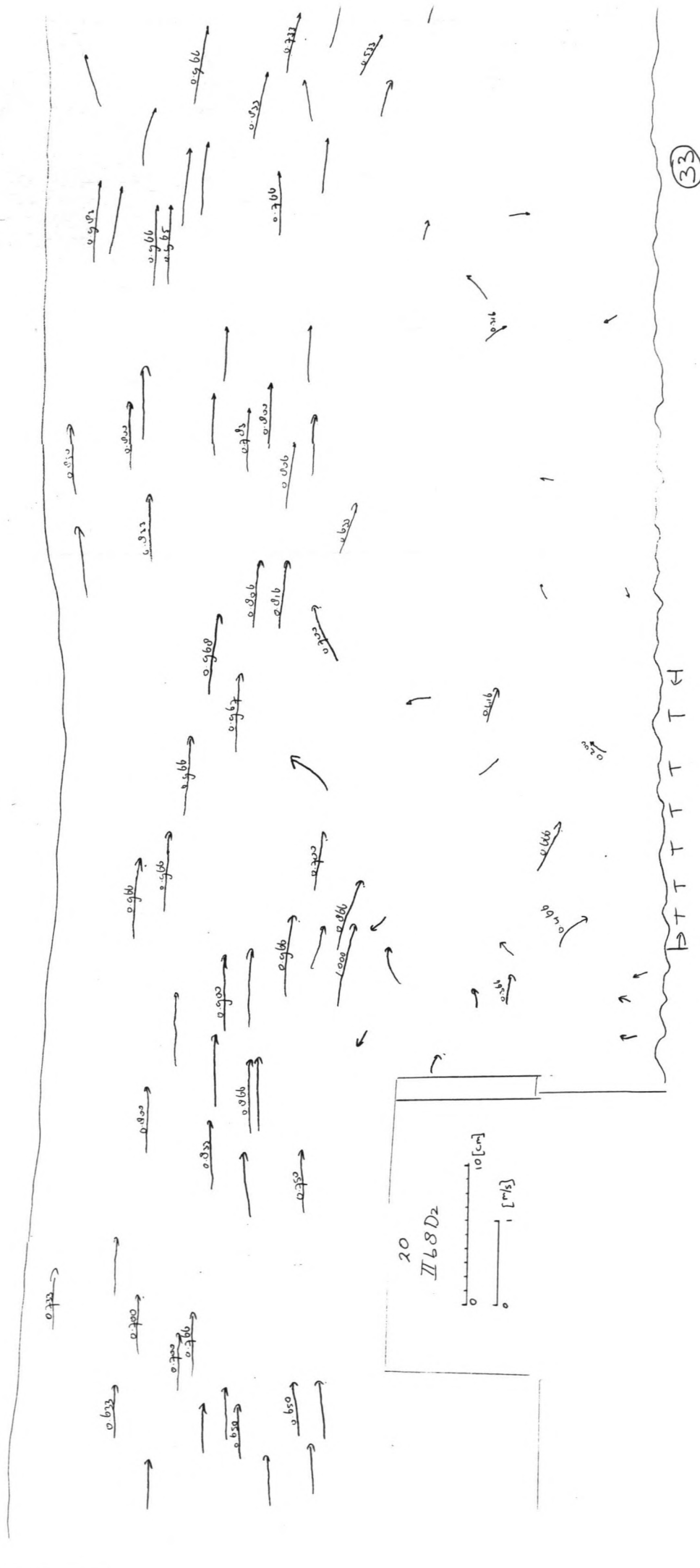


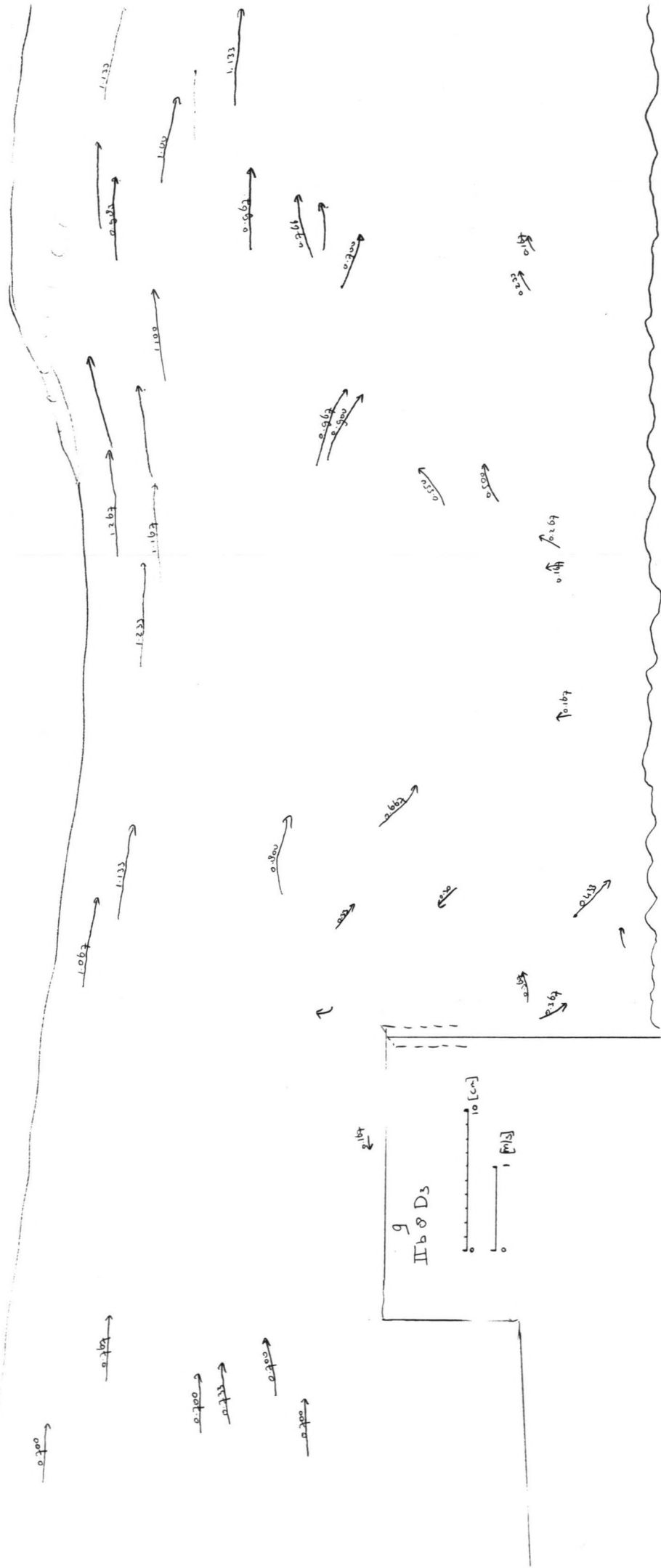


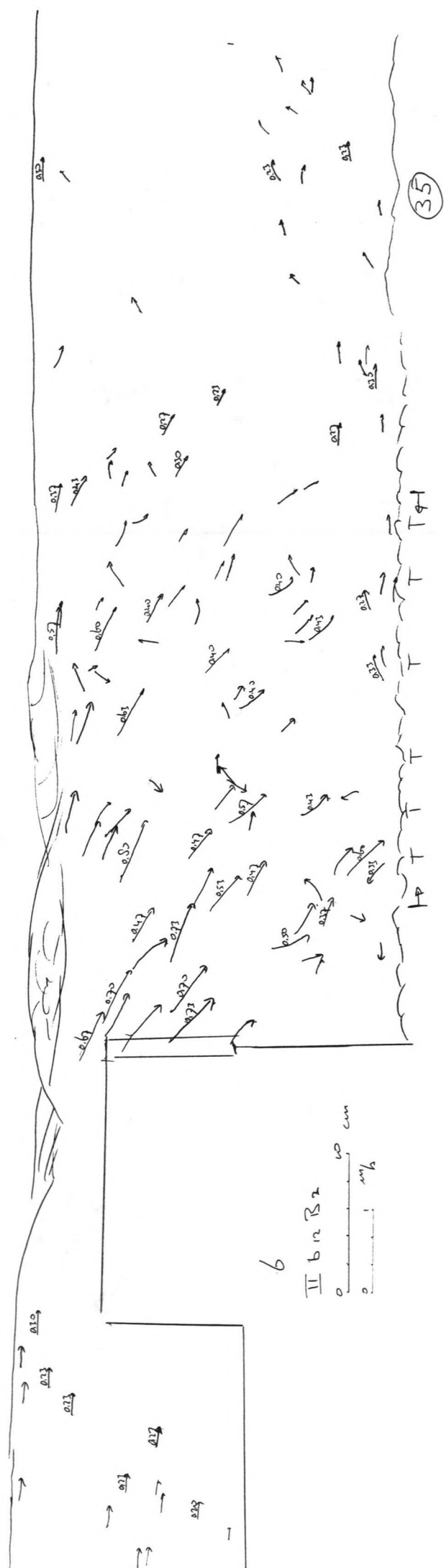
19
II b8C2



(32)



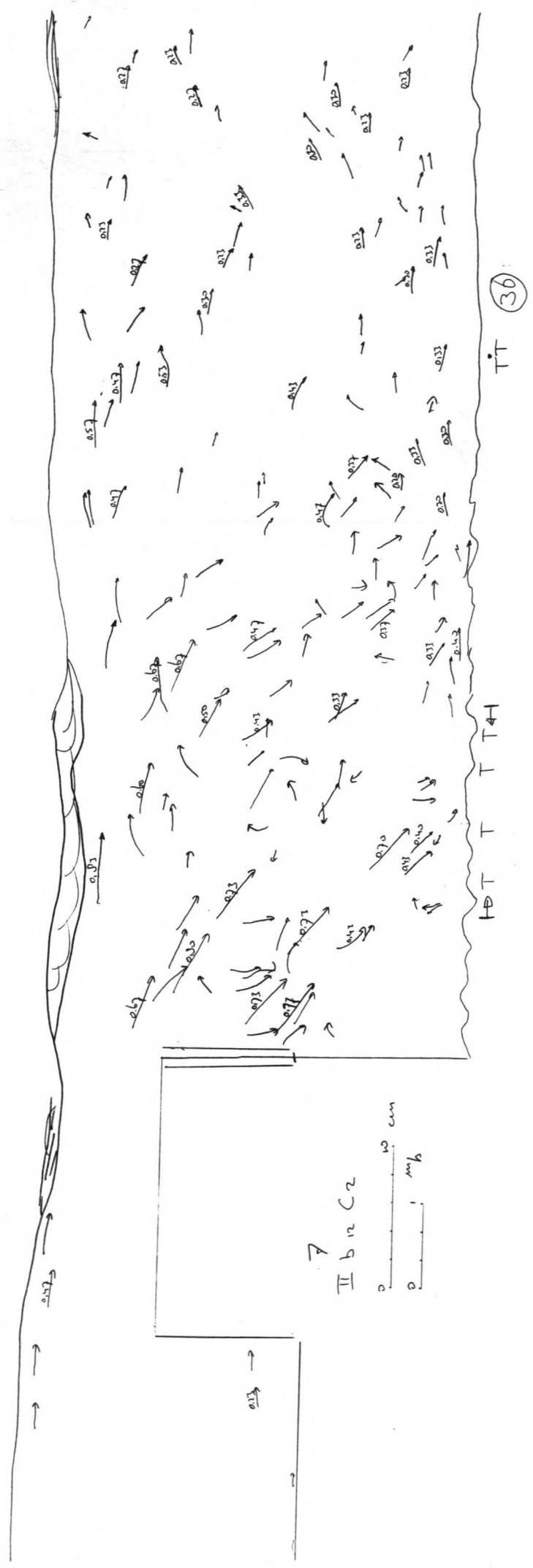




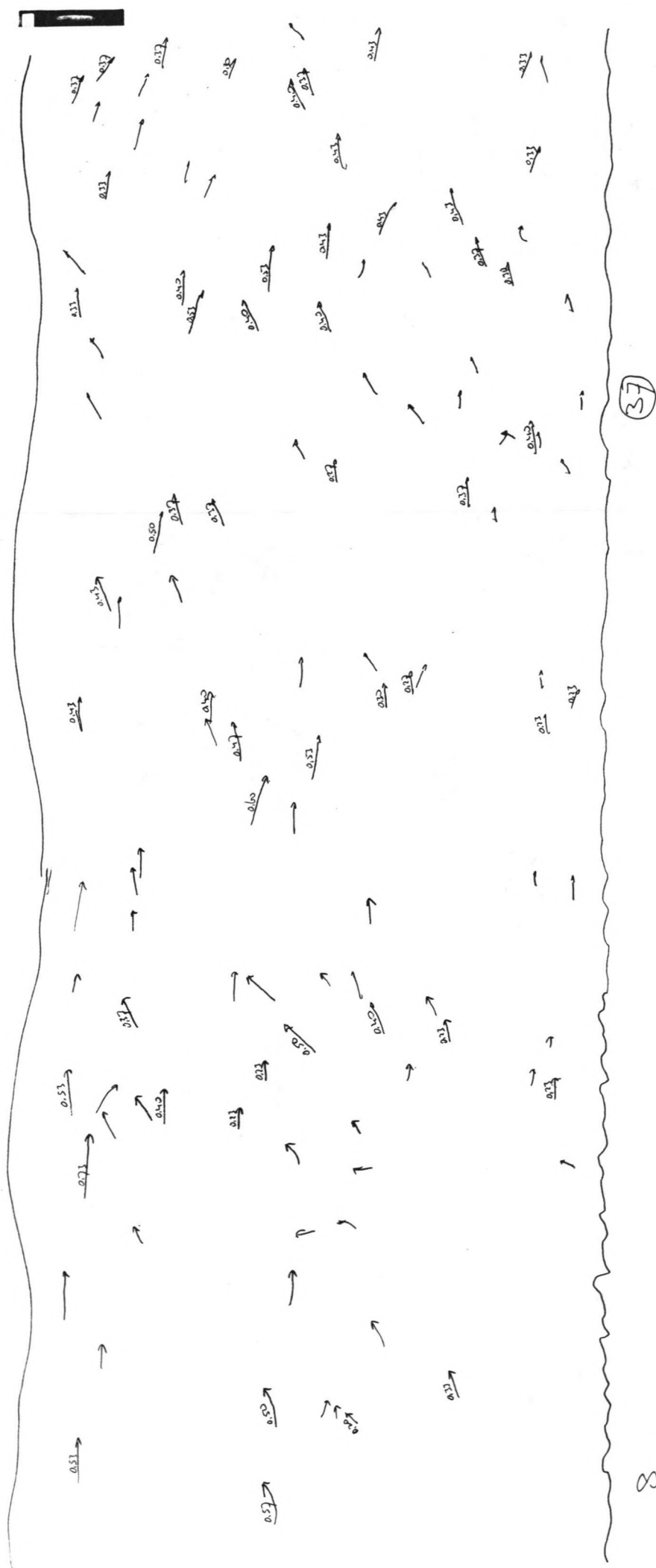
6

II b n B z
 0 1 2 3 4 5 6 7 8 9 10 cm

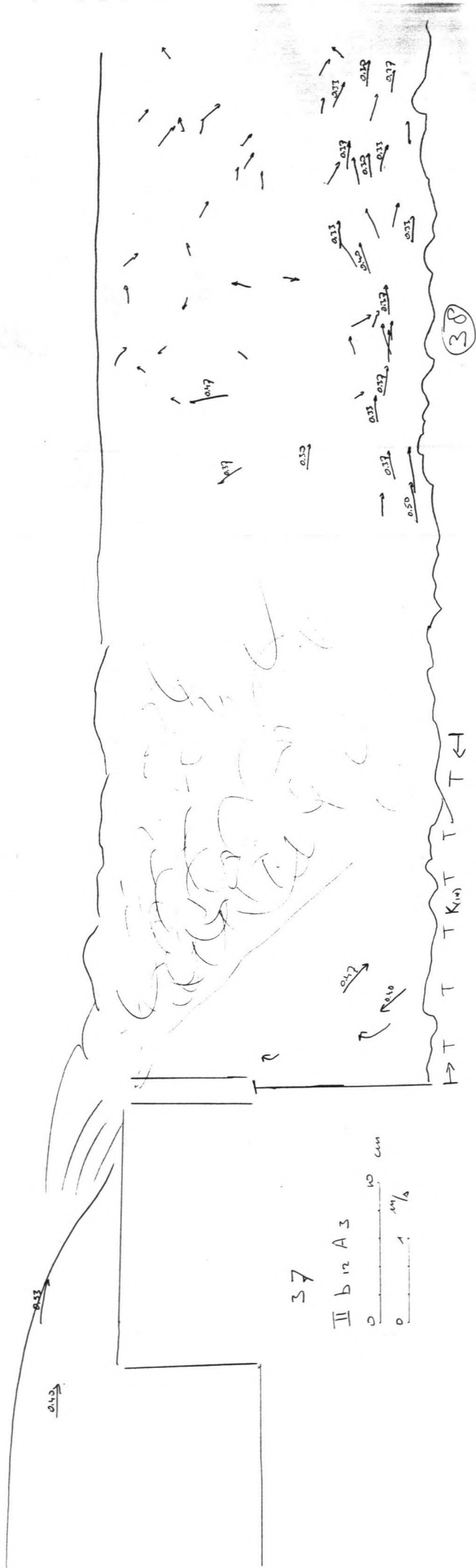
35







8
 II b 12 D 2
 0 10 cm
 0 1 m/h

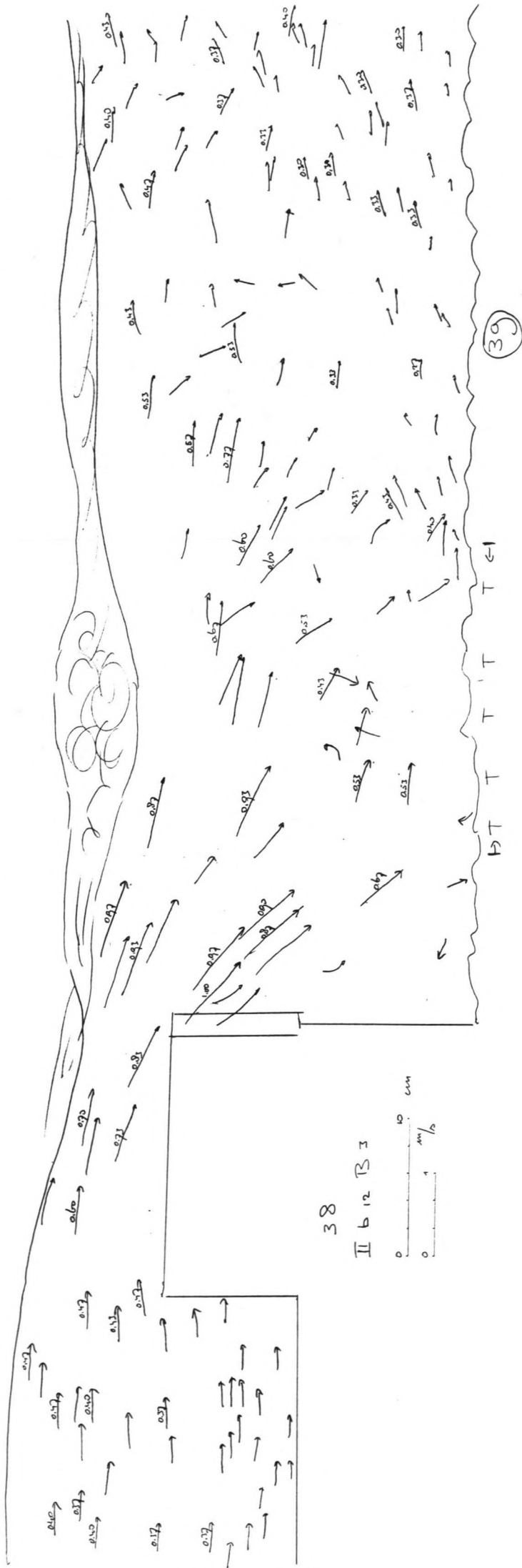


38

37

III b 12 A 3



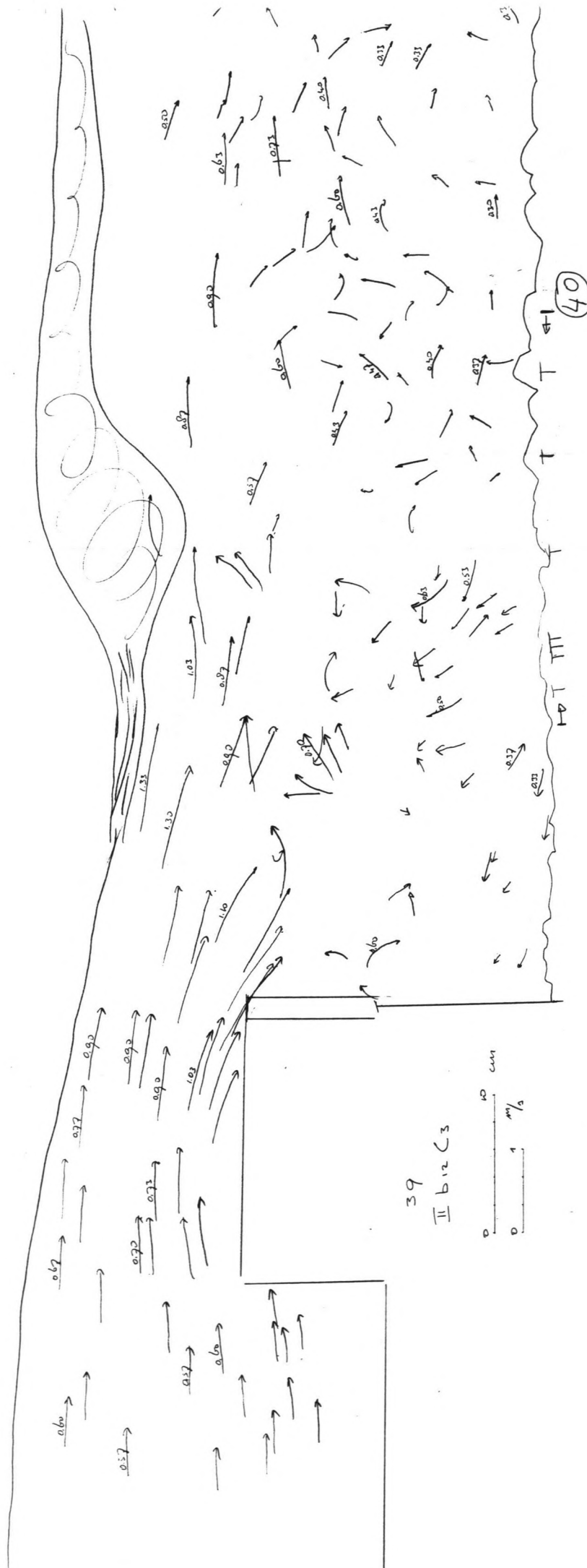


38

II 6 12 B 3

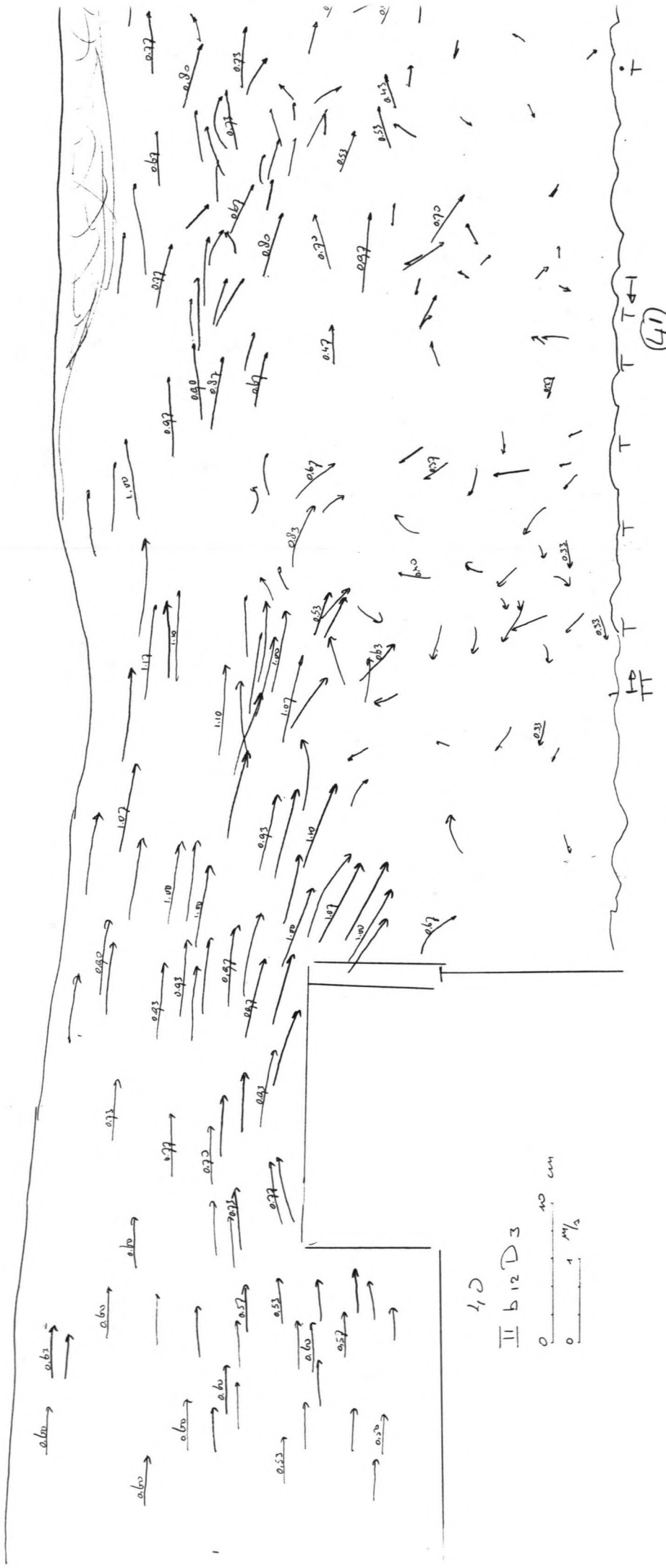


39



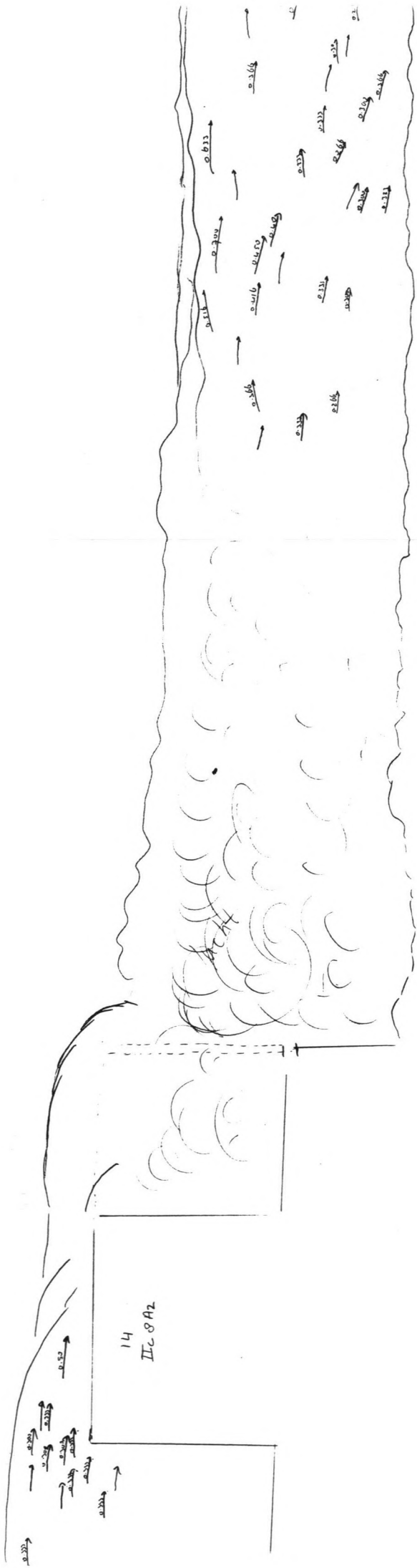
39
II b12 C3





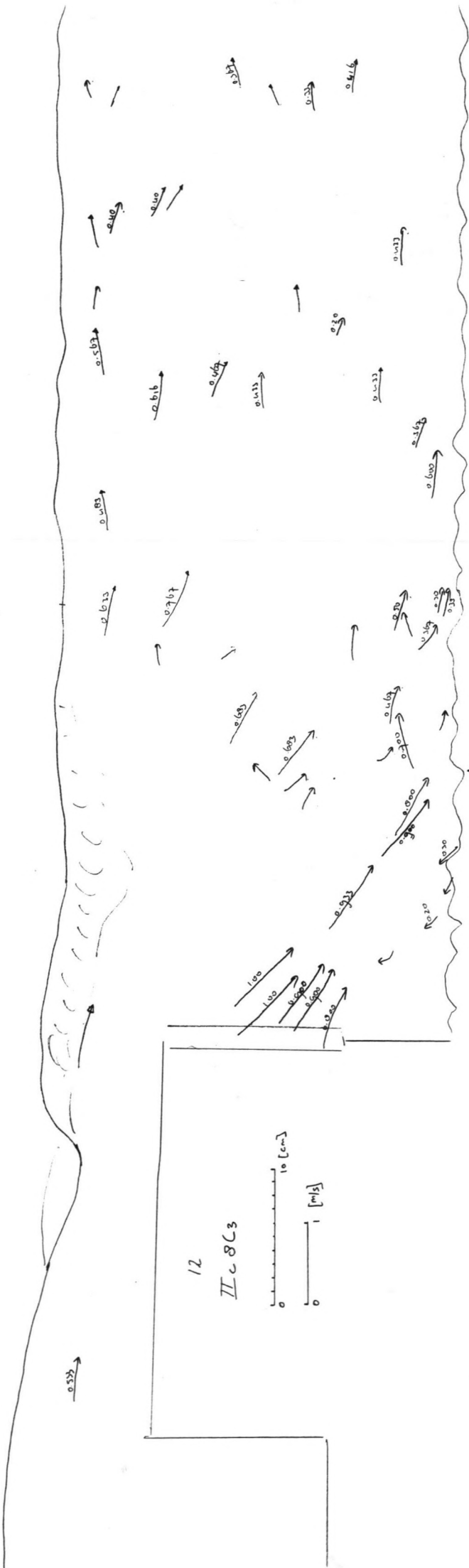
40
 II b 12 D 3
 0 10 cm
 0 1 1/2

42



10 cm 1 m/s

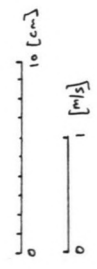
14
ILC 8 A2



(43)

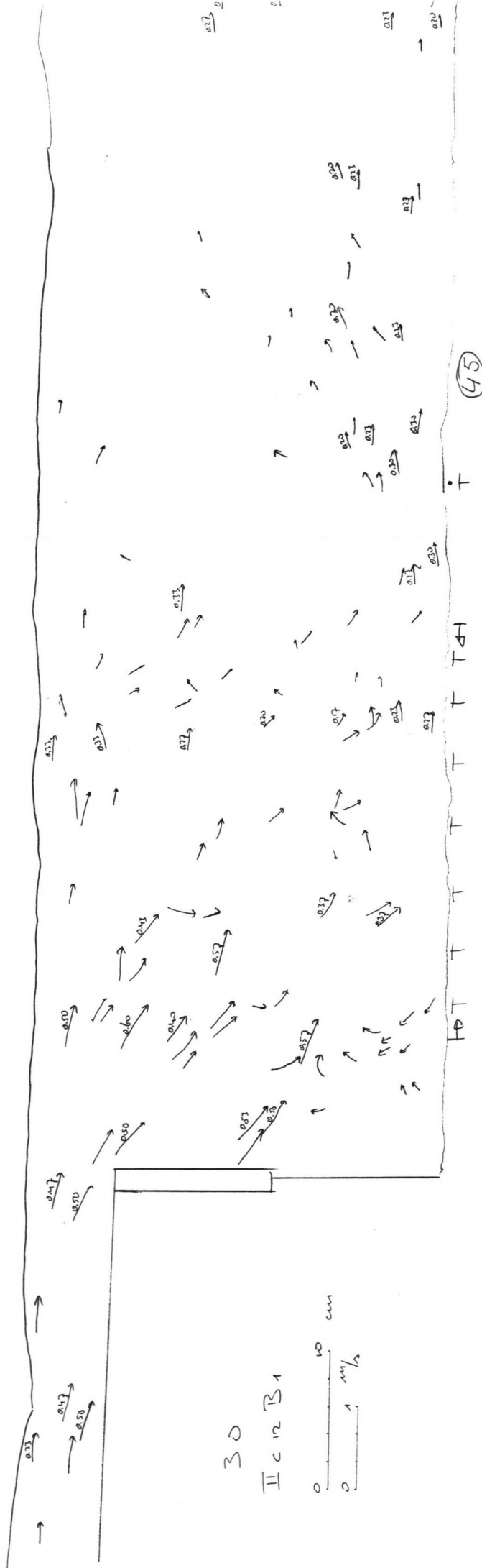
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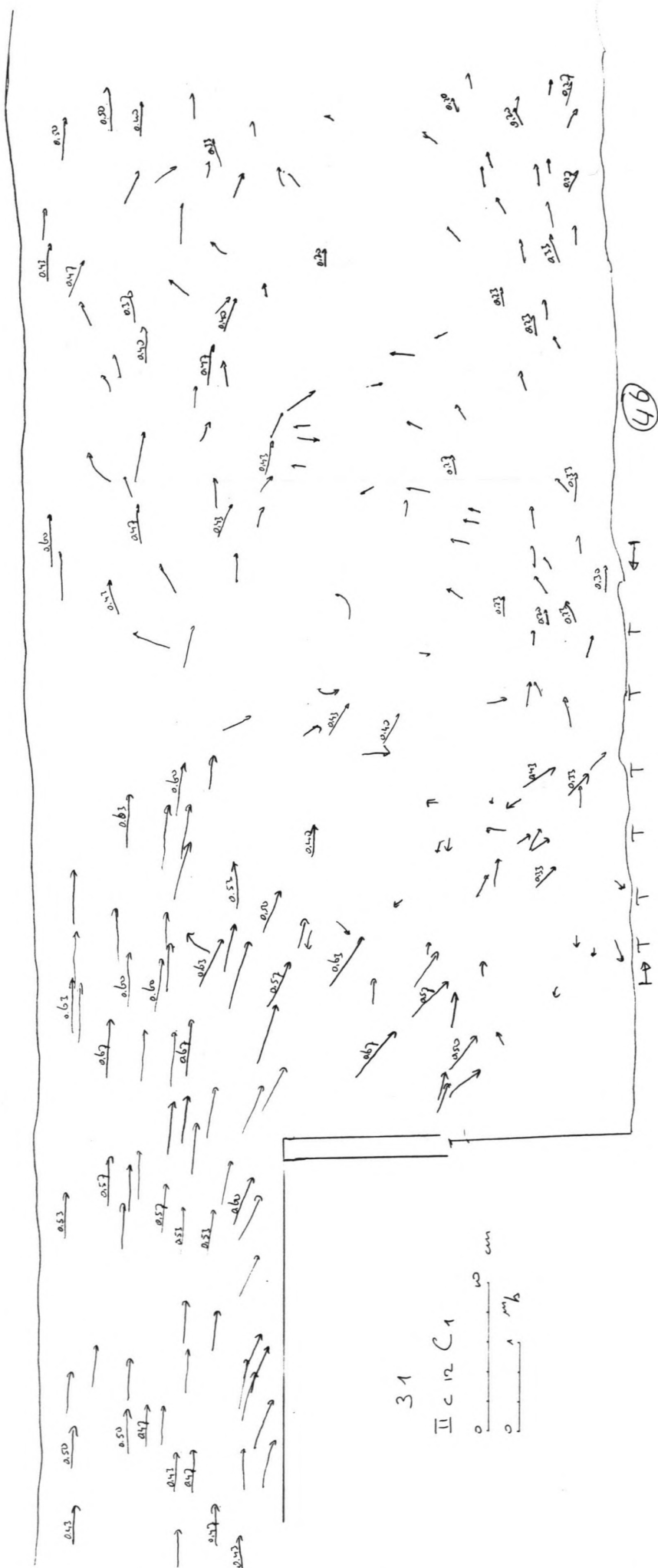
II-8C3





(44)

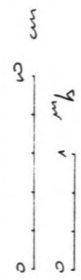




(46)

31

II c 12 C 1



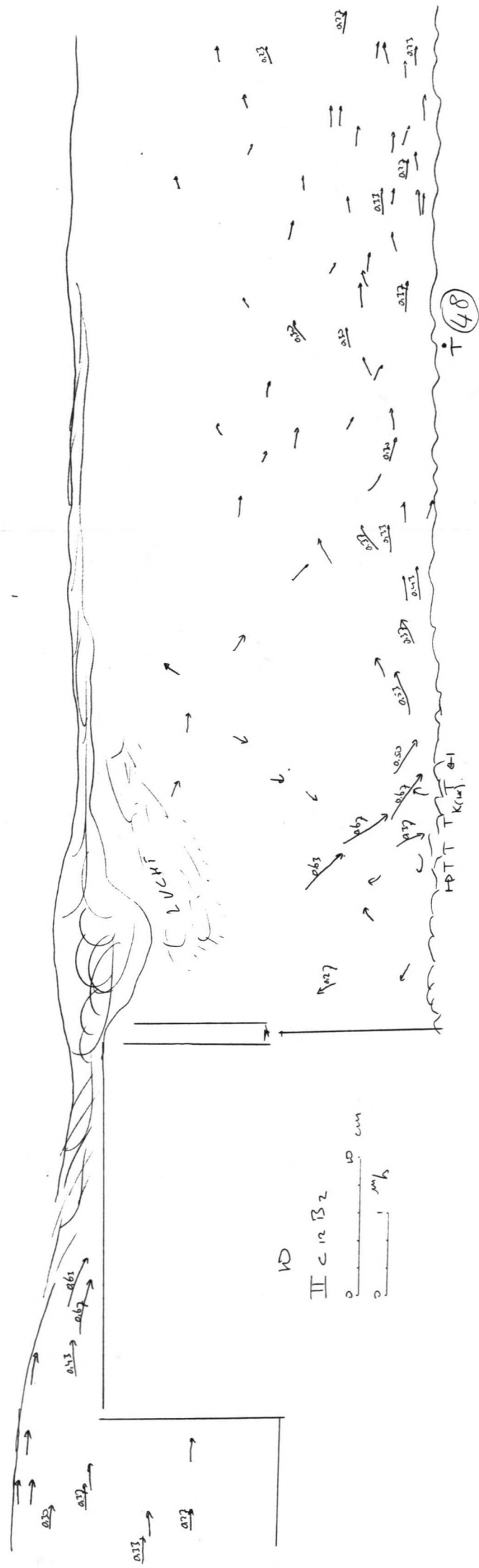


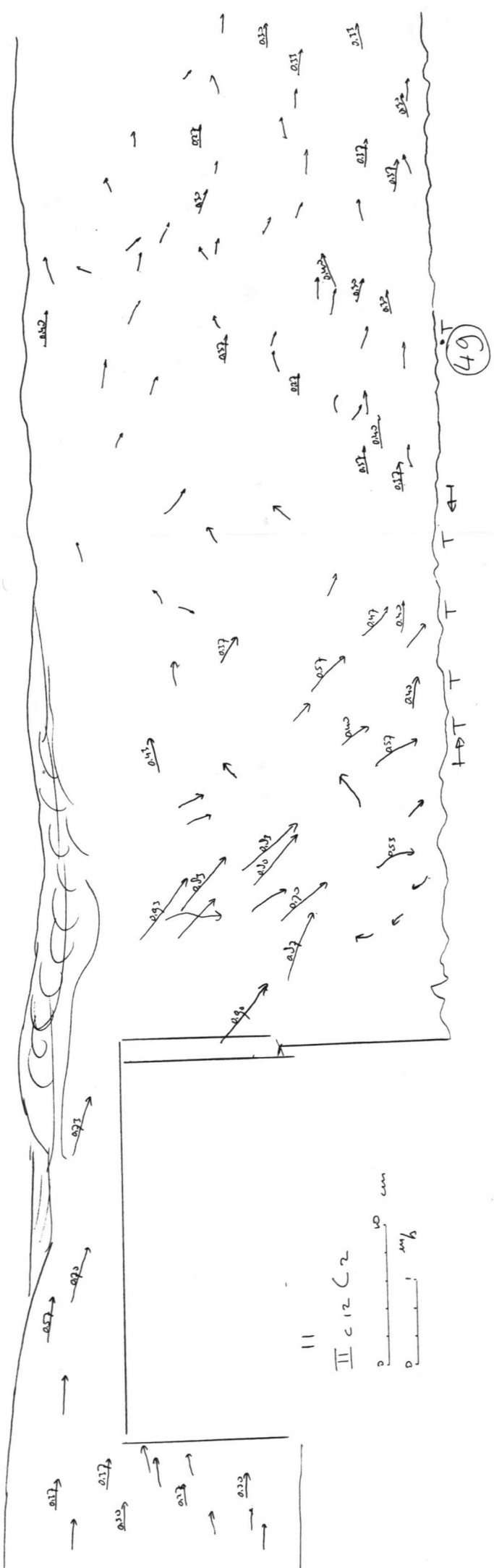
32

II c 12 D 1



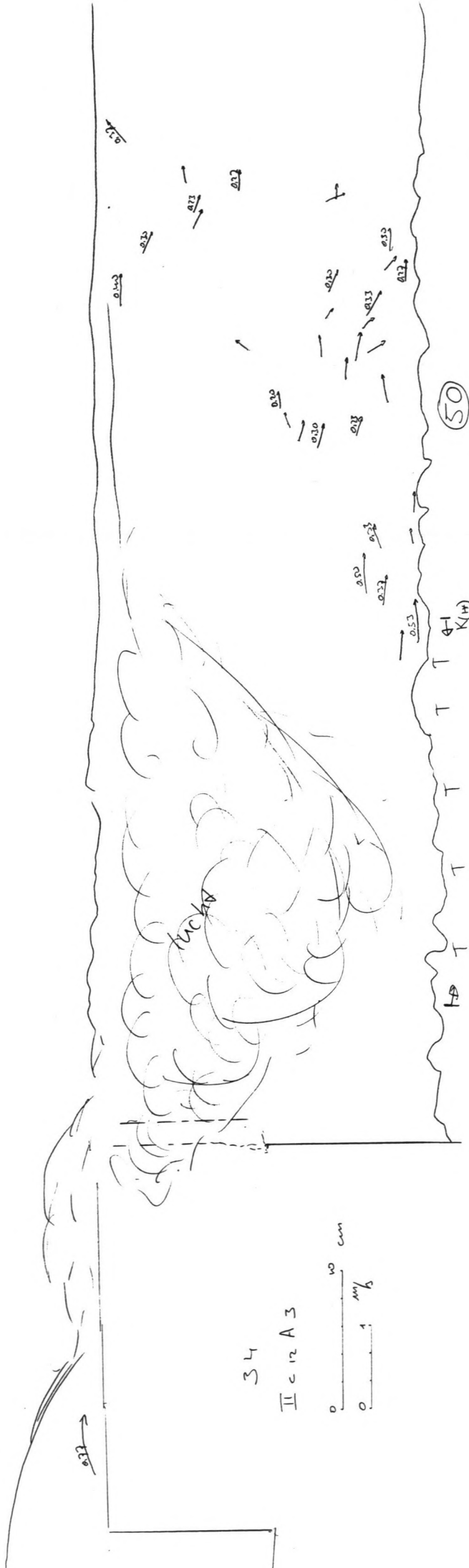
(47)





II c 12 C 2

11



34

II c 12 A 3



→ 0.11

(50)

0.53

0.54

0.55

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0.95

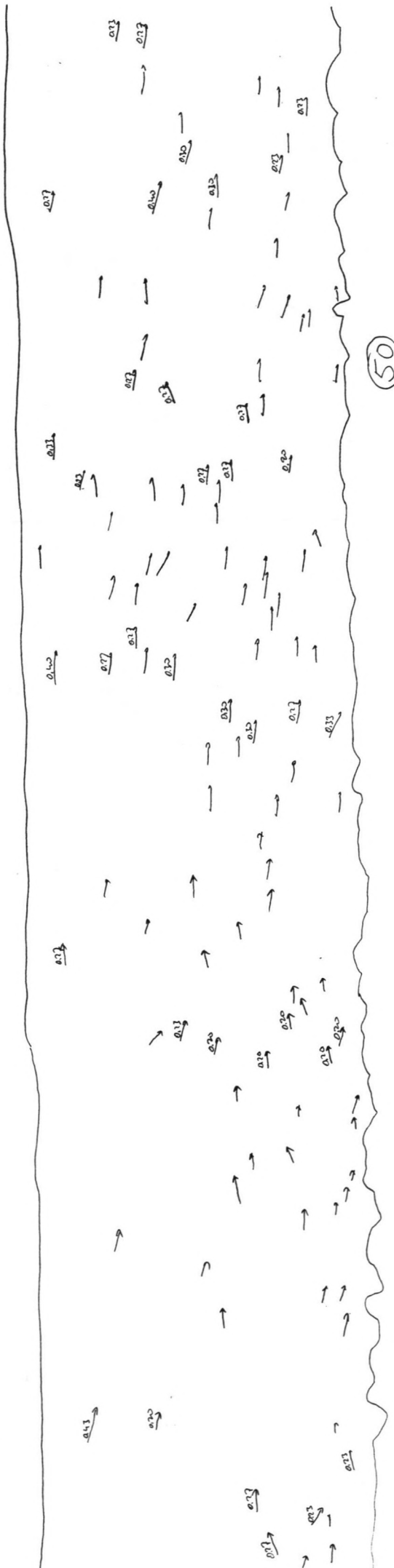
0.96

0.97

0.98

0.99

1.00



50

34

II c 12 A 3

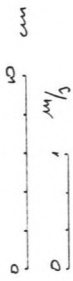




0.90

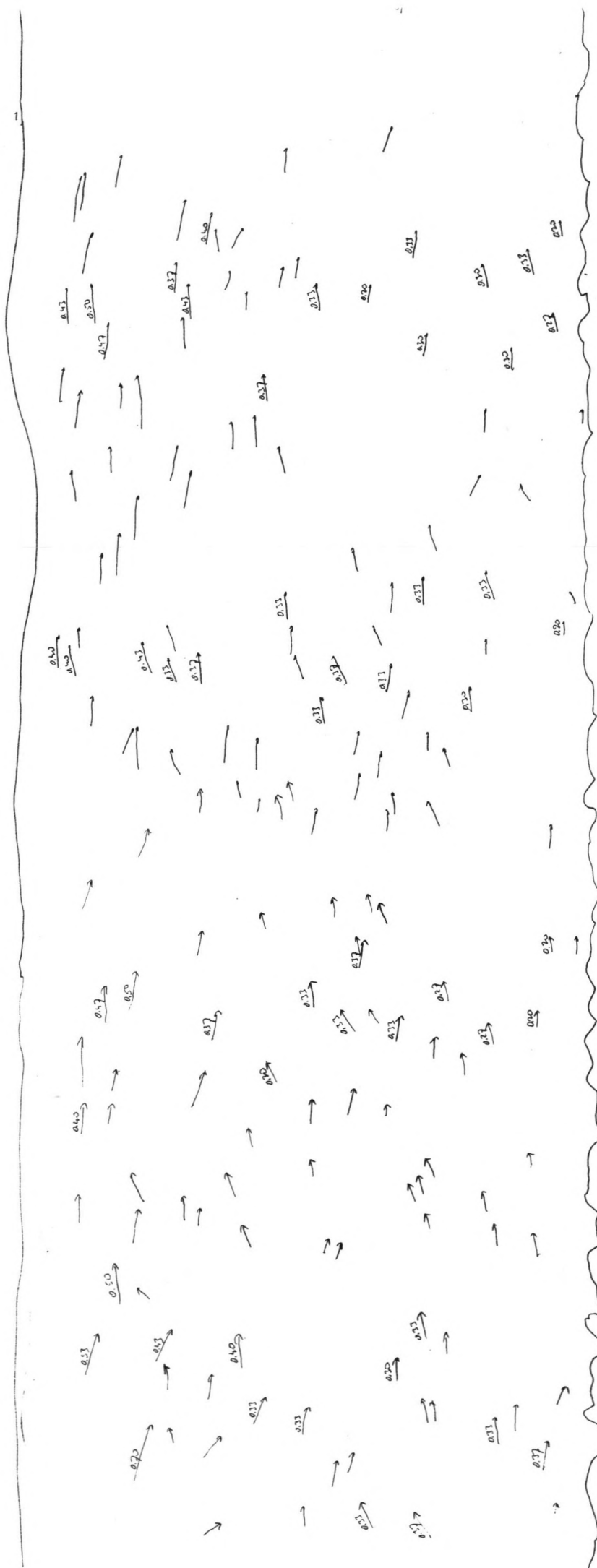
33

II c 12 B 3



$K(x)$

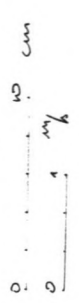
51



(52)

35

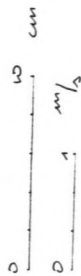
II c 12 C 3

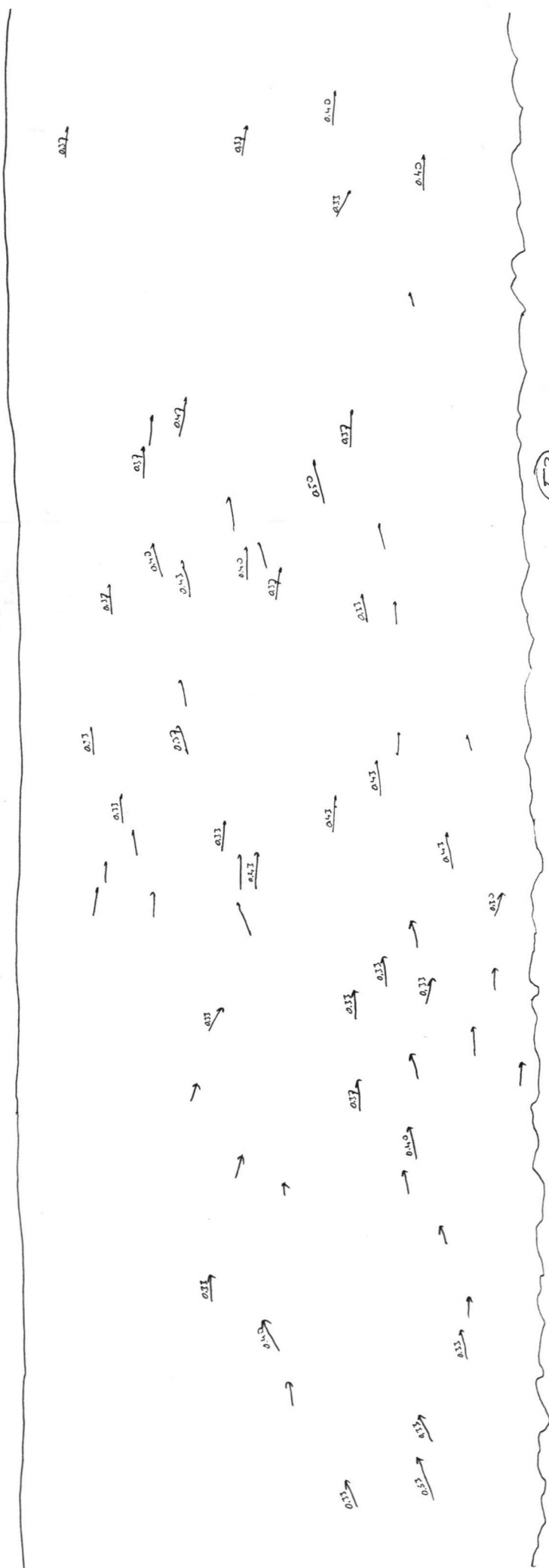




36

II c 12 D 3





53

36

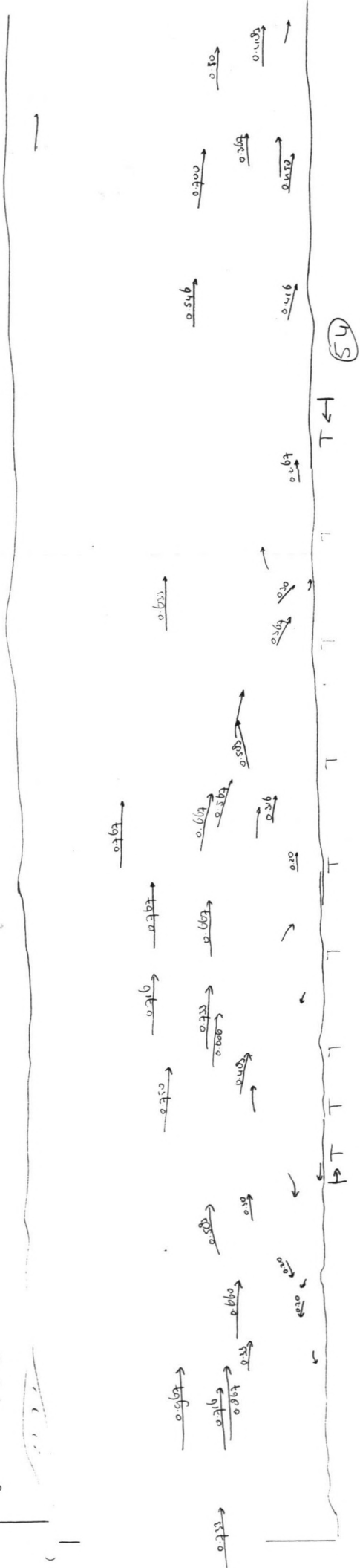
II c 12 D 3

0 10 cm
 0 1 1/2

50
IIIa, 4A1

0 10 [m]

0 1 [m/s]



54

T

T

T

T

T

T

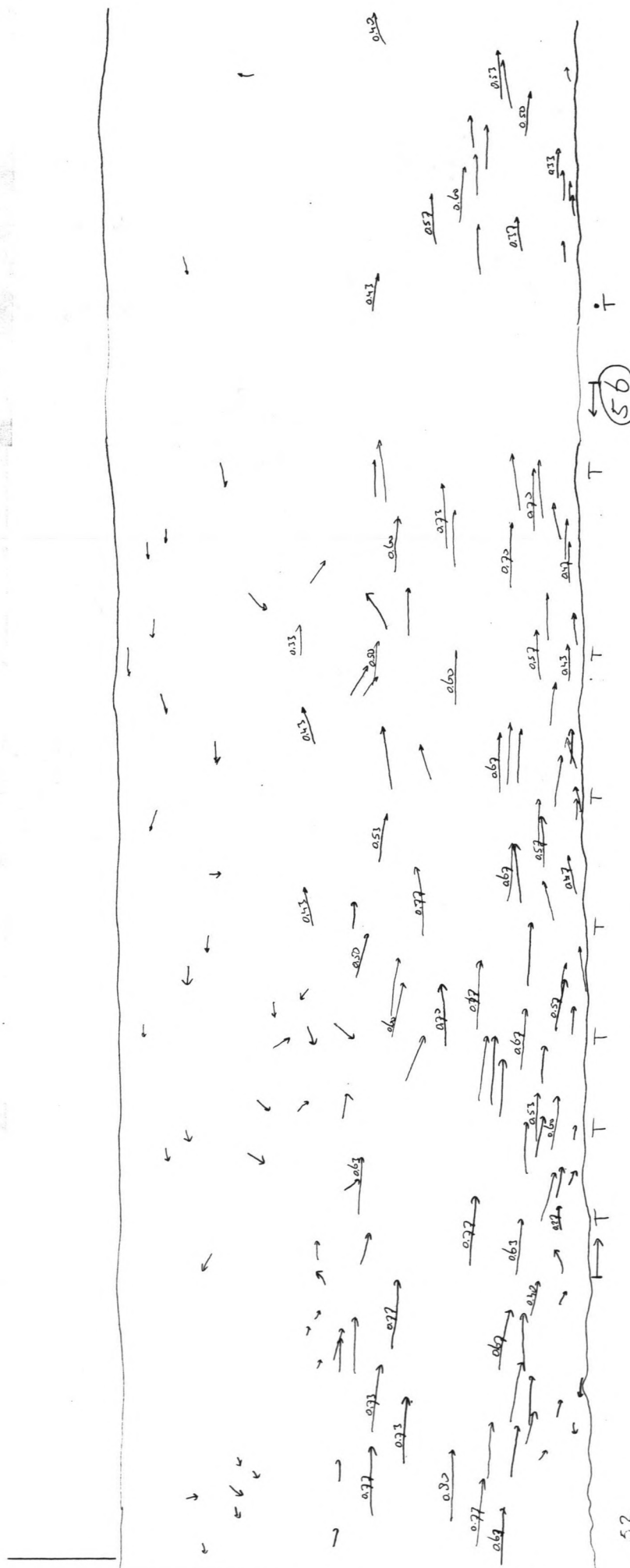
T

T

T

T

T



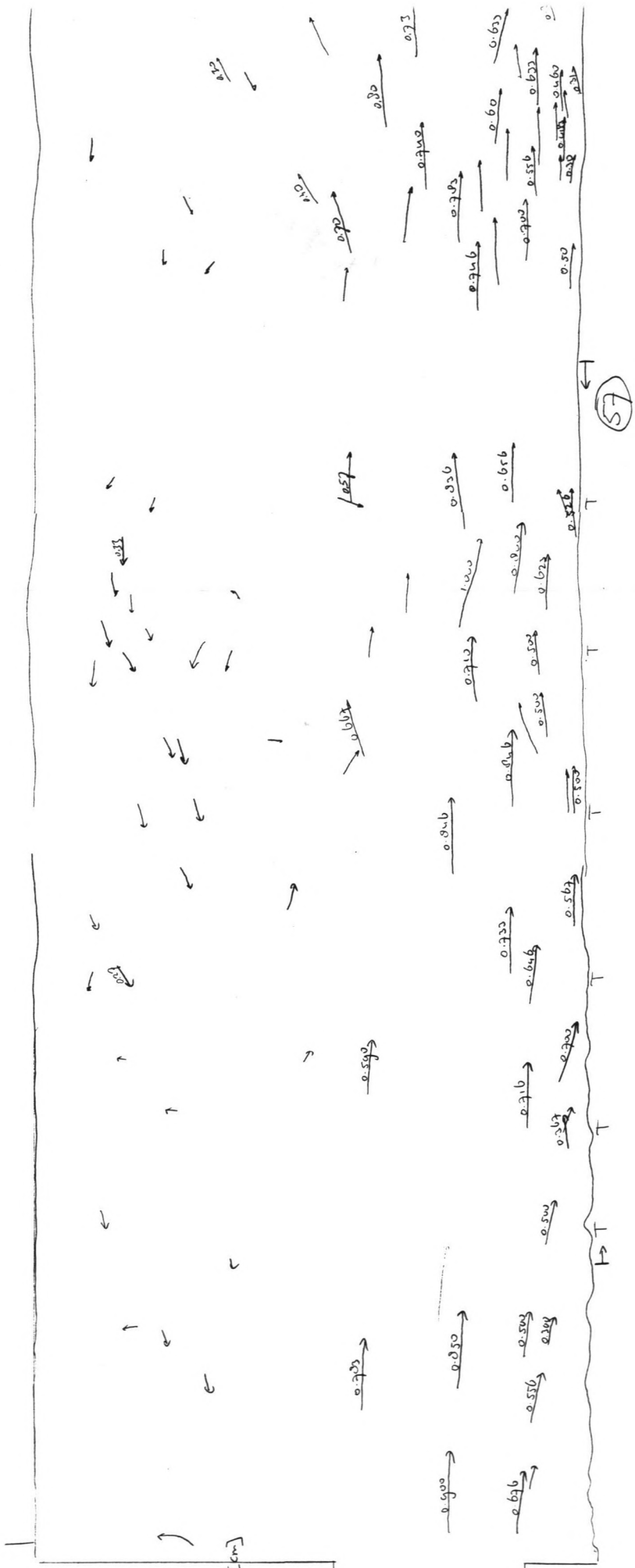
52

III a 4 C 1

0
0
0

10 cm

1 1/4



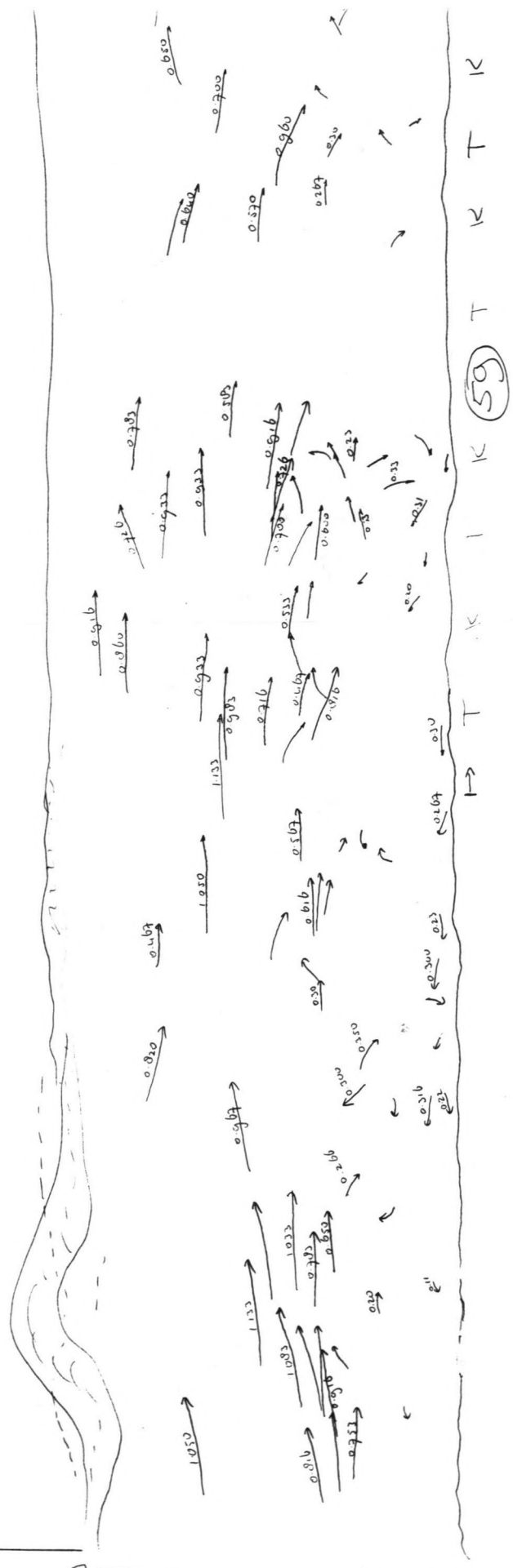
53
 III, a, v, D, I
 0 10 [cm]
 0 1 [m/s]

55

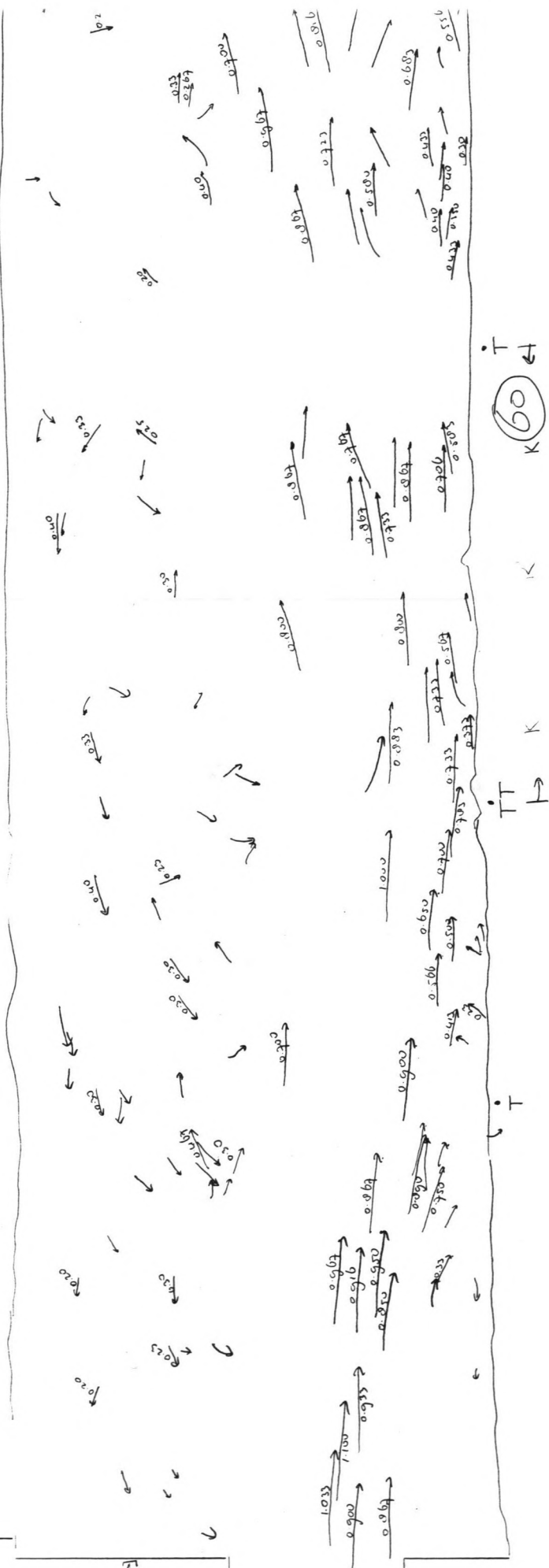
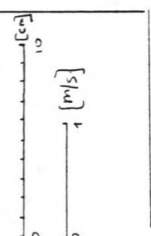
III, a. 4, B2

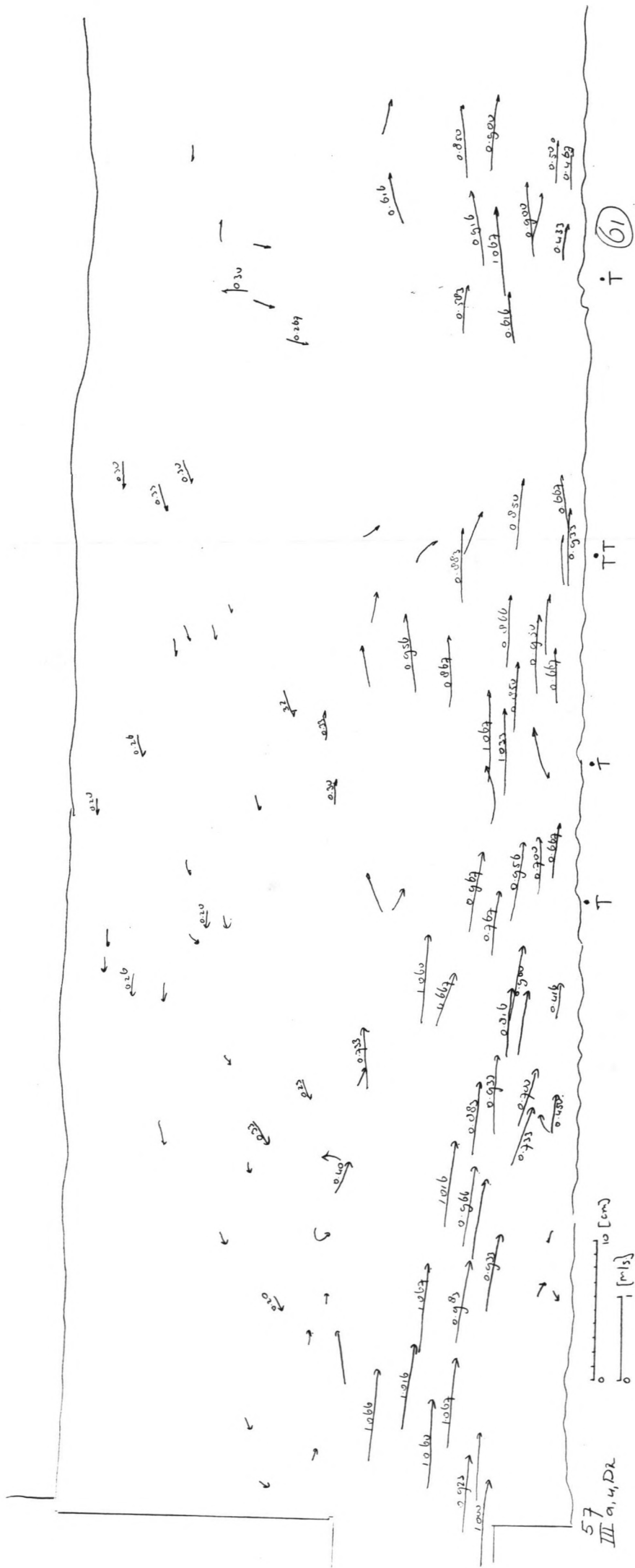
0 10 [cm]

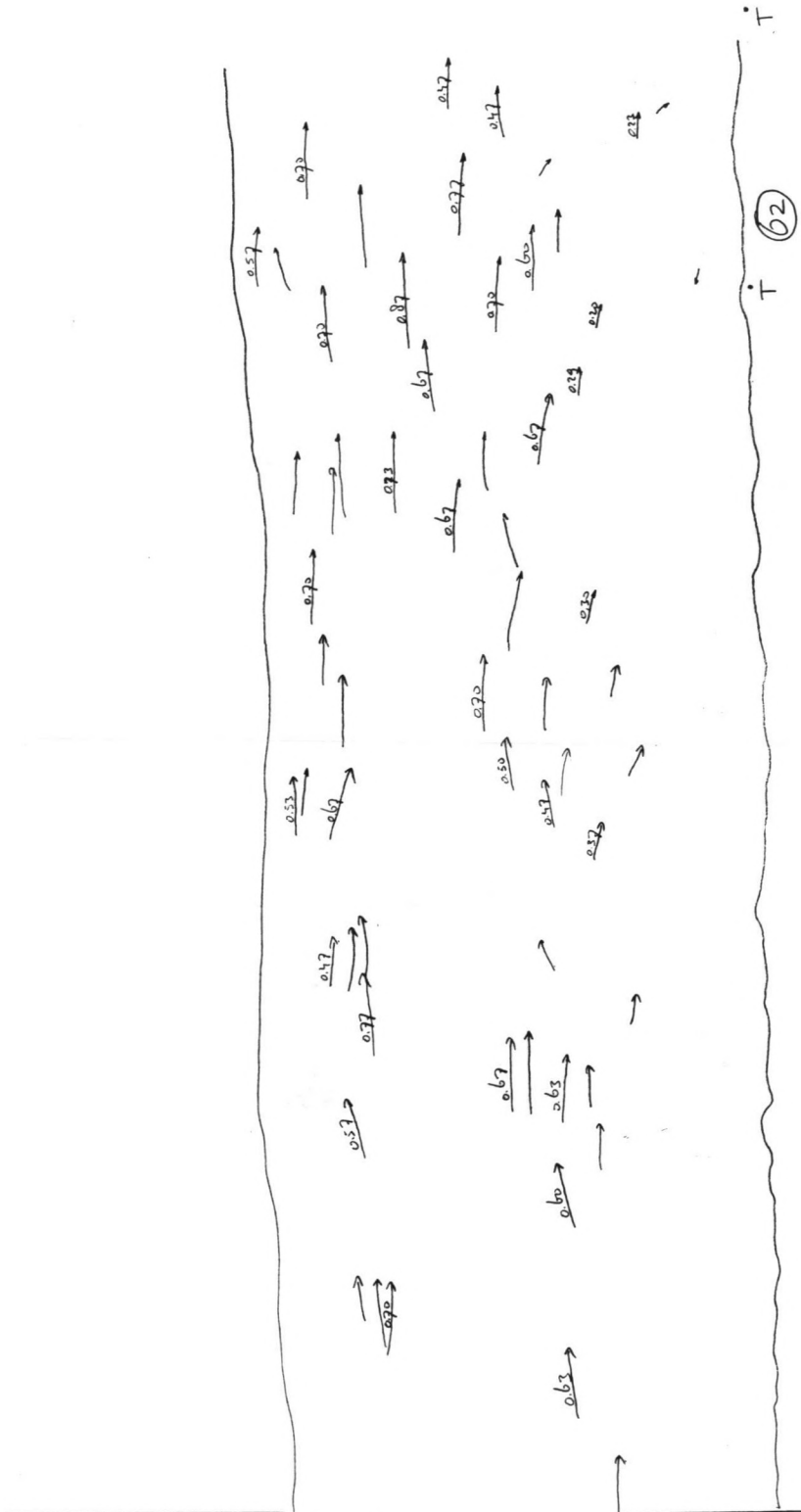
0 1 [m/s]



56
III a, u, 62



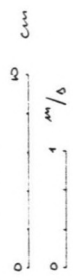


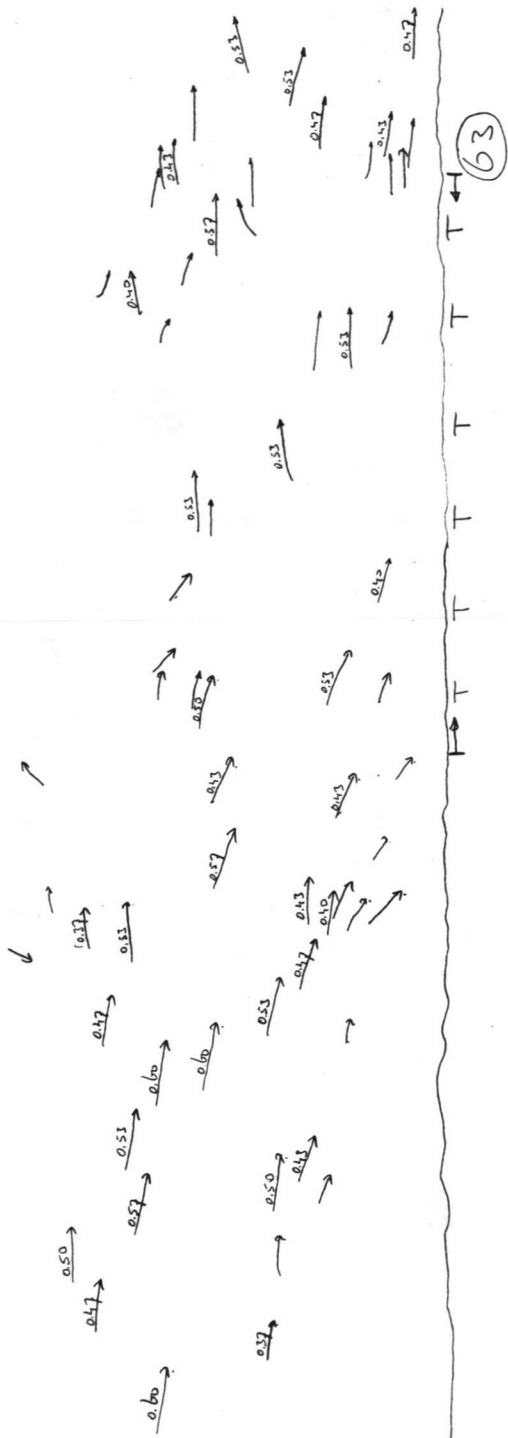


(02)

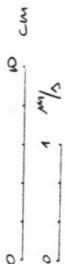
33

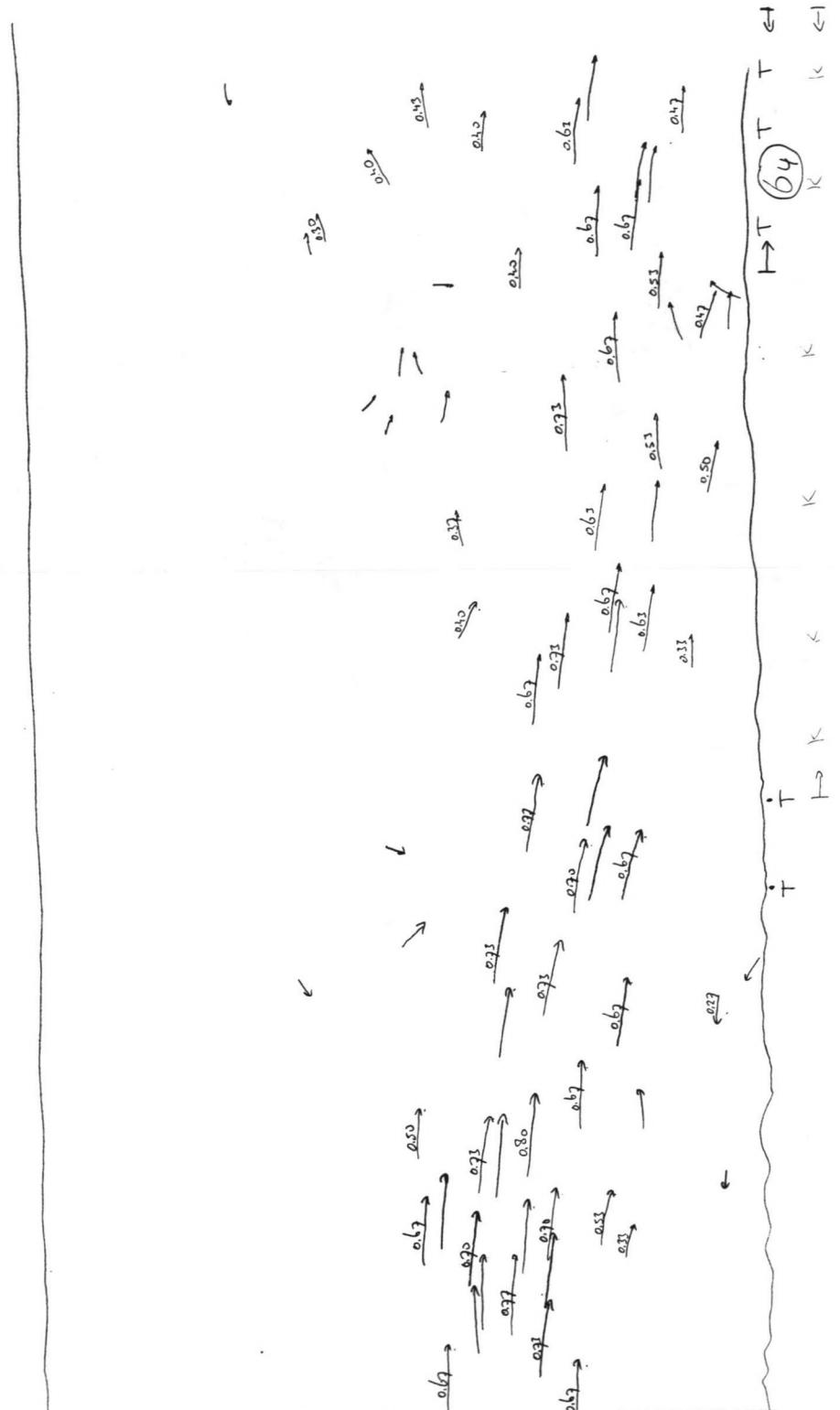
III a 8 B 1





34
III a 8 C 1



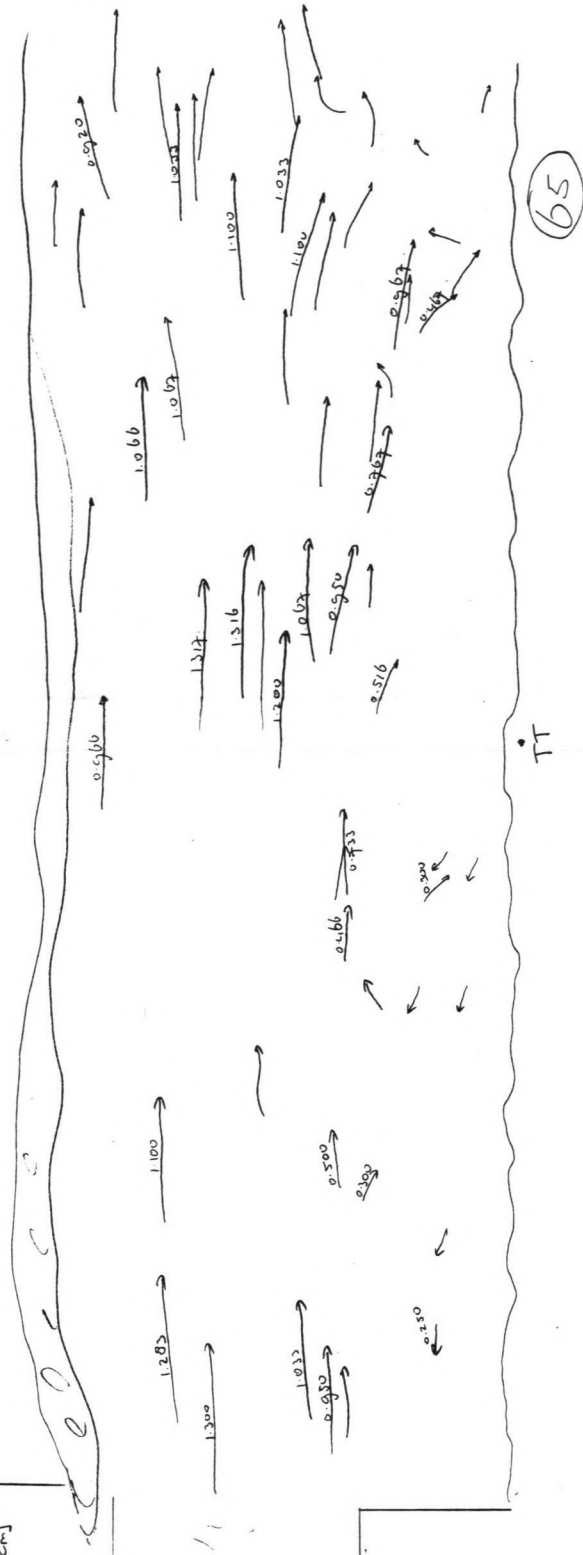
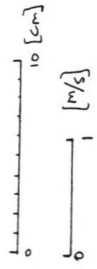


35

III a 8 D 1

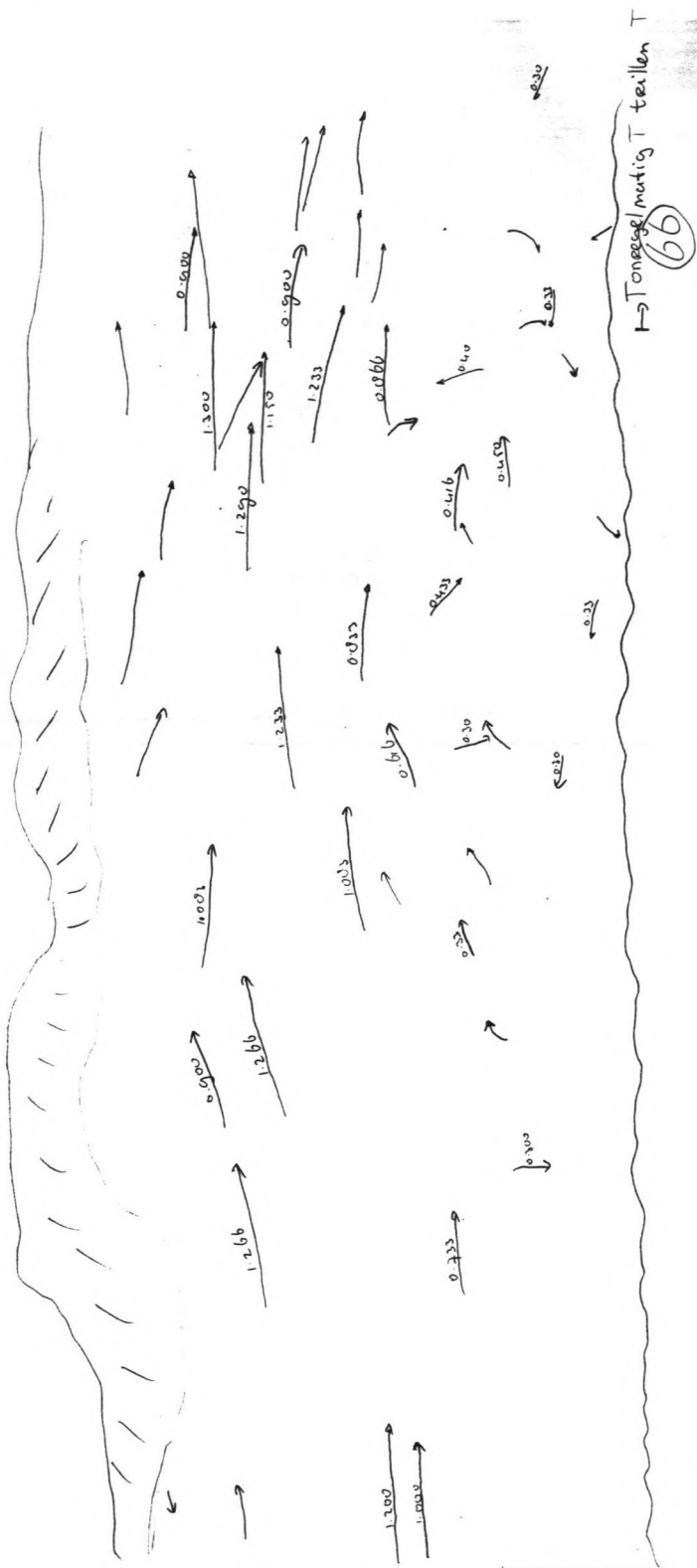
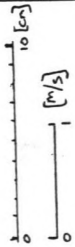


29
III a 8 A2

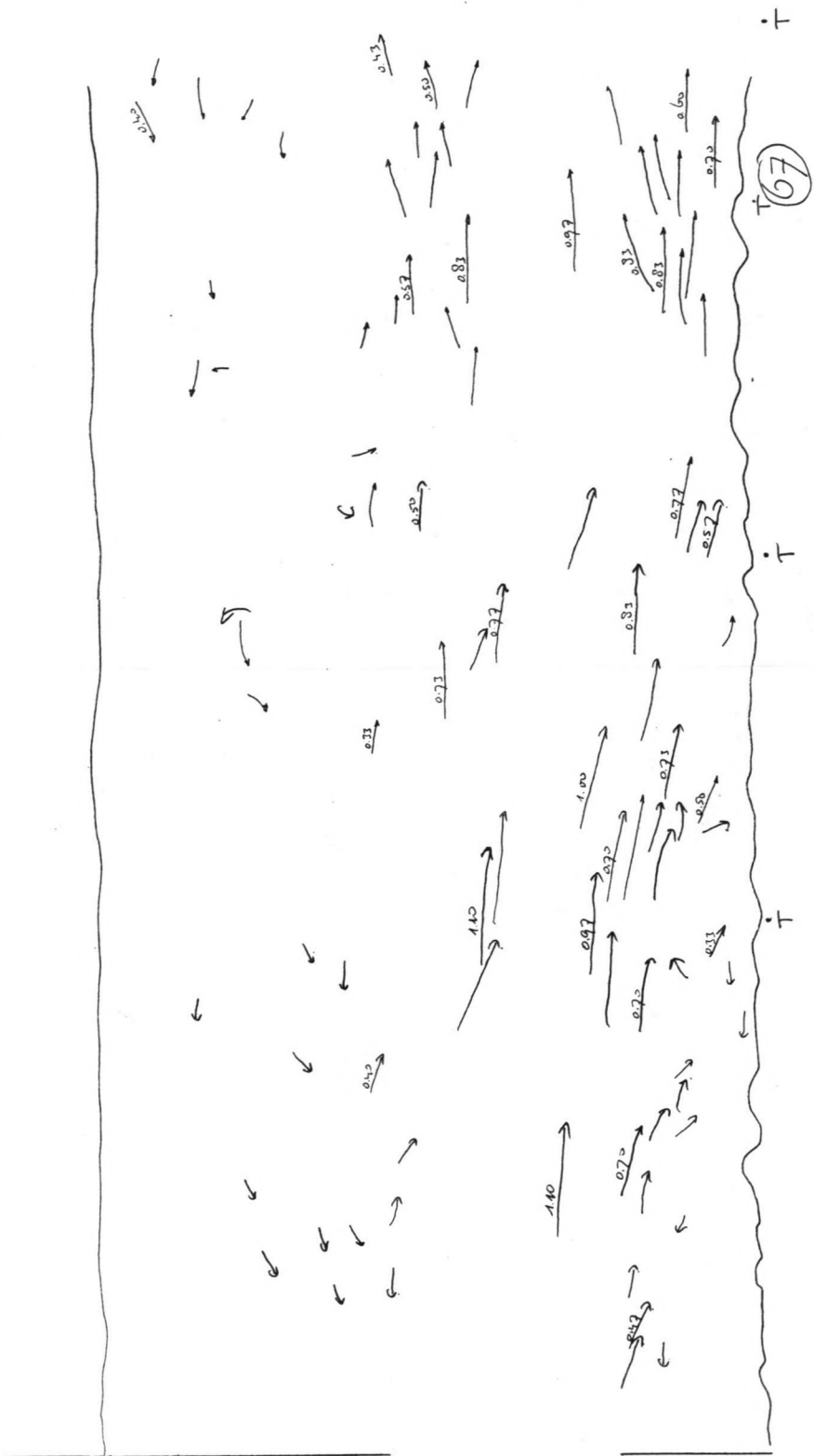


30

III a 8 B2

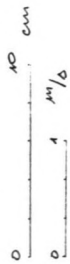


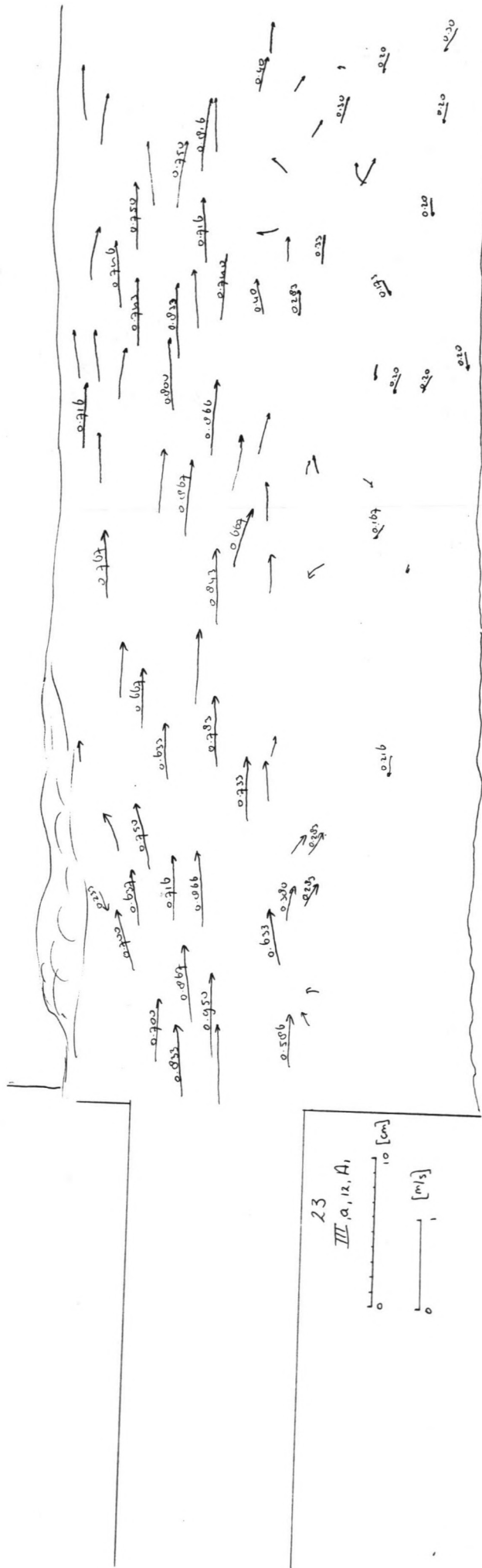
66
Tonegg/mutig T teilen T



31

III a S C 2





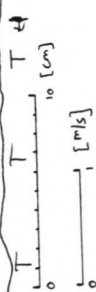
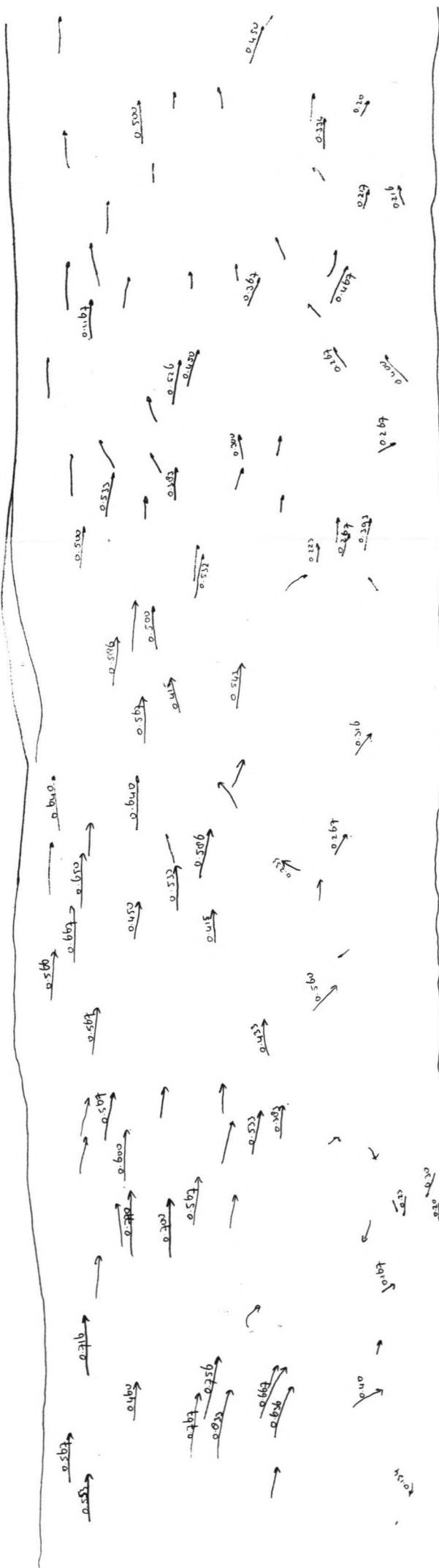
23
III, a, 12, A₁

0 10 [cm]

0 1 [m/s]

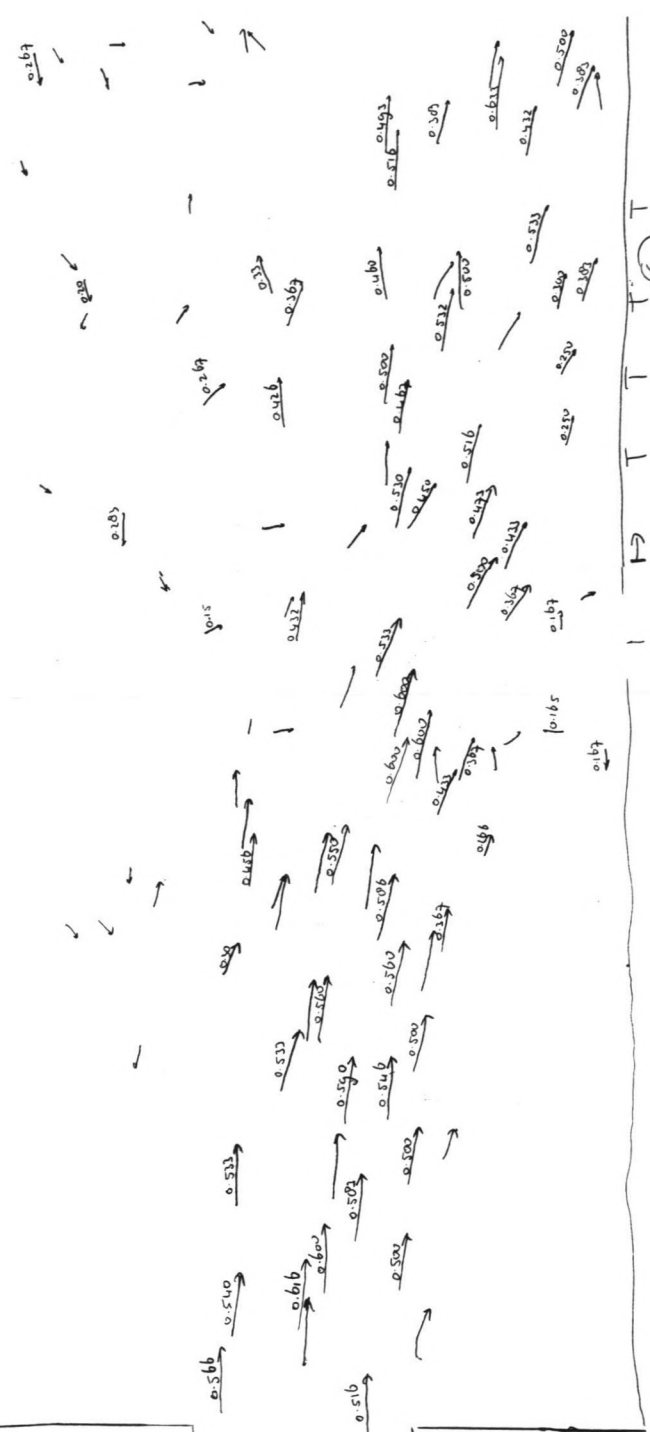
1168

(89)

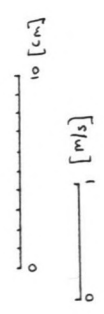


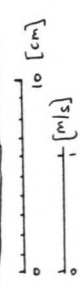
T 23 T
III, a, 12, A, 1

(69)



24
III a 12 B1





T T T T T T T T T T
 24 III a, 12, B1

0.20

0.20

0.167

0.20

0.20

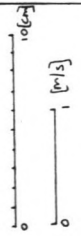
0.20

0.20

70

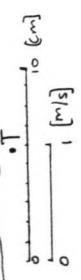


25 III a 12 (1)



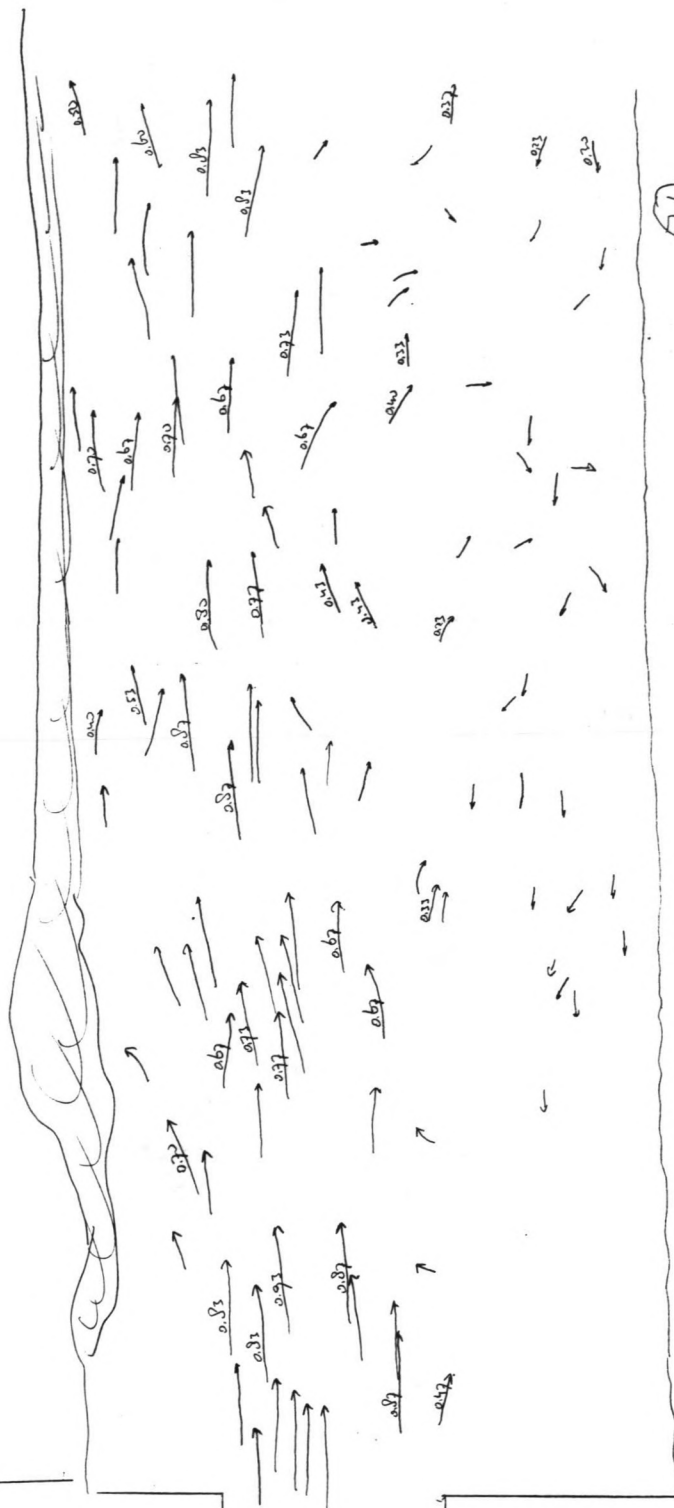


70



T25
III a, 12, C1

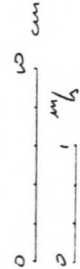
T ← T

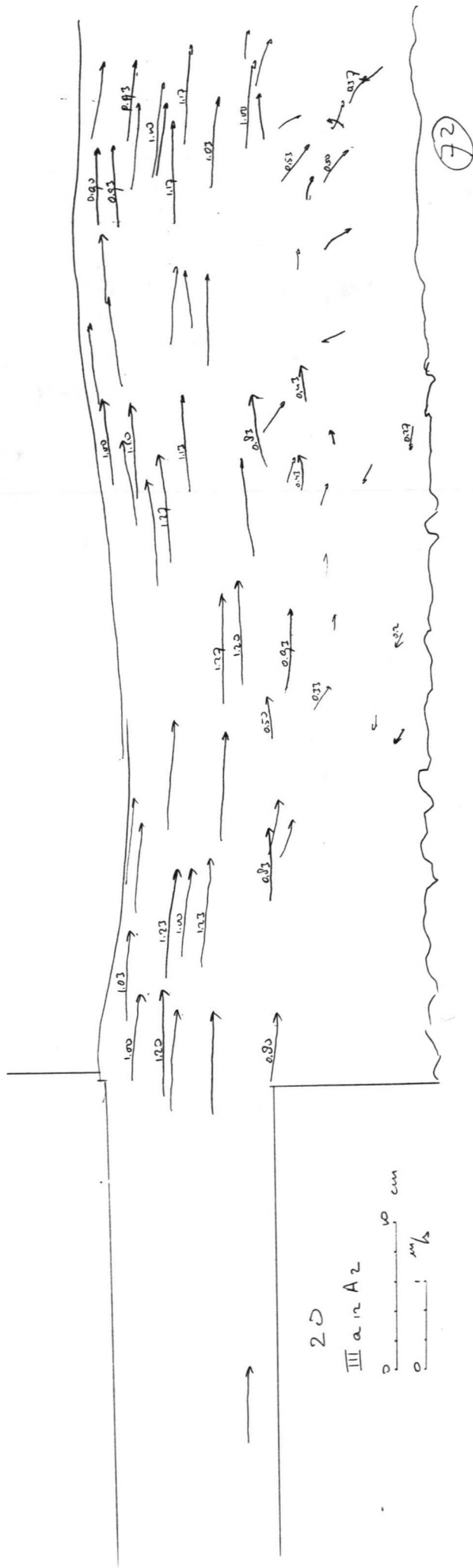


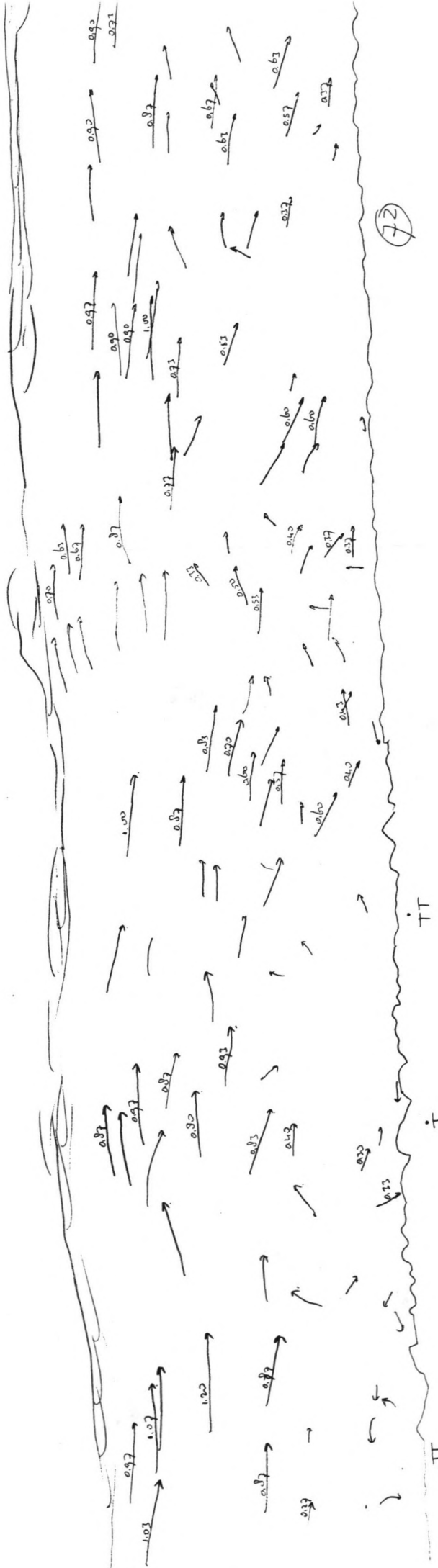
(71)

26

III a 12 D 1



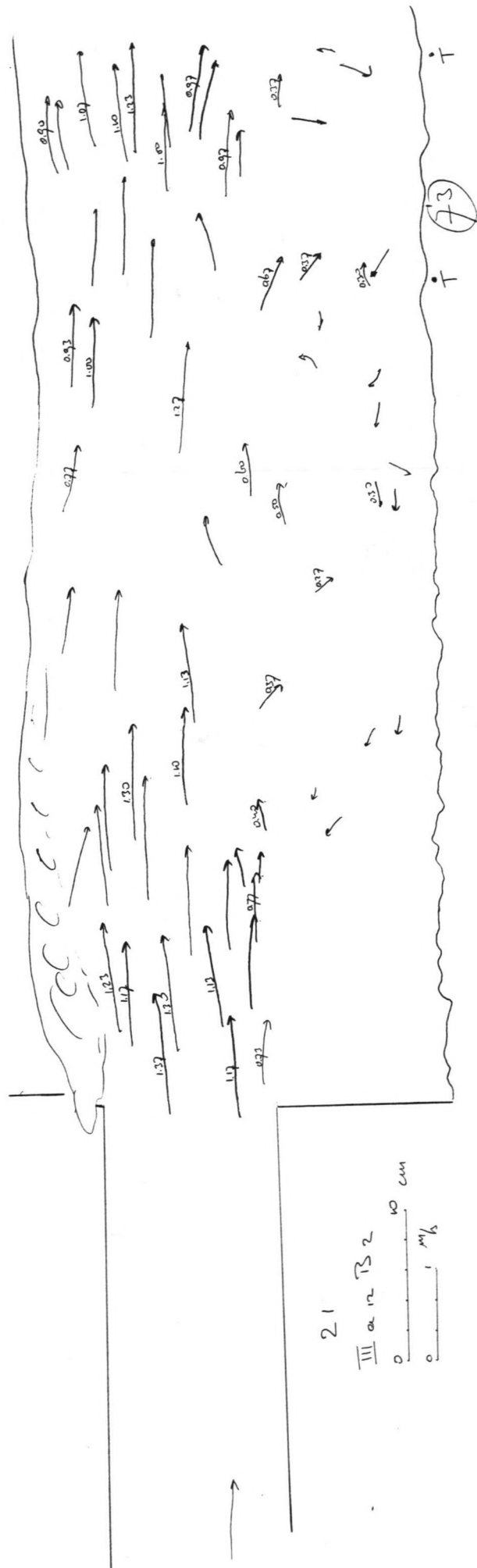




TT
20

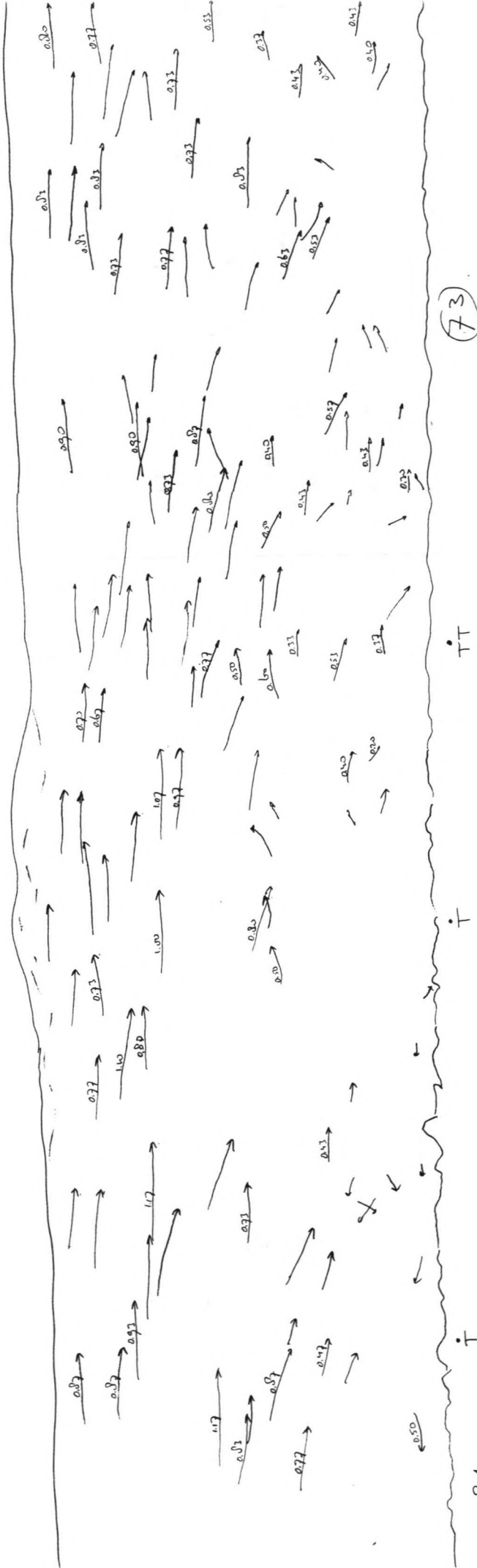
III an Ar





21

III a n B 2
 0 10 cm
 0 1 m/k



73

TT

+

+

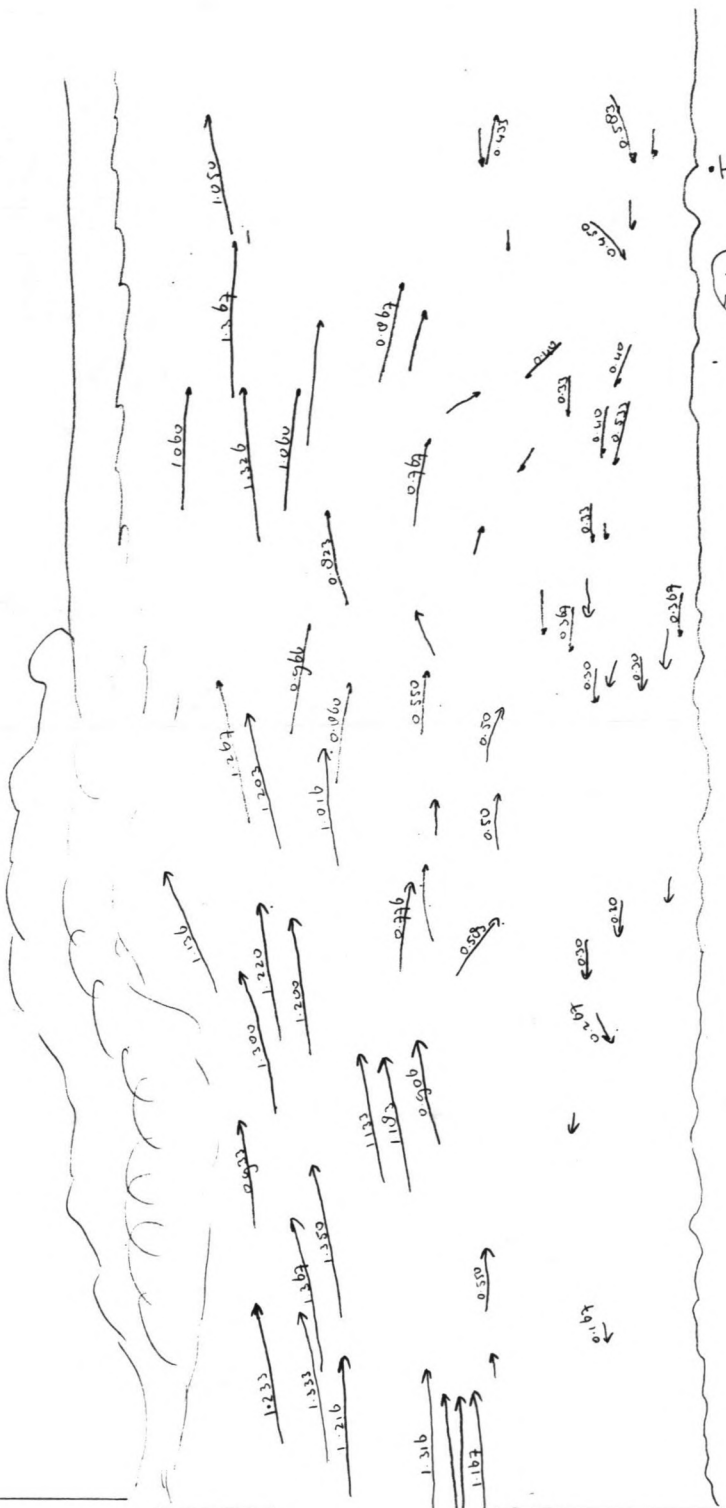
21

III a n B 2

0
 0
 0 : 1 1/8

0 cm

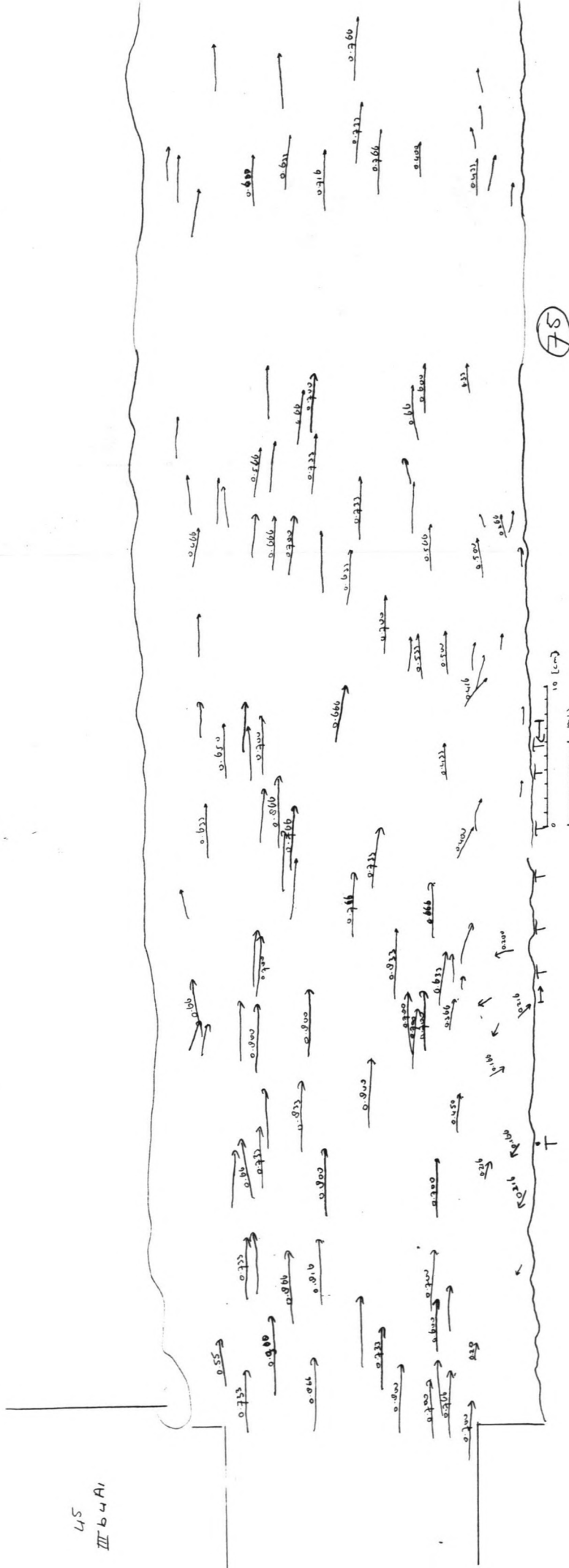
74



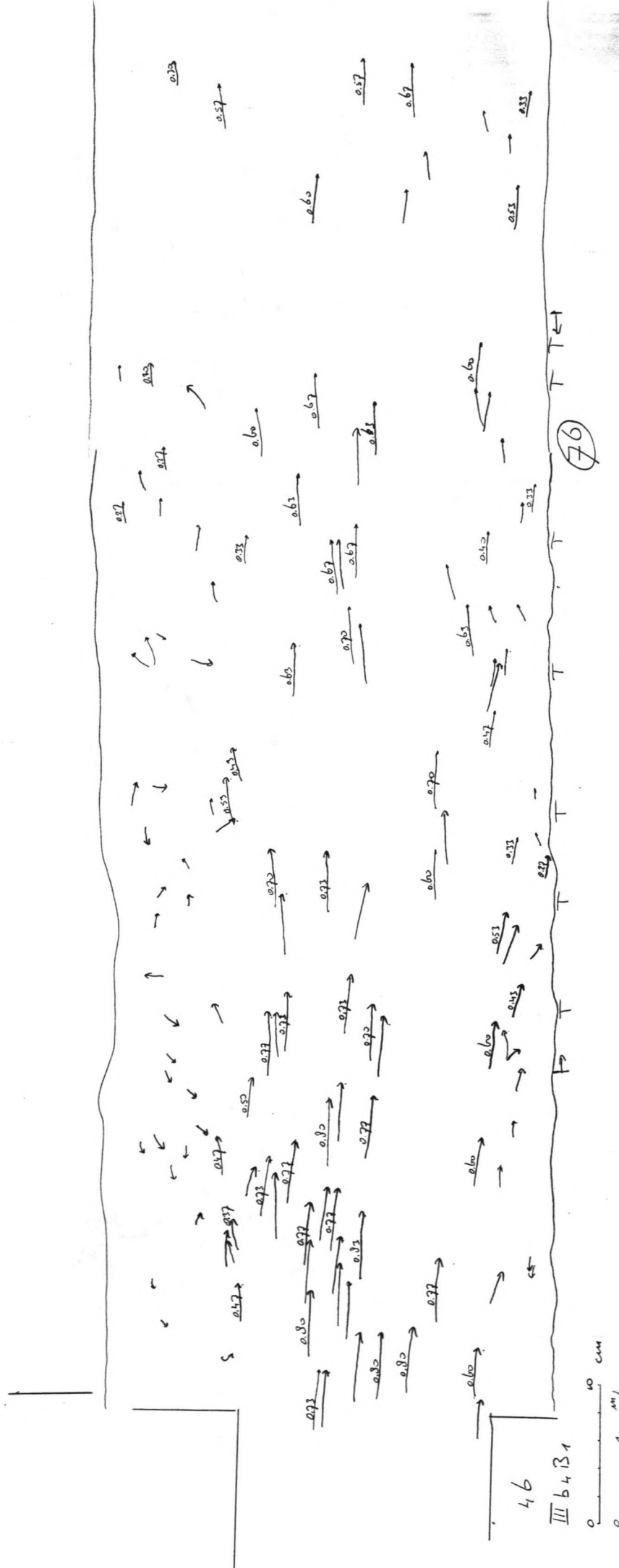
22
III, a, 12, C2



45
III 64 A1

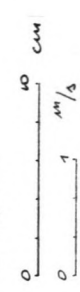


75

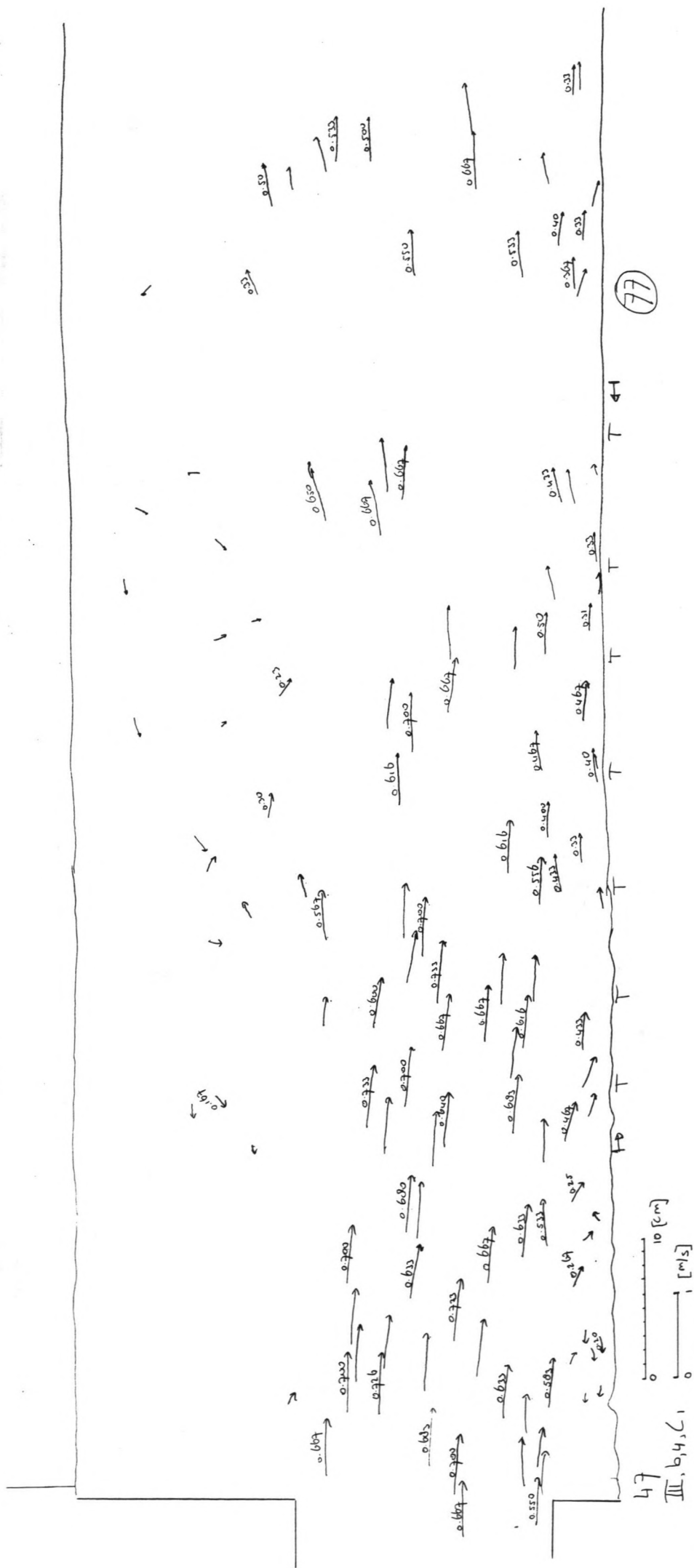


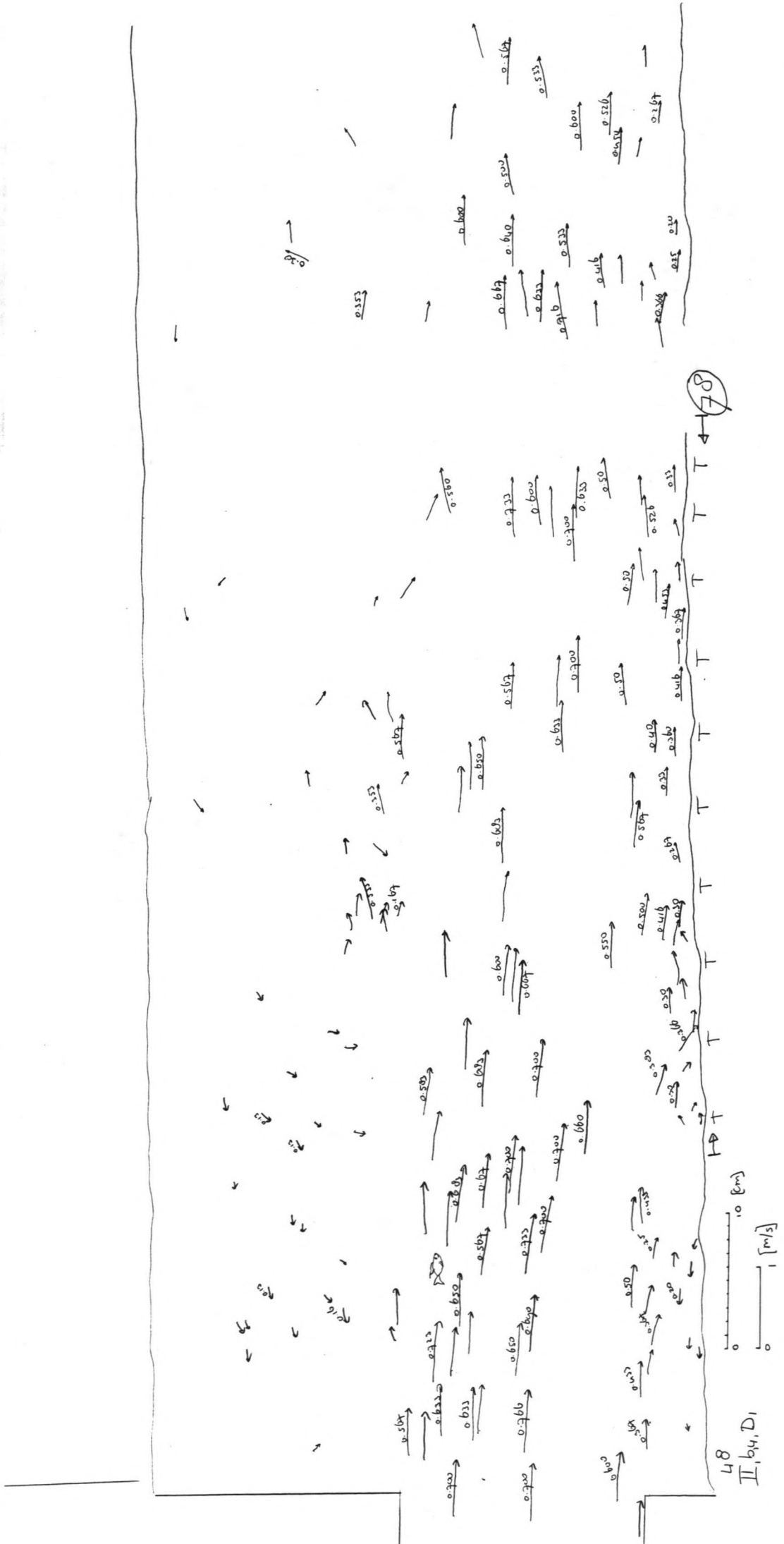
46

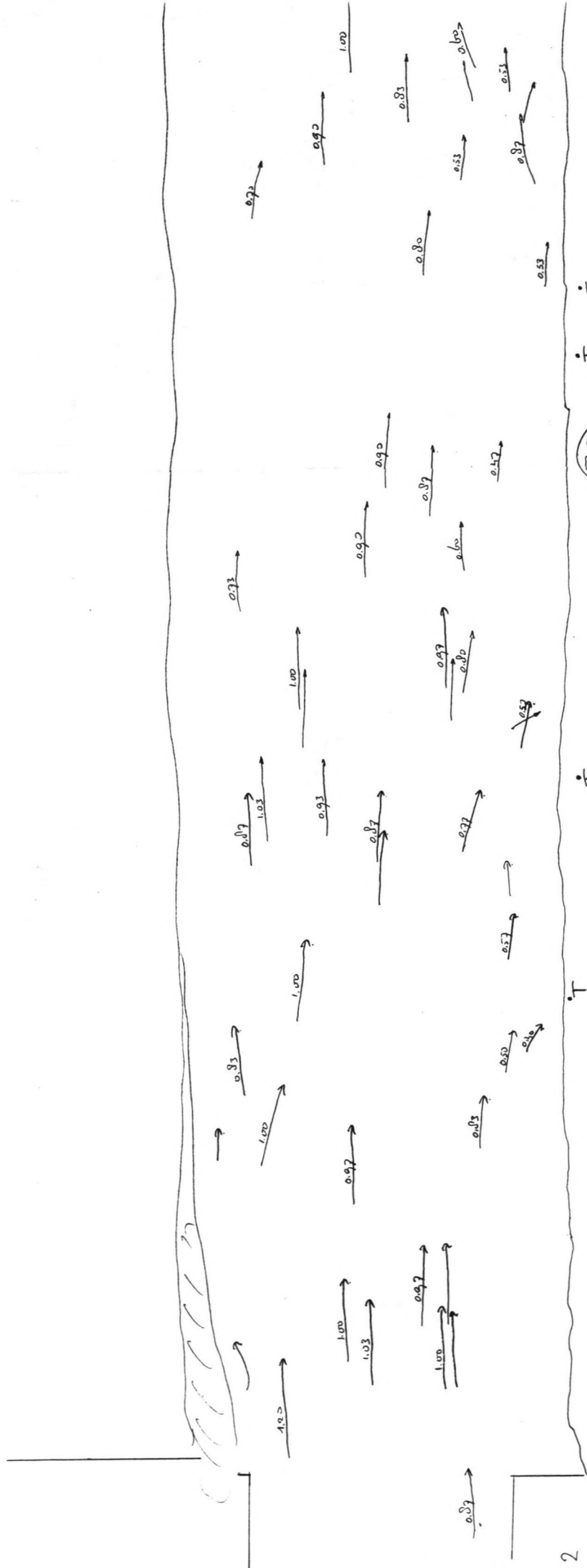
III b 4 B 1



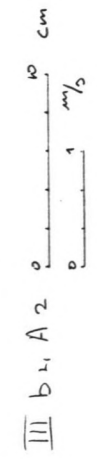
76







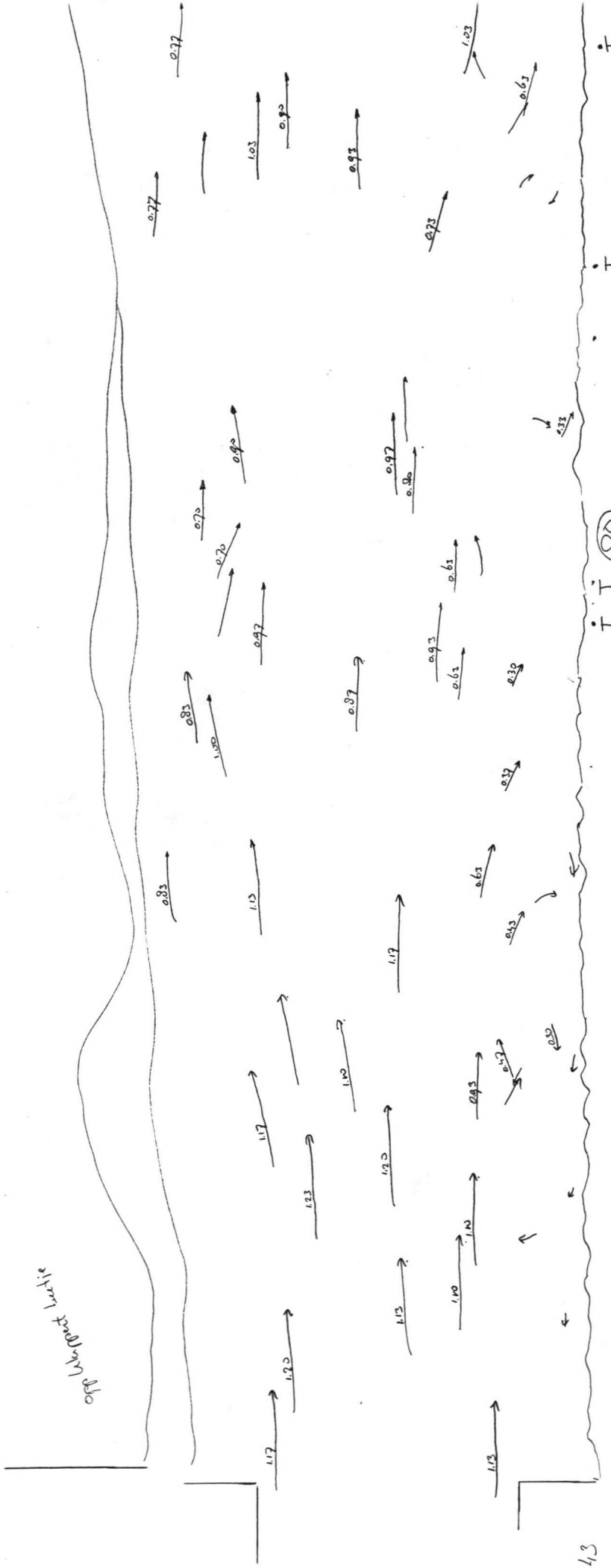
42



III b₁ A 2

117

79

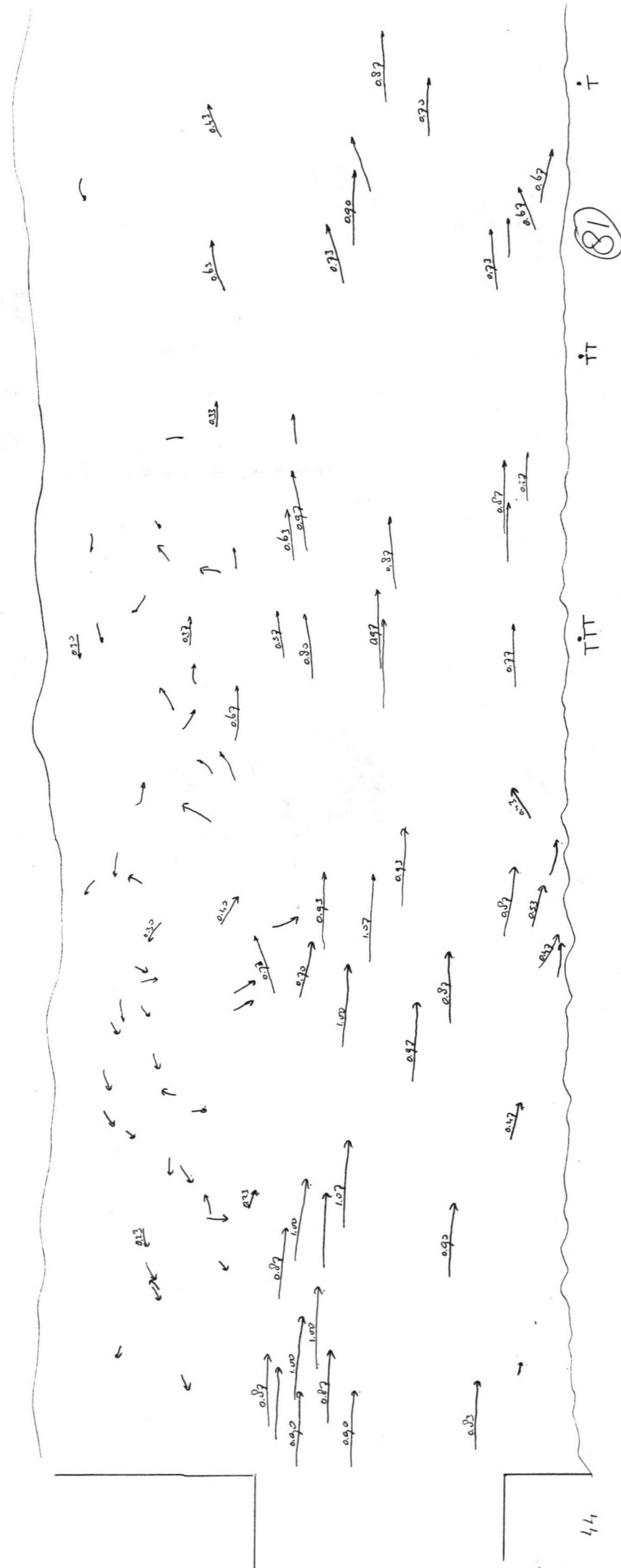


دیتا لیکچر

43

III 6 4 B 2 0 10 cm
0 1 m/s

41



81

T

T

T

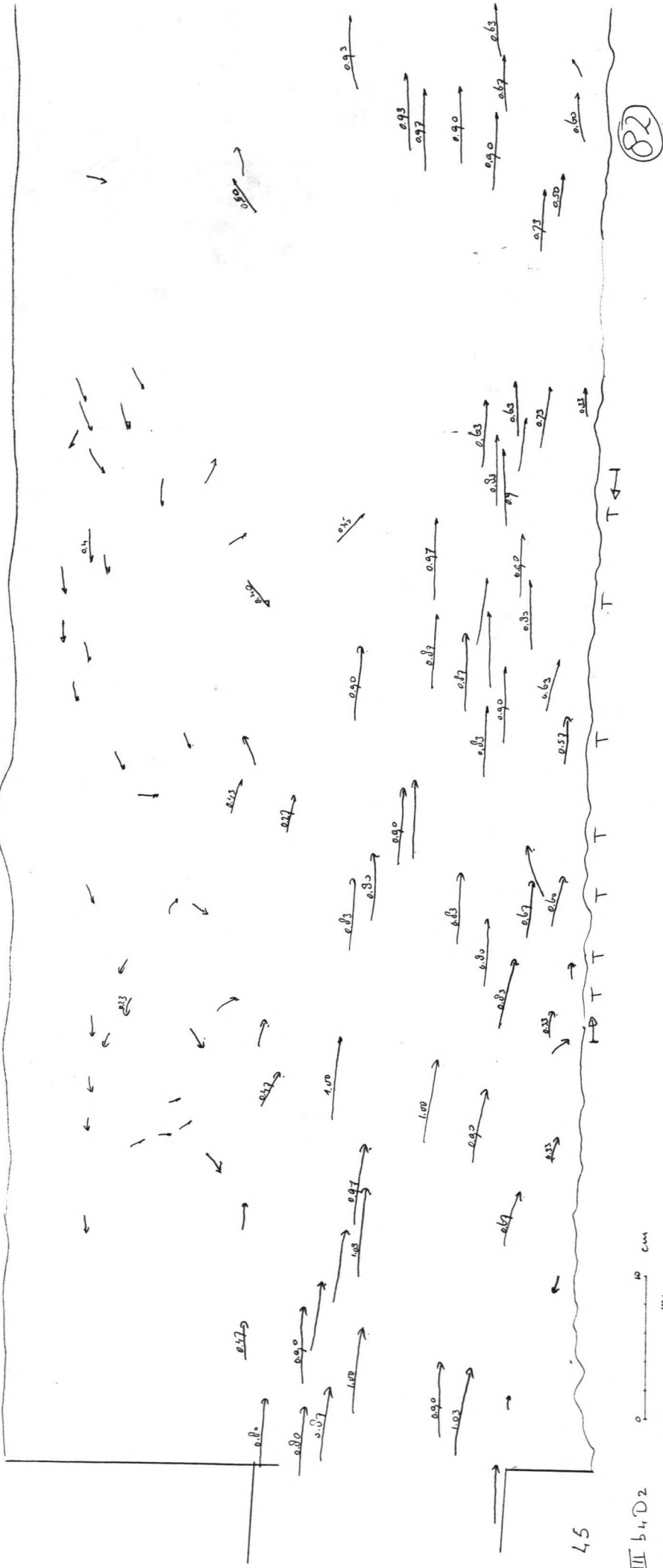
T

T

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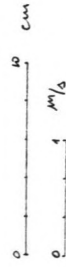
44

III b₄ C₂ 0 10 cm
 0 1 m/s

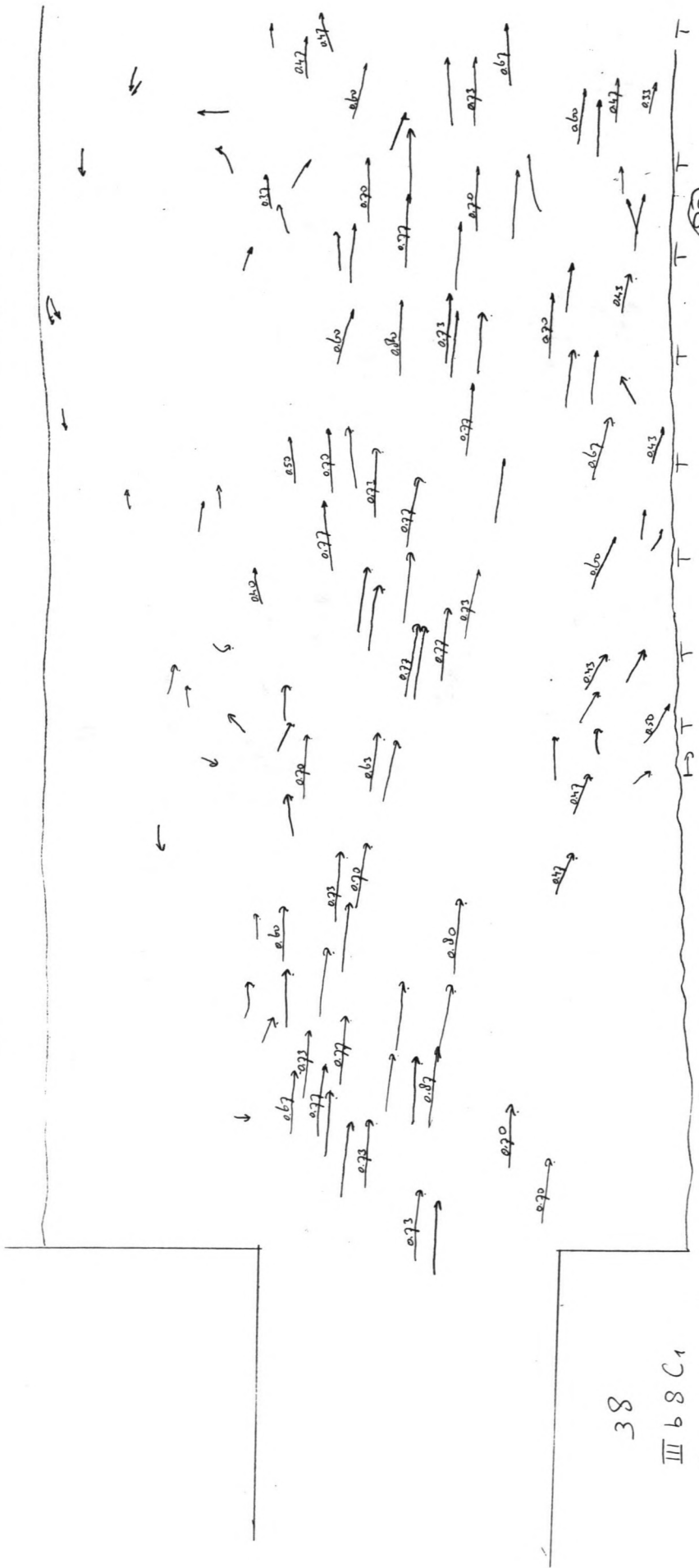


45

III b 4 D 2

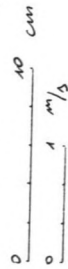


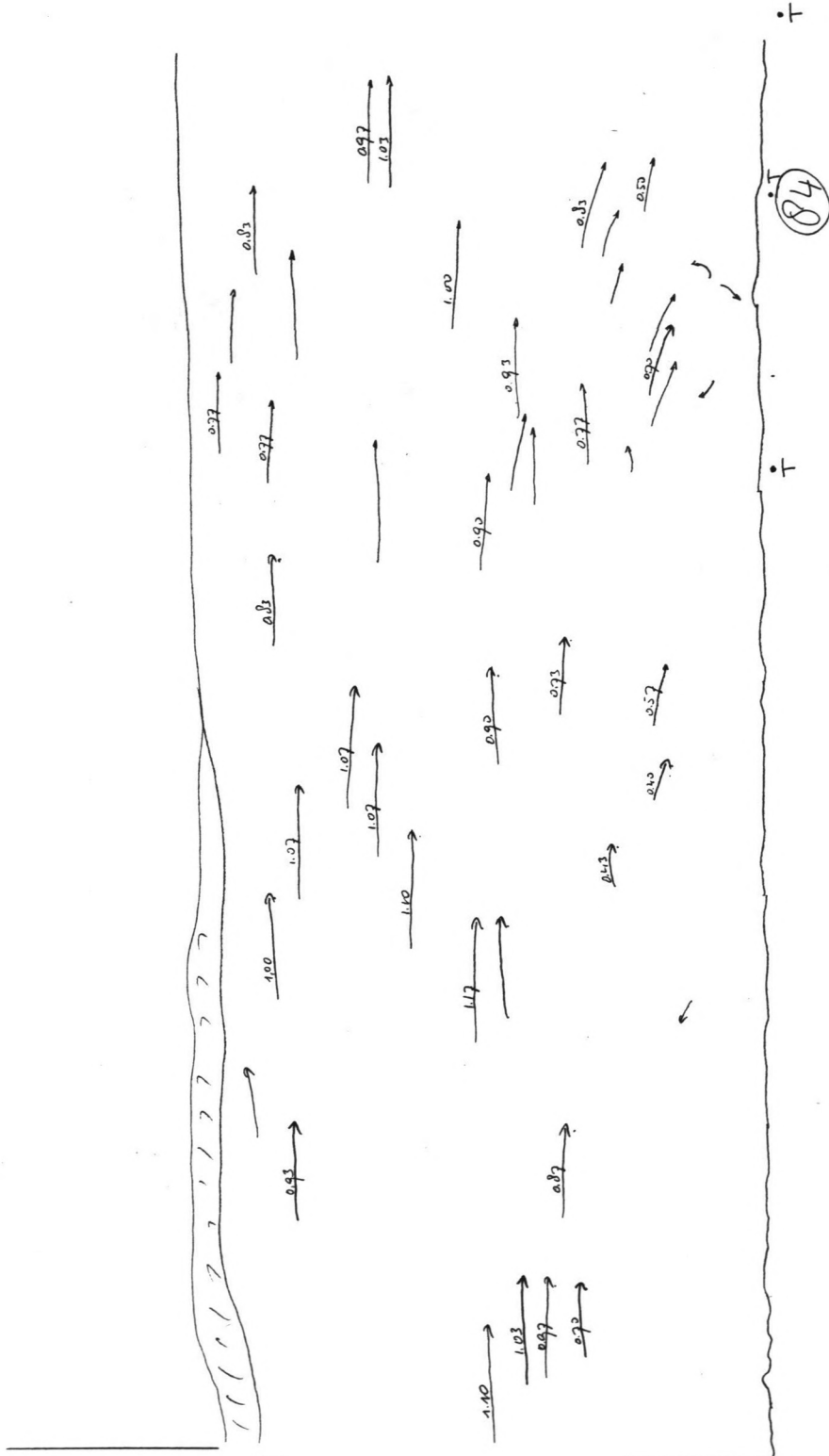
82



38

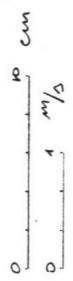
III b 8 C₁



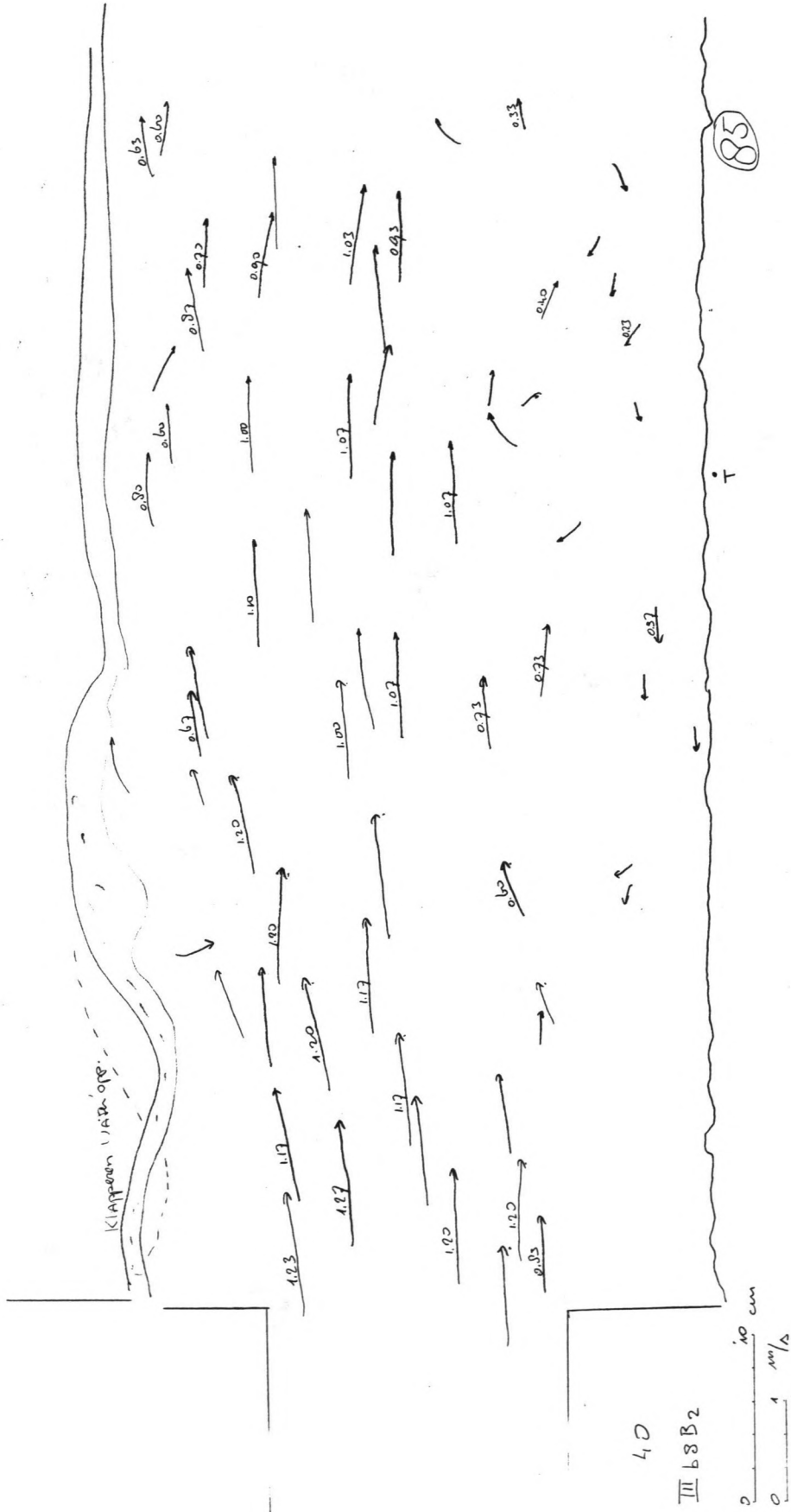


39

III 68 A2



57



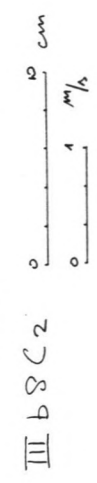
117



86

211

41

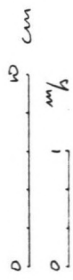


III b 8 C 2

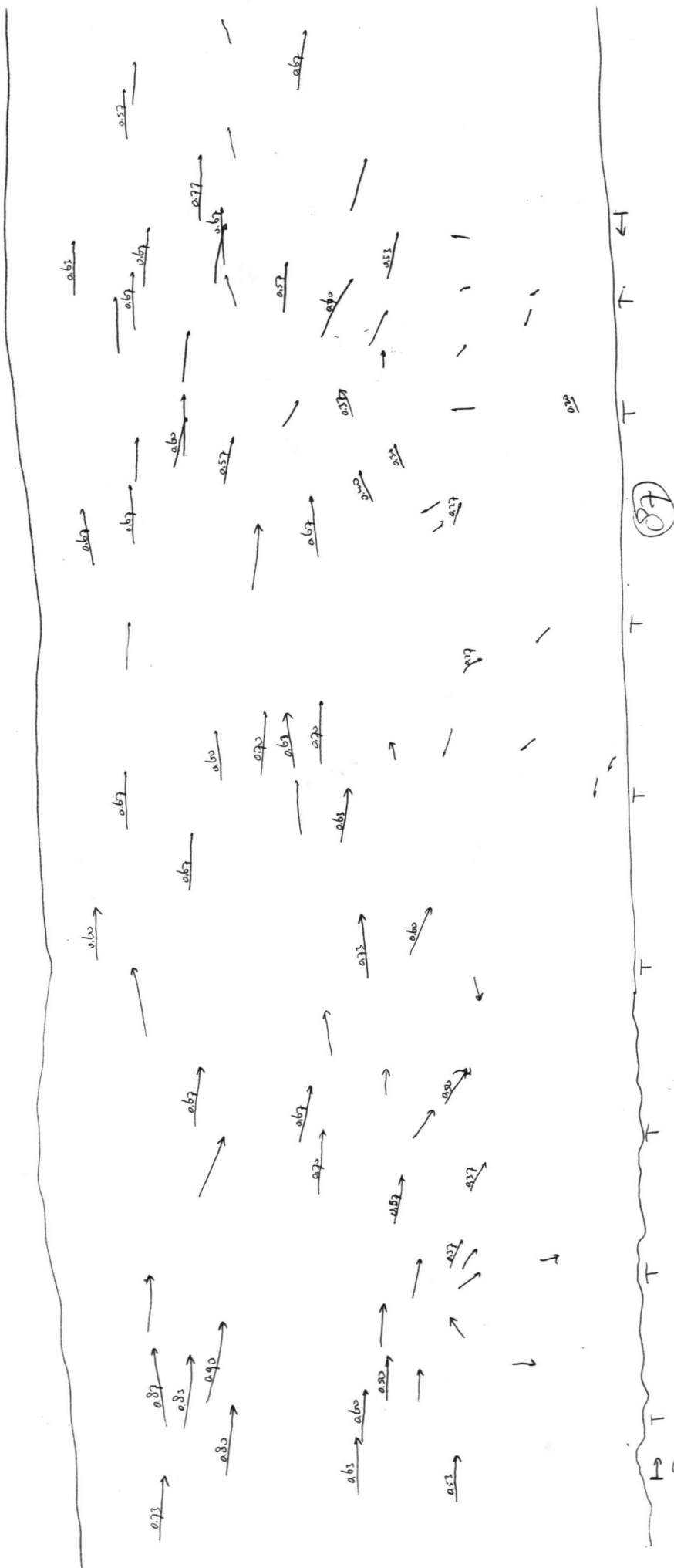


28

III b 12 B 1

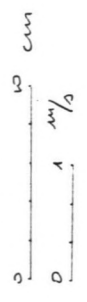


(87)

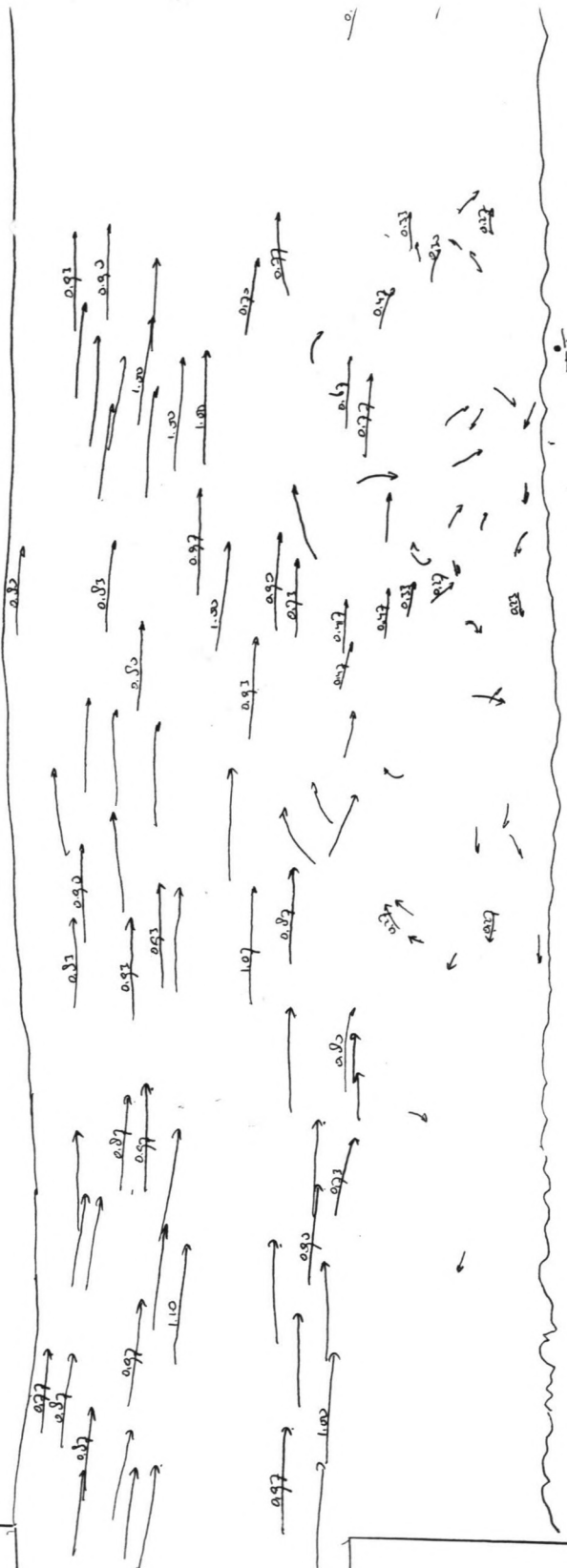


28

III b 12 B 1

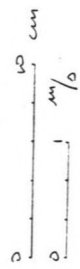


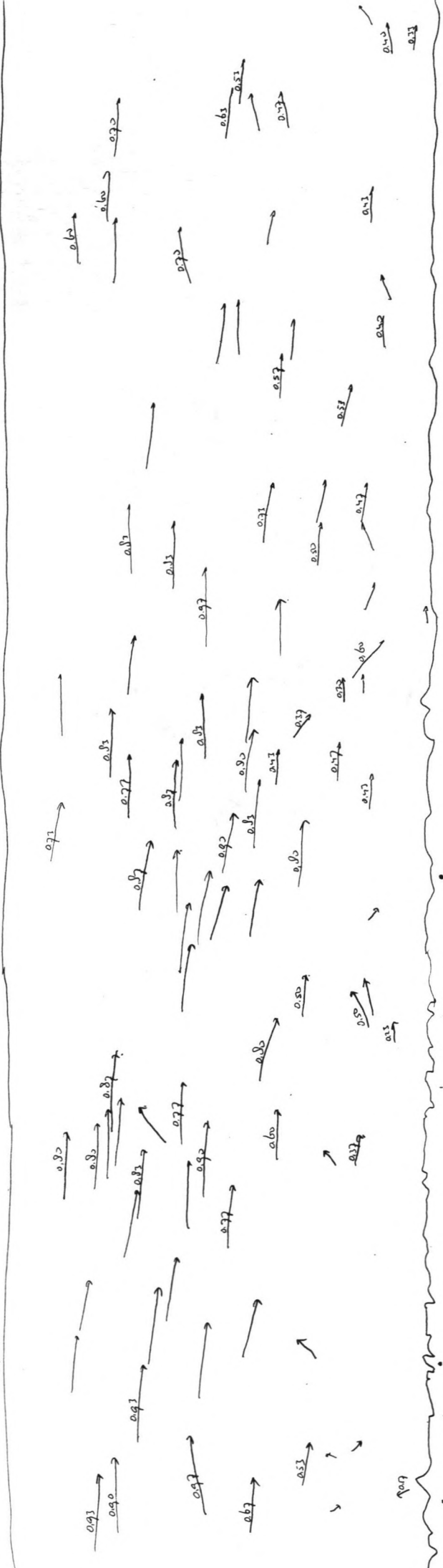
(88)



18

III bin A2





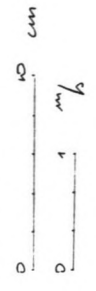
TT

TT

TT

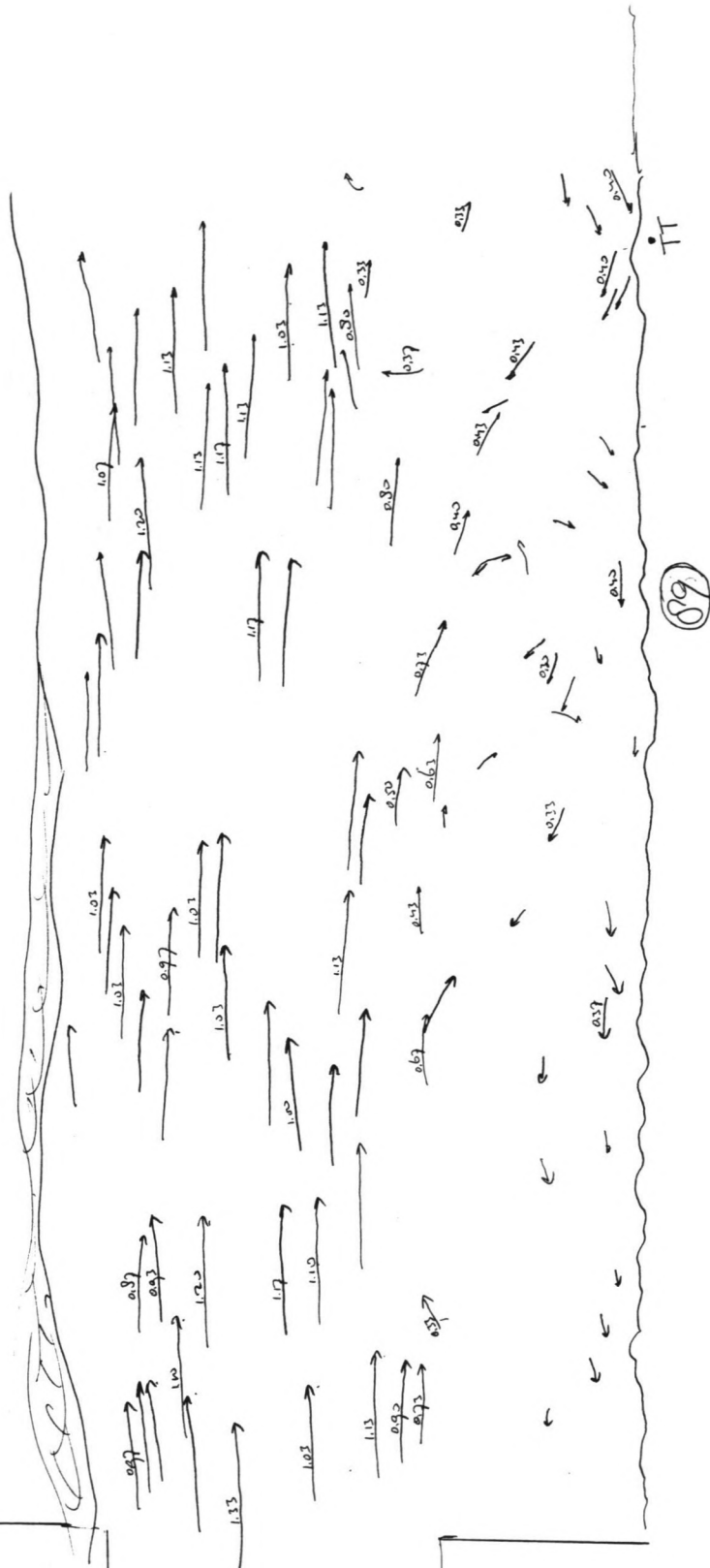
(88)

III b r A2



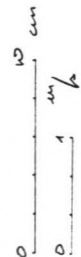
909

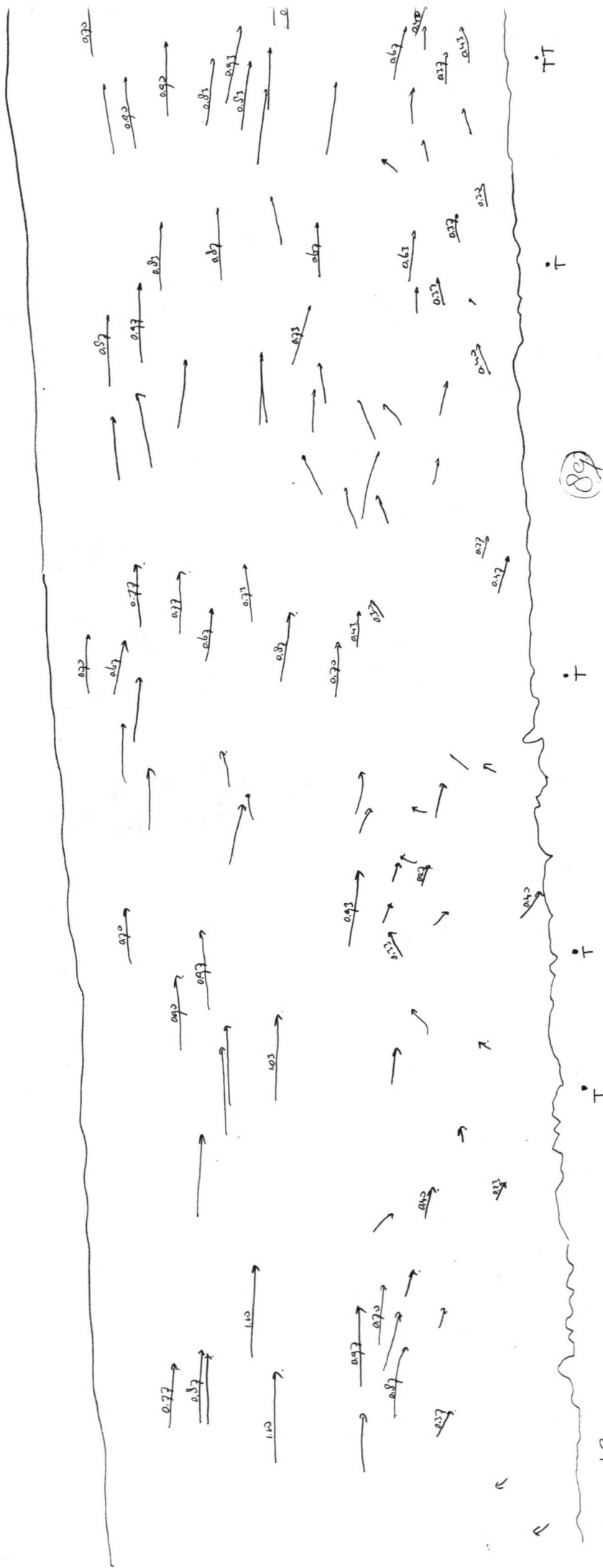
18



19

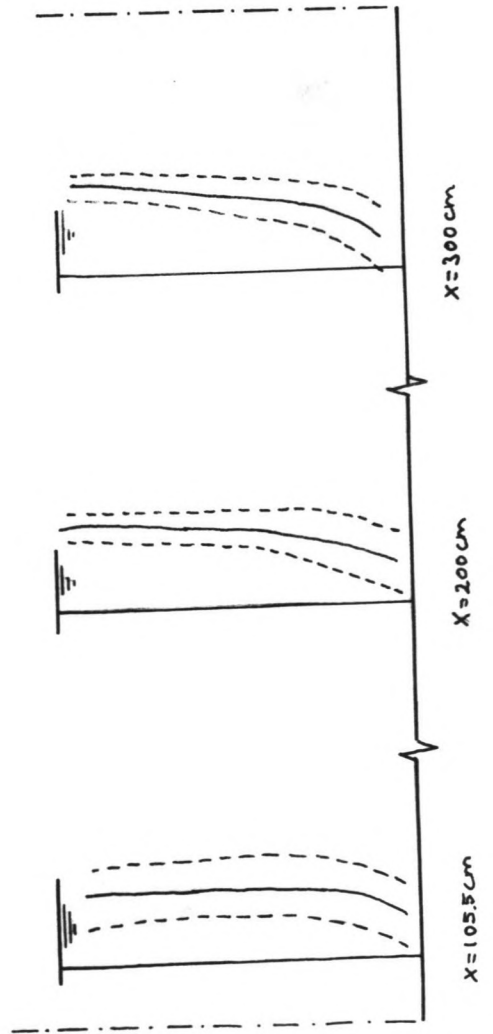
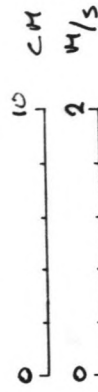
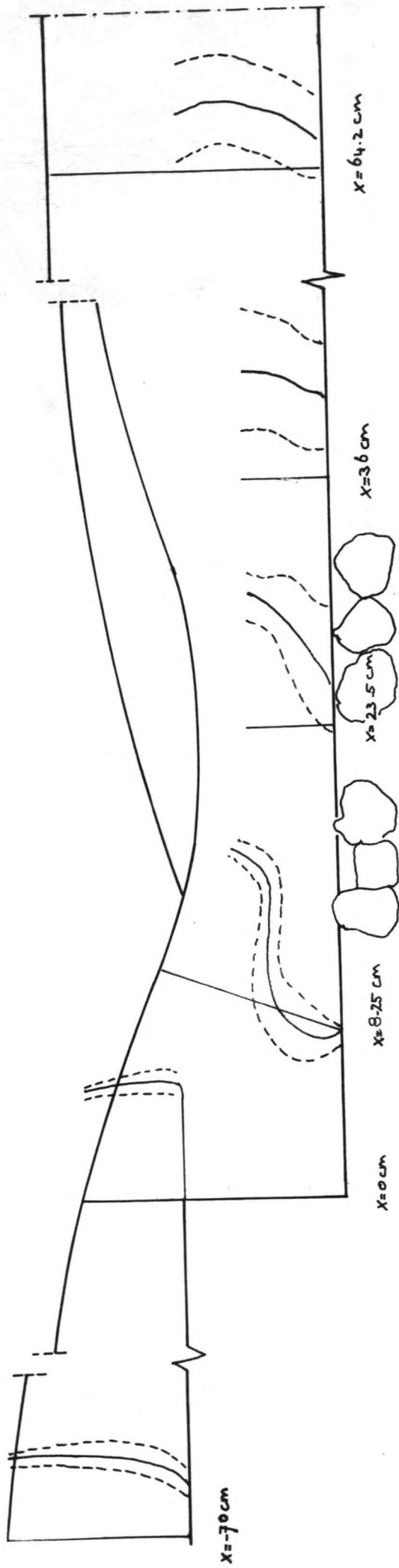
III b 12 B 2



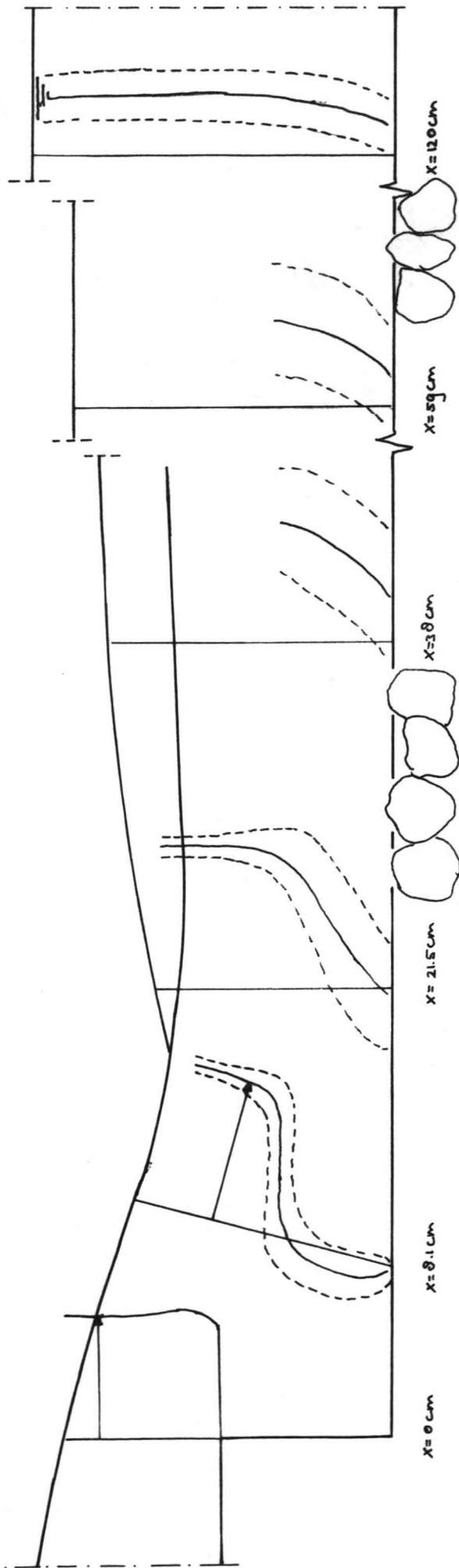


89

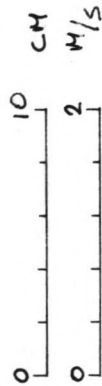
19
 III 5 12 B 2
 0 ——— 10 cm
 0 ——— 1 mm/A

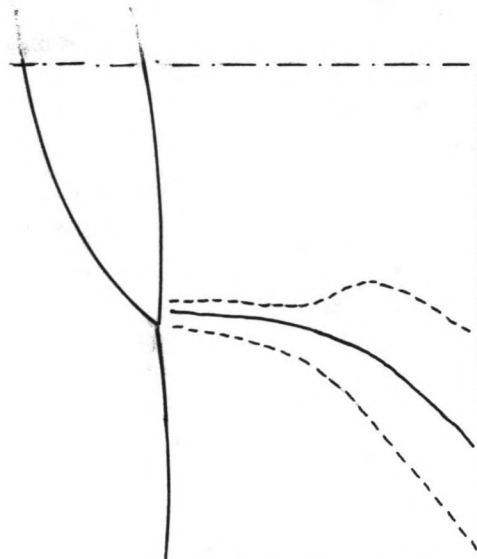


RUN: I	M1834:
stabiliteitskriterium:	
$h_s = 0.08 \text{ m}$	$k = 0.76 \text{ m}$
$D50 = 0.03 \text{ m}$	
snelheidschaal: $1 \text{ CM} = 0.4 \text{ M/S}$	
lengteschaal: $1 : 2$	



RUN: II	M1834: I & A3
stabiliteitskriterium: KANTELEN	
$h_s = .08$ m	$k = .091$ m $D50 = .03$ m
snelheidschaal: 1 CM = .4 M/S	
lengteschaal: 1:2	

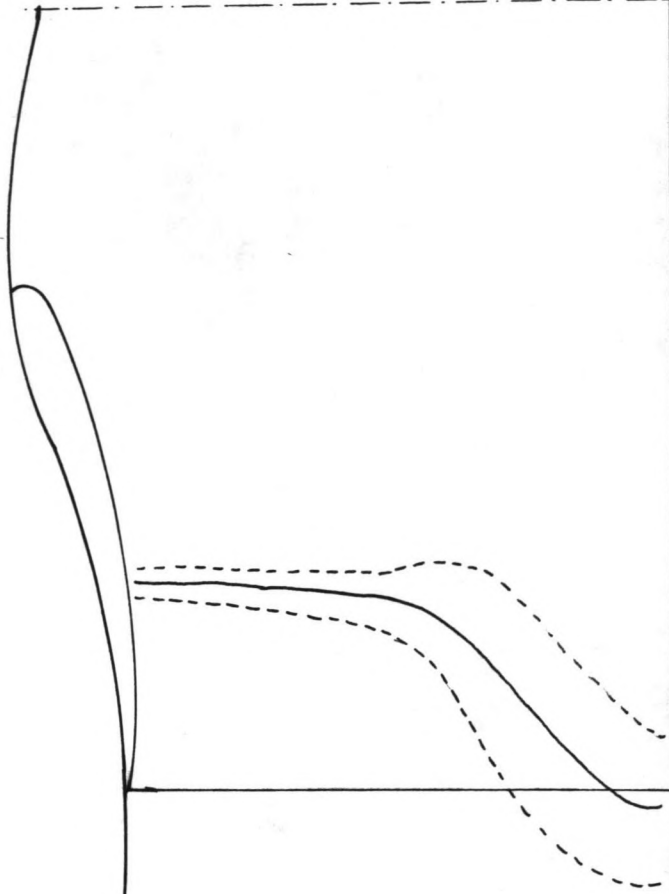
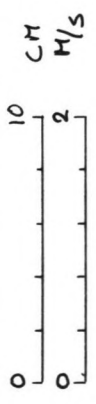




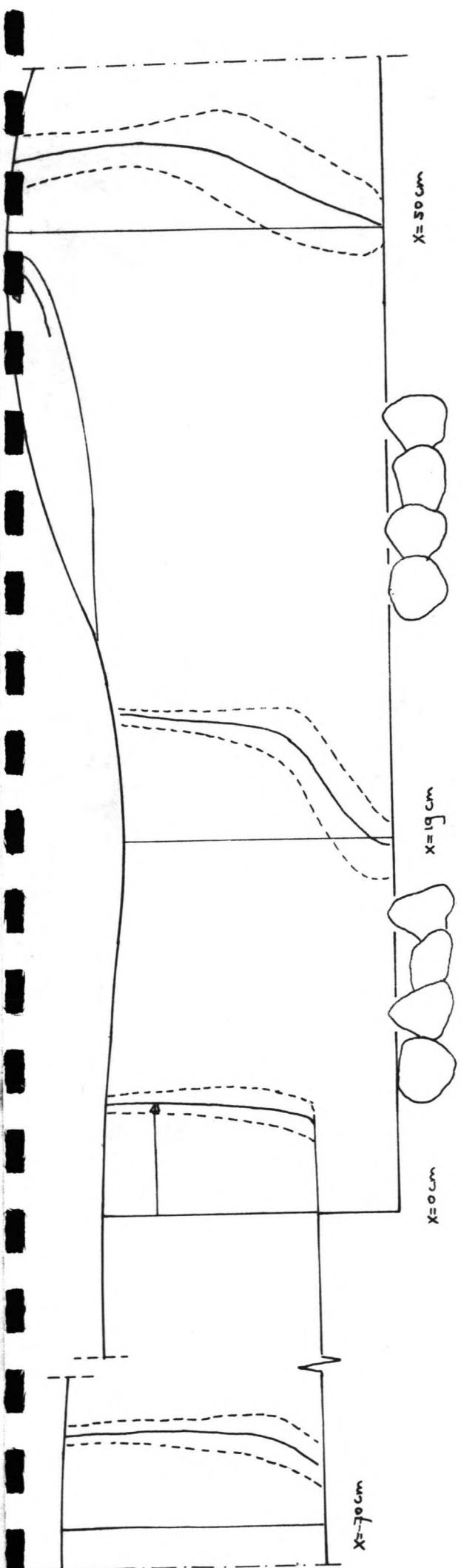
RUN: III	M1834:	
stabiiliteitskriterium:		
$h_s = .08$ m	$k = .136$ m	$D50 = .03$ m
snelheidschaal: 1 CM = .4 M/S		
lengteschaal: 1 : 2		



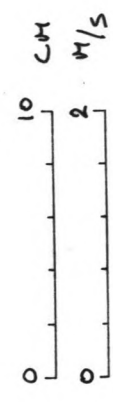
X = 35 cm



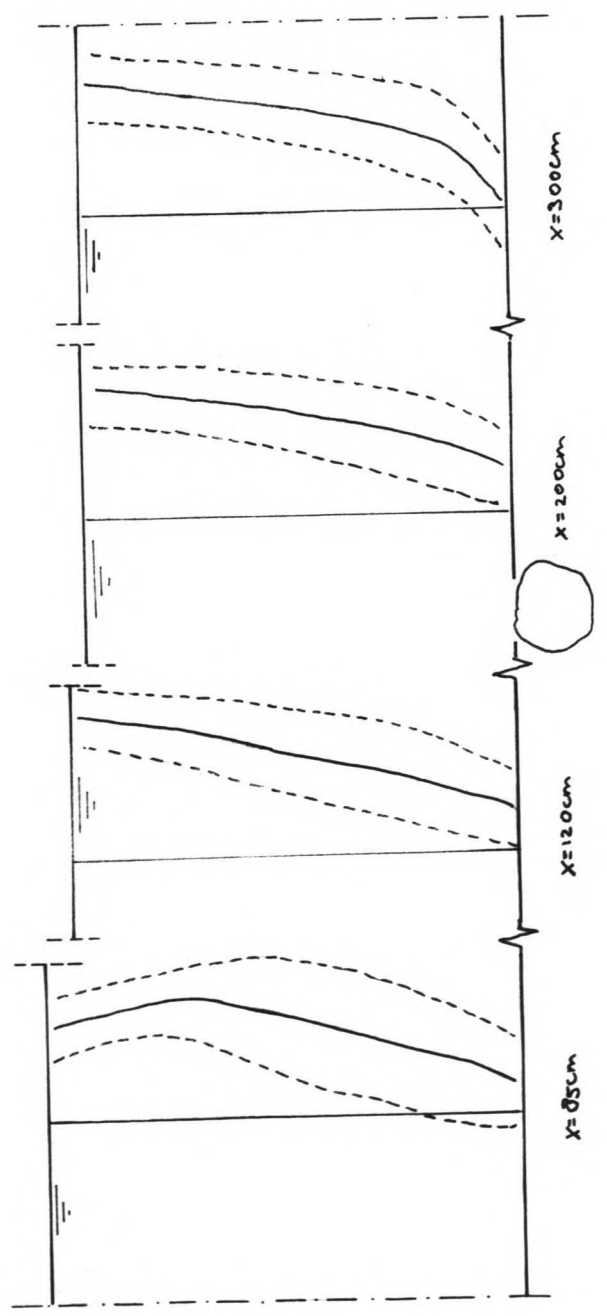
RUN: IV	M1834:	I8C3
stabiiliteitskriterium: Kantelen		
$h_s = .00$ m	$k = .136$ m	$D50 = .03$ m
snelheidschaal: 1 CM = .4 M/S		
lengteschaal: 1 : 2		

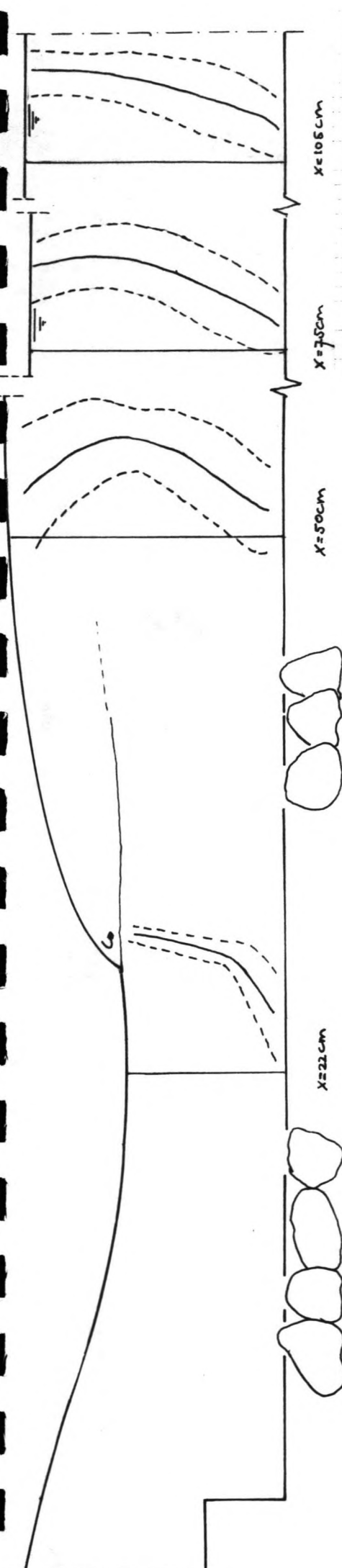


TRILLEN: 25 <math>L < L < 90</math>
 ZWAARSTE AANVAL: 25 <math>L < L < 30</math>

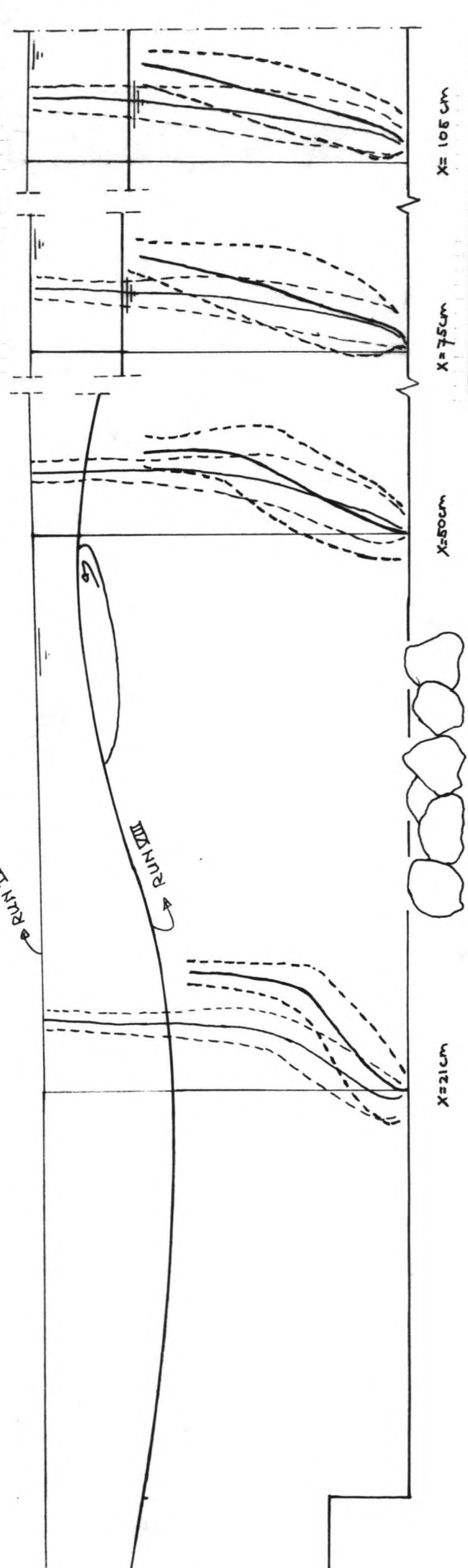


RUN: V	M1834: I ₄ D ₃
stabiliteitskriterium: TRILLEN	
$h_s = 0.04$ m	$k = 0.11$ m
$D50 = 0.03$ m	
snelheidschaal: 1 CM = 0.4 M/S	
lengteschaal: 1:2	



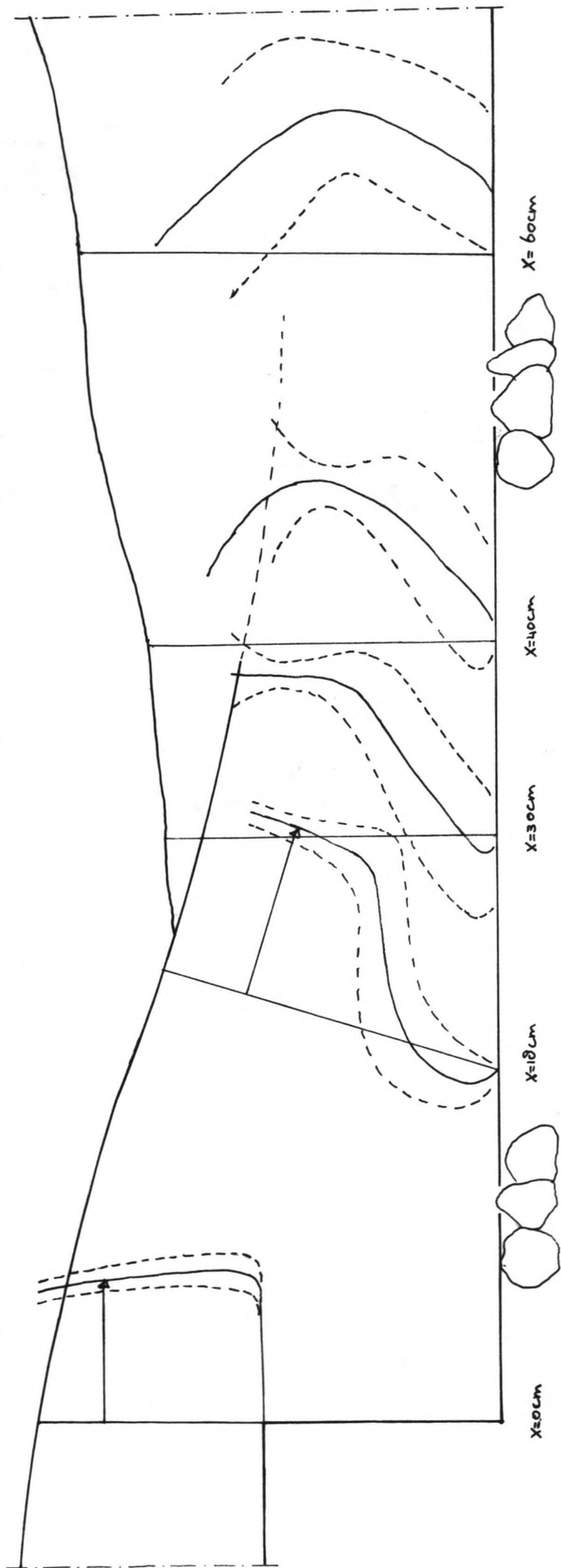


RUN: VII M1834: /
 stabiliteitkriterium: /
 $h_s = .04$ m $k = .099$ m $D50 = .03$ m
 snelheidschaal: 1 CM = .4 M/S
 lengteschaal: 1:2

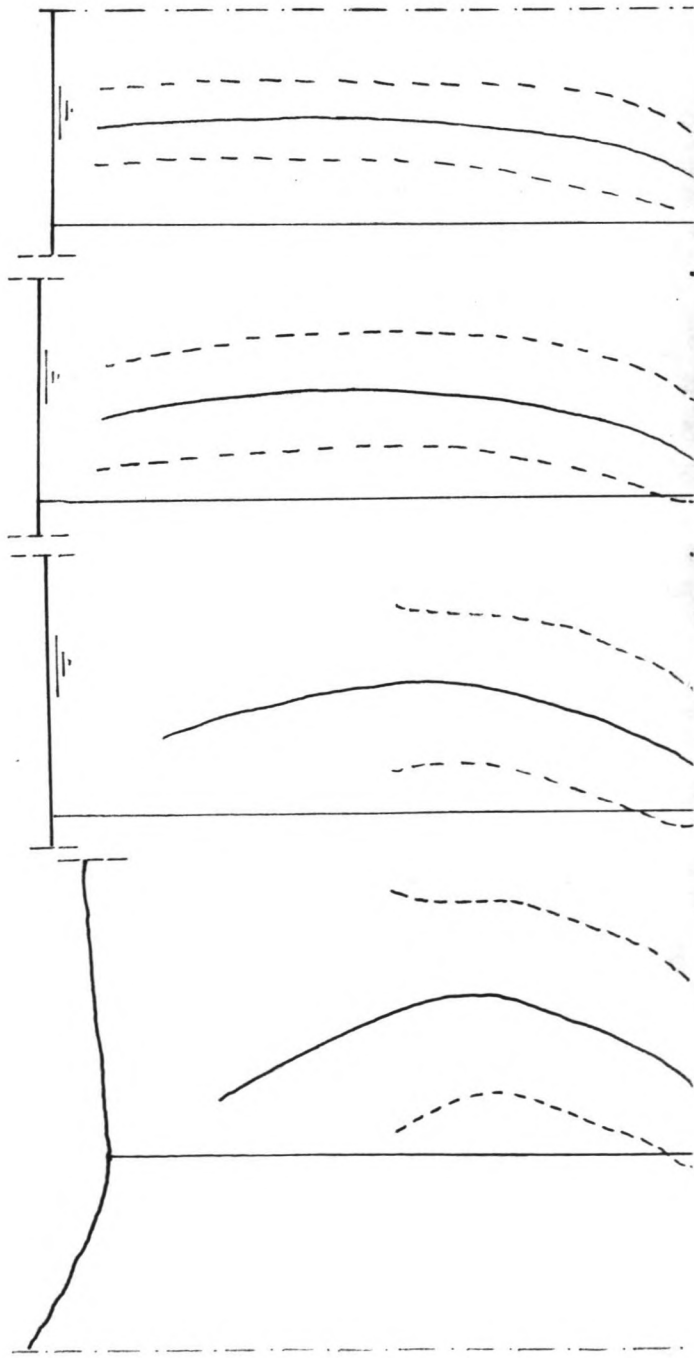


RUN: VIII, IX M1834: /
 stabiliteitkriterium: /
 $h_s = .04$ m $k = .099$ m $D50 = .03$ m
 snelheidschaal: 1 CM = .4 M/S
 lengteschaal: 1:2

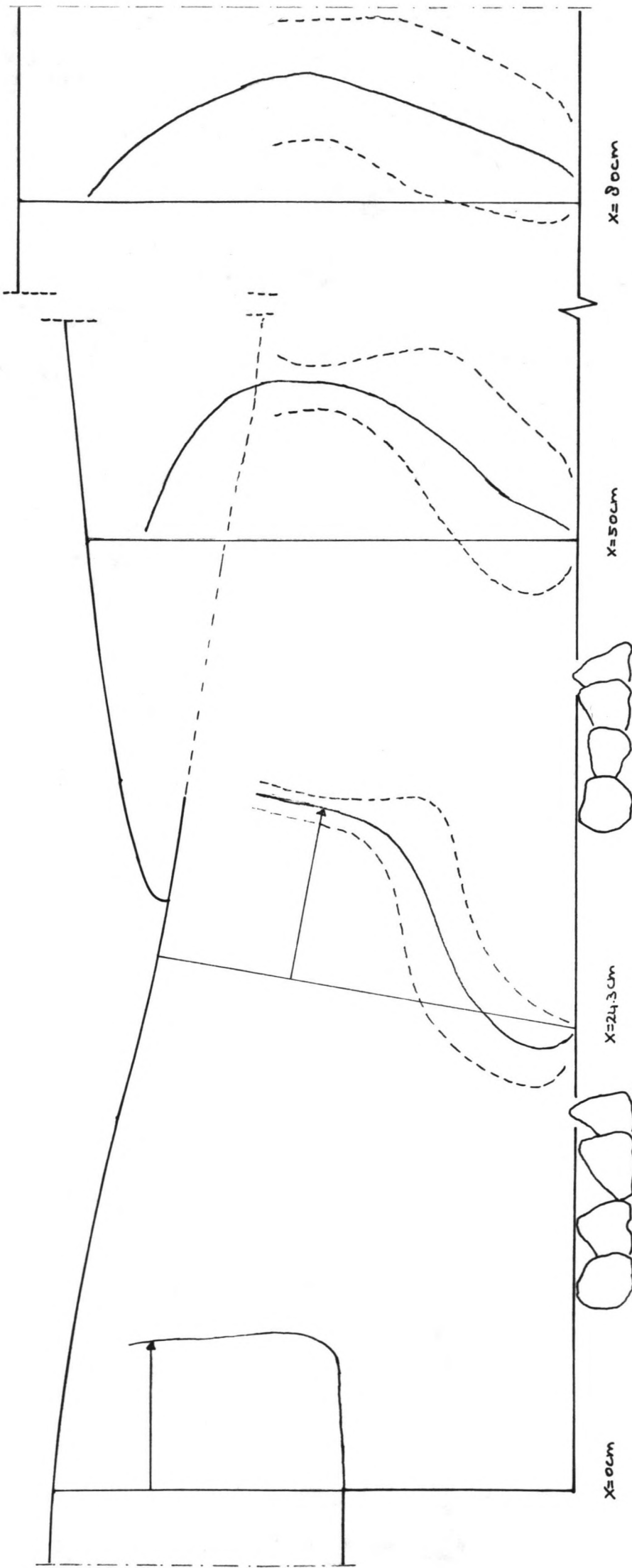




KANTELEN: 40LXL60

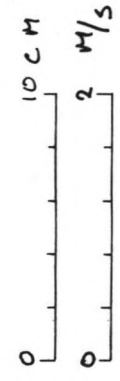


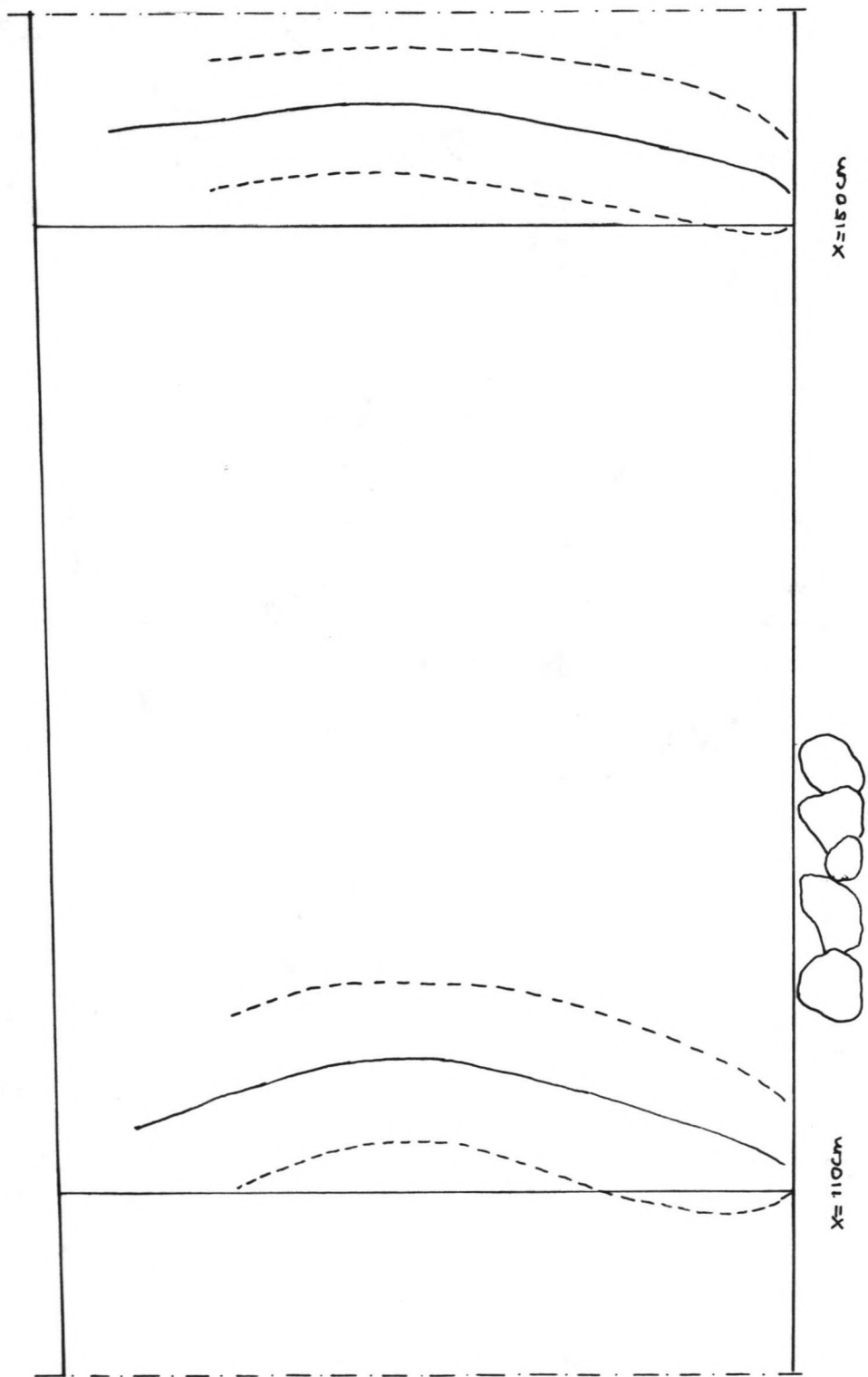
RUN: X	M1834: I ₁₂ A3
stabiliteitkriterium: KANTELEN	
$h_s = 0.12$ m	$k = 0.142$ m
$D_{50} = 0.03$ m	
snelheidschaal: 1CM = 0.4 M/S	
lengteschaal: 1:2	



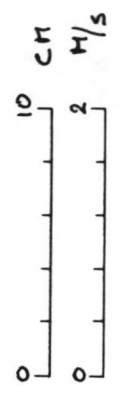
KANTELEN 40 X 4 1:20

RUN: XI	M1834: I, 12 B3
stabiliteitskriterium: KANTELEN	
$h_s = 1.2$ m	$k = 1.75$ m
snelheidschaal: 1 CM = 4 M/S	
lengteschaal: 1:2	

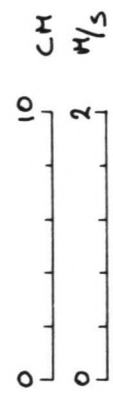
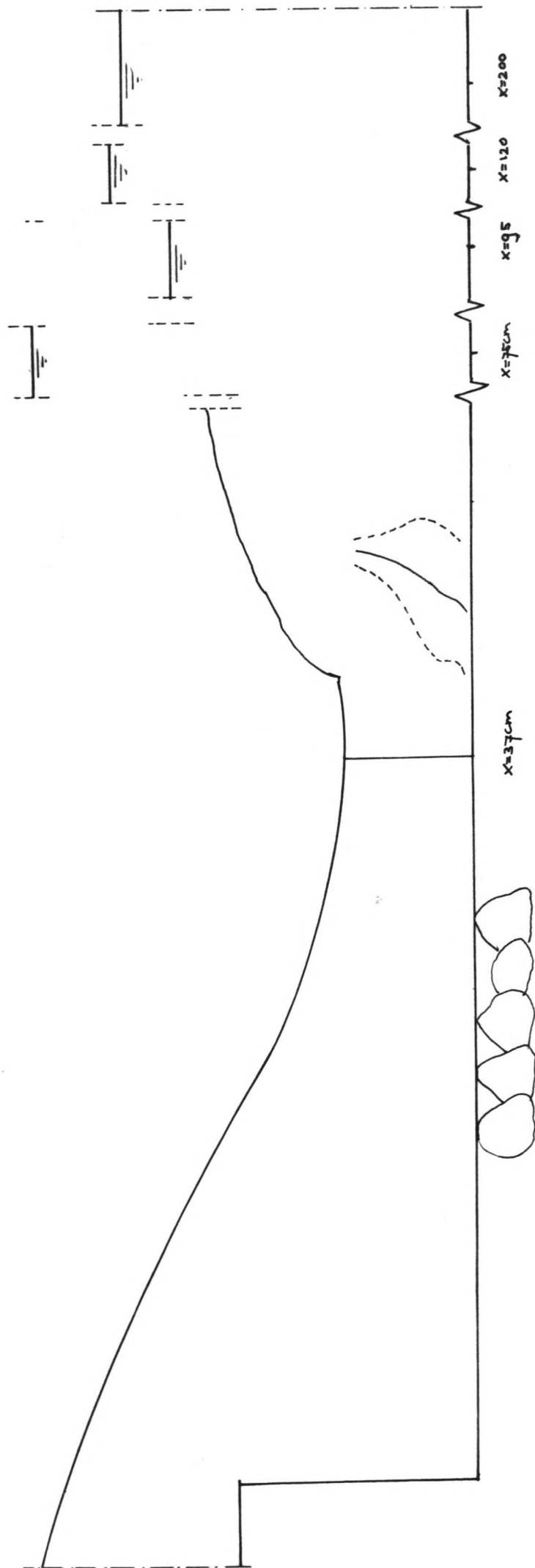




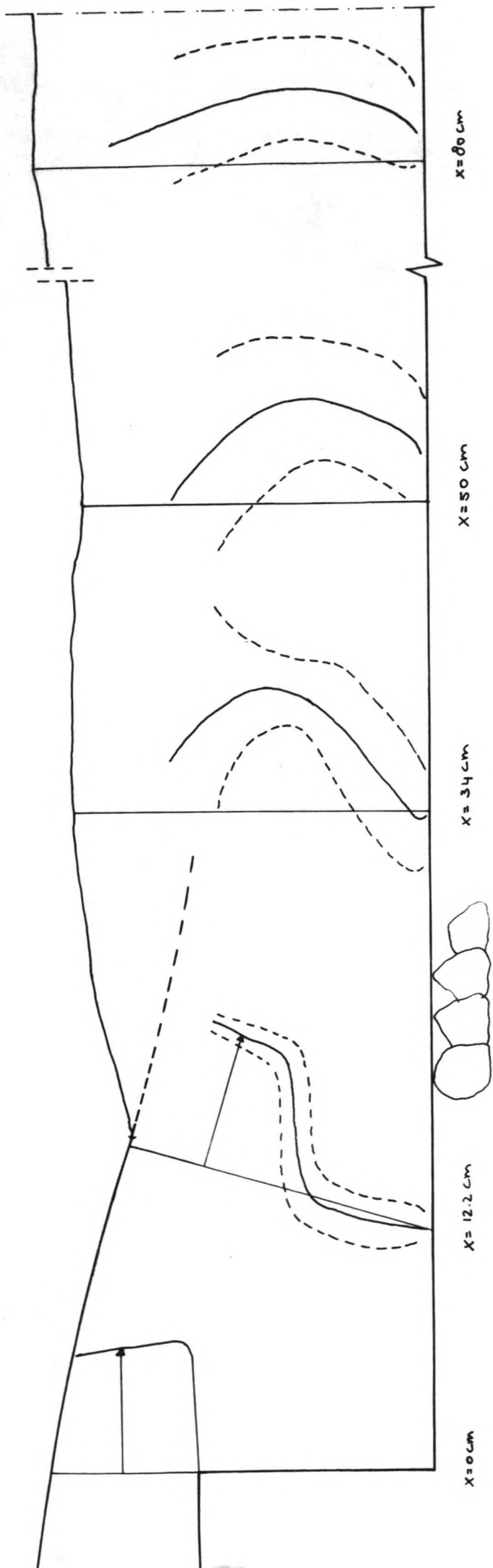
KANTELEN: $40 < X < 120$



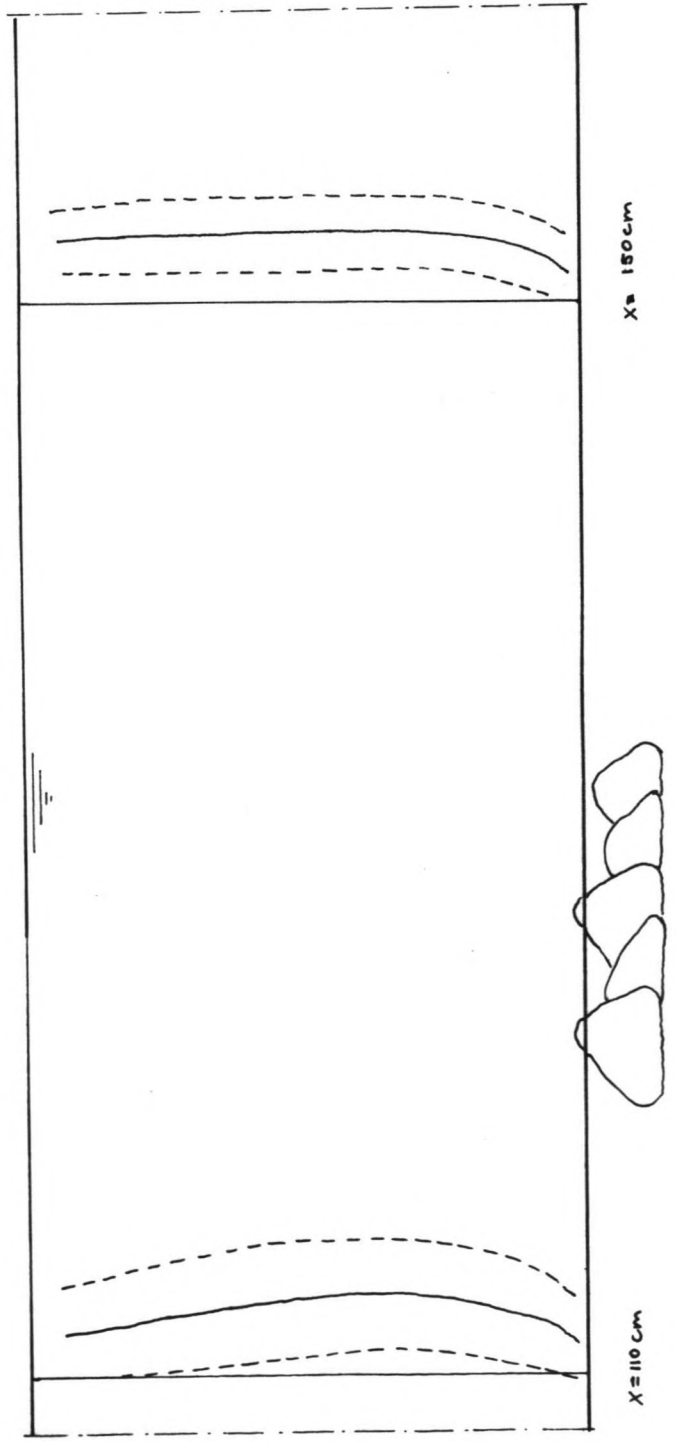
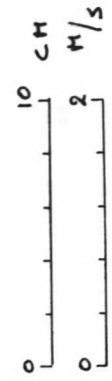
RUN: XI	M1834: I.12 B3
stabiliteitskriterium: KANTELEN	
$h_s = 12$ m	$k = 175$ m $D50 = 0.03$ m
snelheidschaal: $1\text{CM} = 0.4\text{M/S}$	
lengteschaal: 1:2	



RUN: XII	M 1834:	/
stabiliteitkriterium:		
$h_s = .12$ m	$k = .117$ m	$D50 = .03$ m
snelheidschaal: 1 CM = .4 M/S		
lengteschaal: 1 : 2		

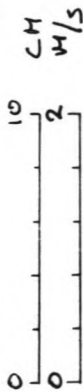


KANTELEN : 25 <math>X < 80</math>



RUN: XIII	M 1834: I ₁₂ E ₂
stabiliteitskriterium: KANTELEN	
$h_s = .12\text{ m}$	$k = .095\text{ m}$
$D50 = .02\text{ m}$	
snelheidschaal: 1 CM = .4 M/S	
lengteschaal: 1 : 2	

RUN: XIV	M 1834: I ₁₂ A ₂
stabiliteitskriterium: KANTELEN	
h _s = .12 m	k = .122 m D50 = .02 m
snelheidschaal: 1 CM = .4 M/S	
lengteschaal: 1 : 2	



RUN: XV	M 1834: I ₁₂ A ₂
stabiliteitskriterium: KANTELEN	
h _s = .12 m	k = .122 m D50 = .02 m
snelheidschaal: 1 CM = .4 M/S	
lengteschaal: 1 : 2	

KANTELEN BIJ OVERGANG VAN RUN XV NAAR RUN XIV ; KANTELEN: 40 < X < 60



X = 40 cm

X = 50 cm

X = 60 cm

X = 300 cm

WATERHOOGTE RUN XV
WATERHOOGTE M 1834

X = 40 cm

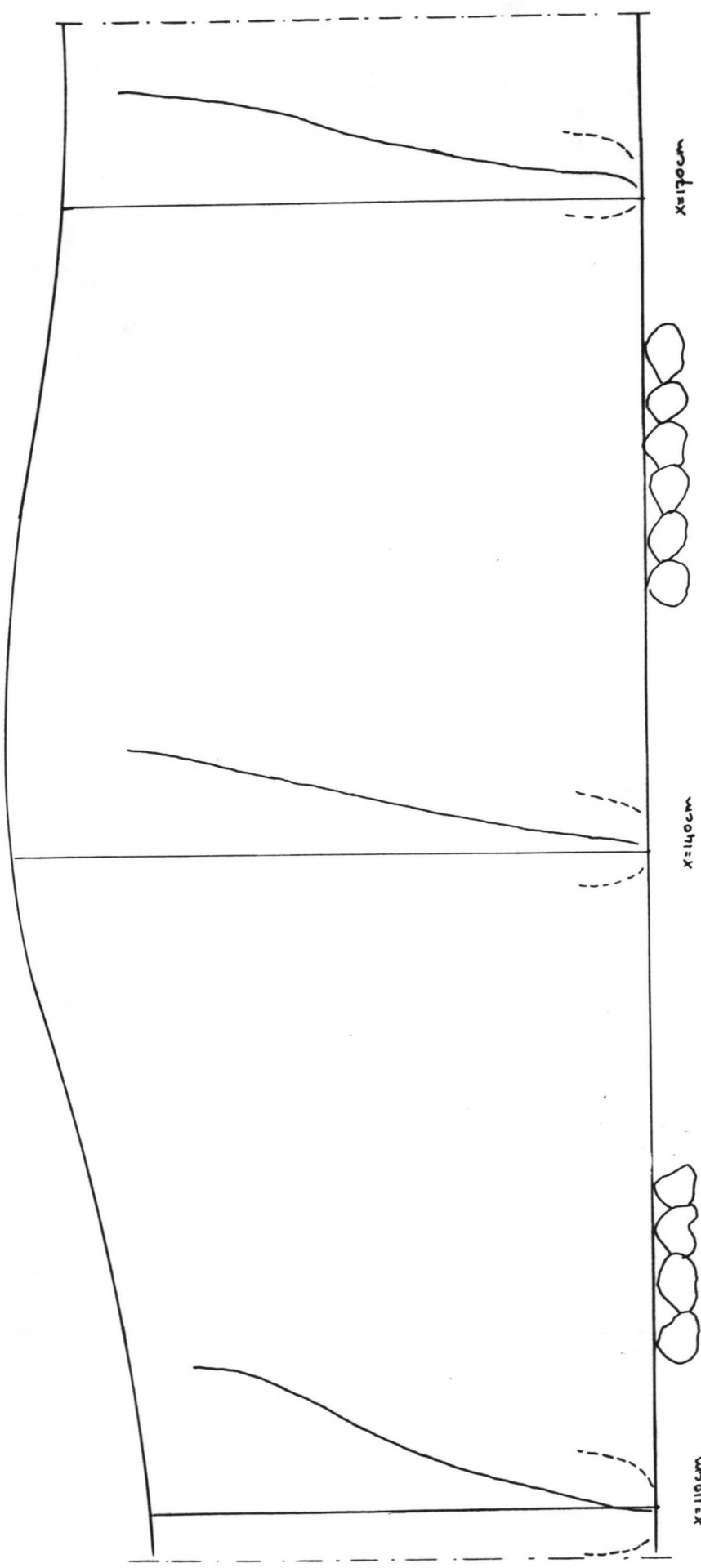
X = 50 cm

X = 60 cm

X = 300 cm

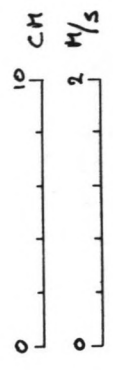
WATERHOOGTE RUN XIV

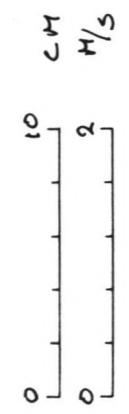
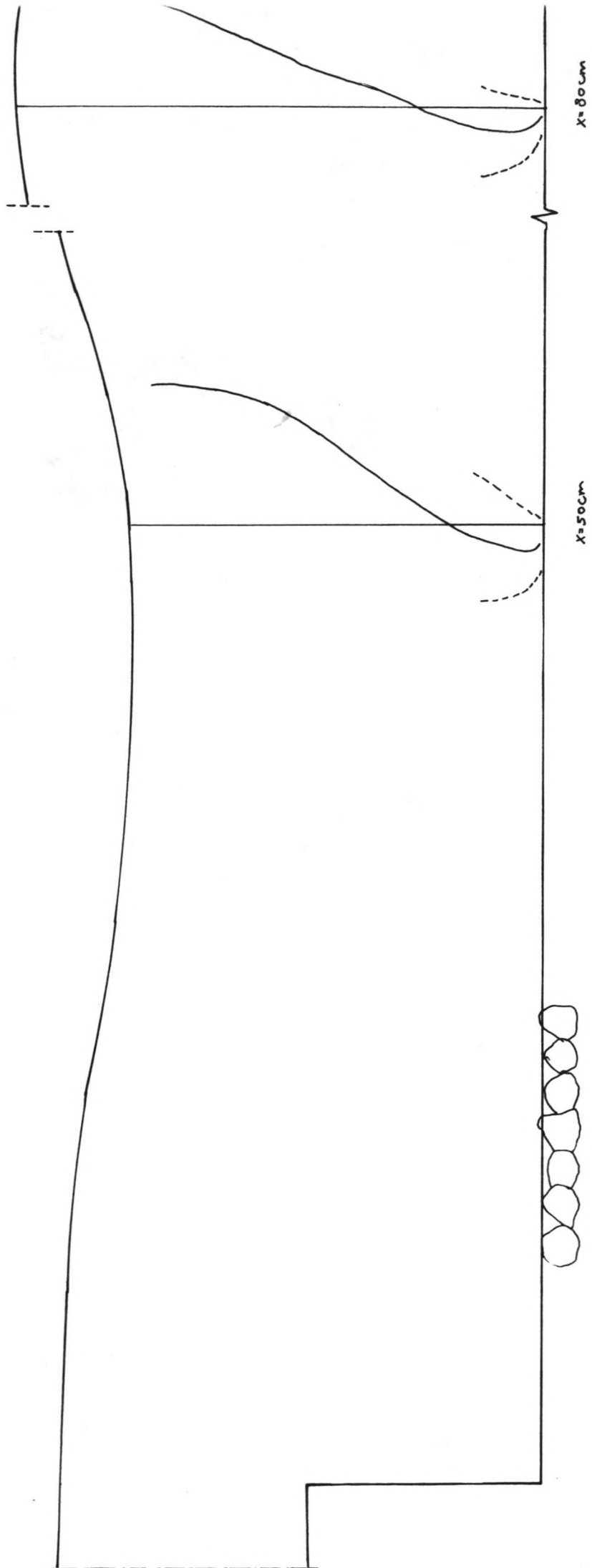
M 1834



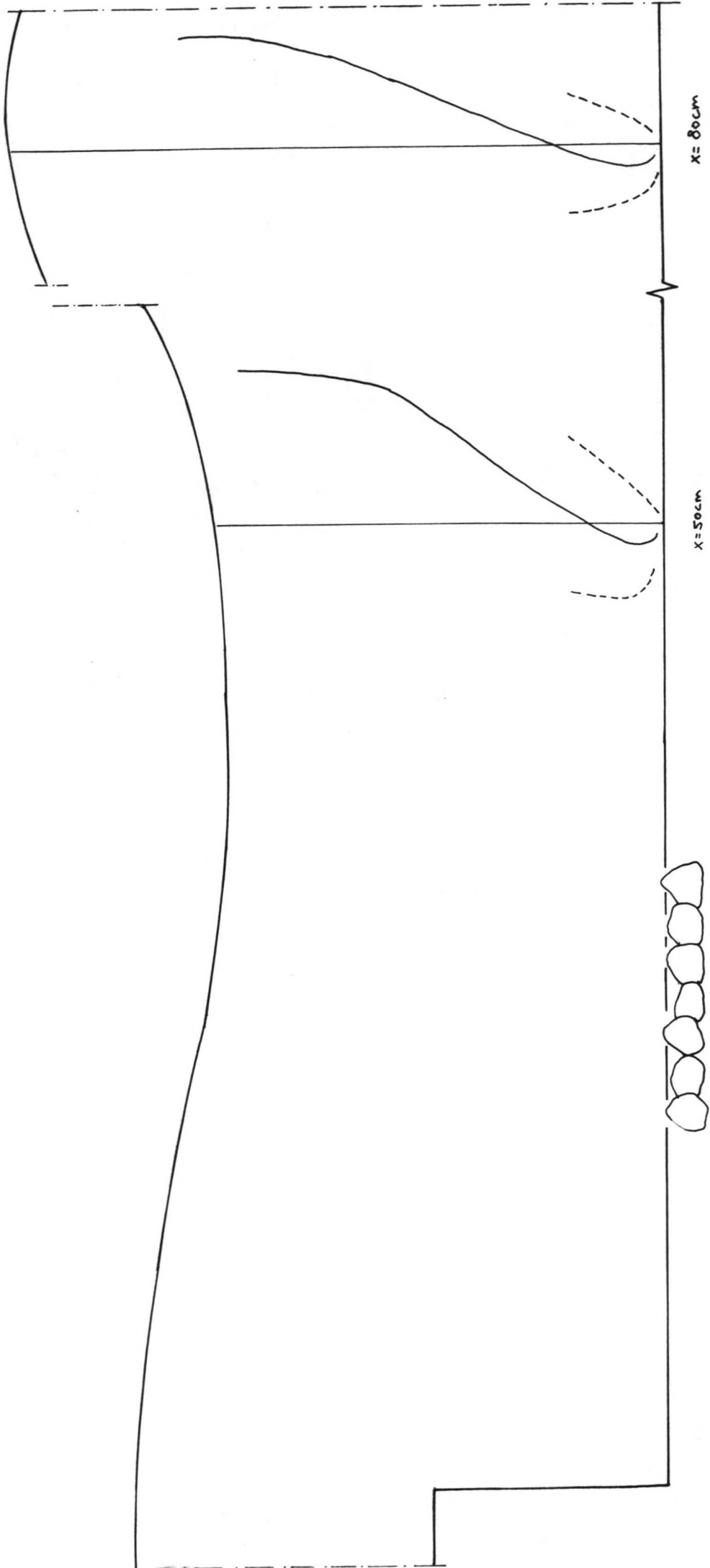
RUN: XVI	M1834: I.12. B2
stabiliteitskriterium: KANTELEN	
hs = 12 m	k = 138 m D50 = 02 m
snelheidschaal: 1CM = 4 M/S	
lengteschaal: 1:2	

KANTELEN: 110 < X < 170
 ZWAARSTE AANVAL: X ≈ 140





RUN: XVI	M1834: I.12 B2
stabiliteitskriterium: KANTELEN	
$h_s = 1.2$ m	$k = 1.38$ m
snelheidschaal: $1\text{CM} = 4\text{M/S}$	
lengteschaal: $1:2$	



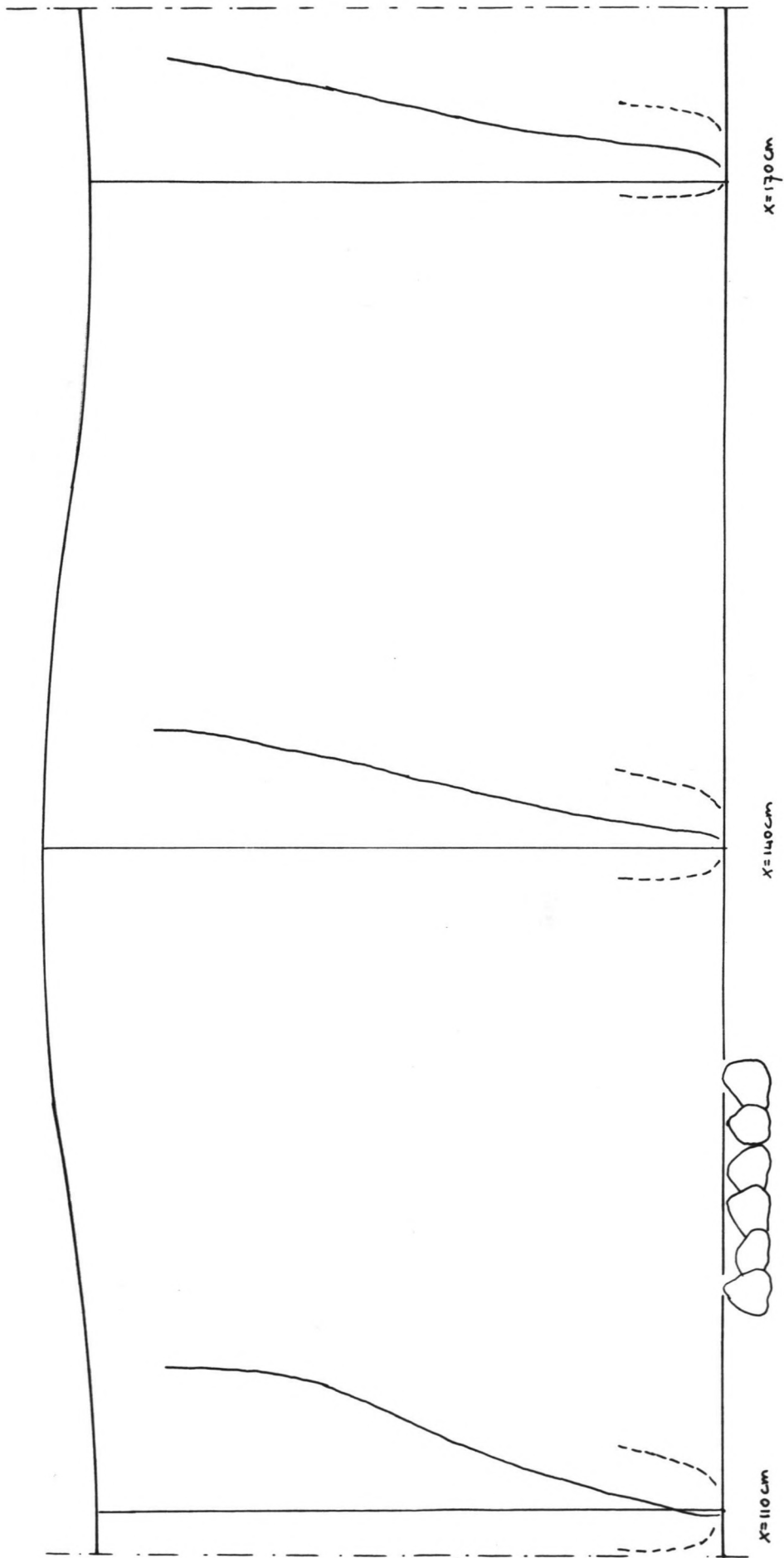
x = 80cm

x = 50cm

KANTELEN; 50 < X < 200



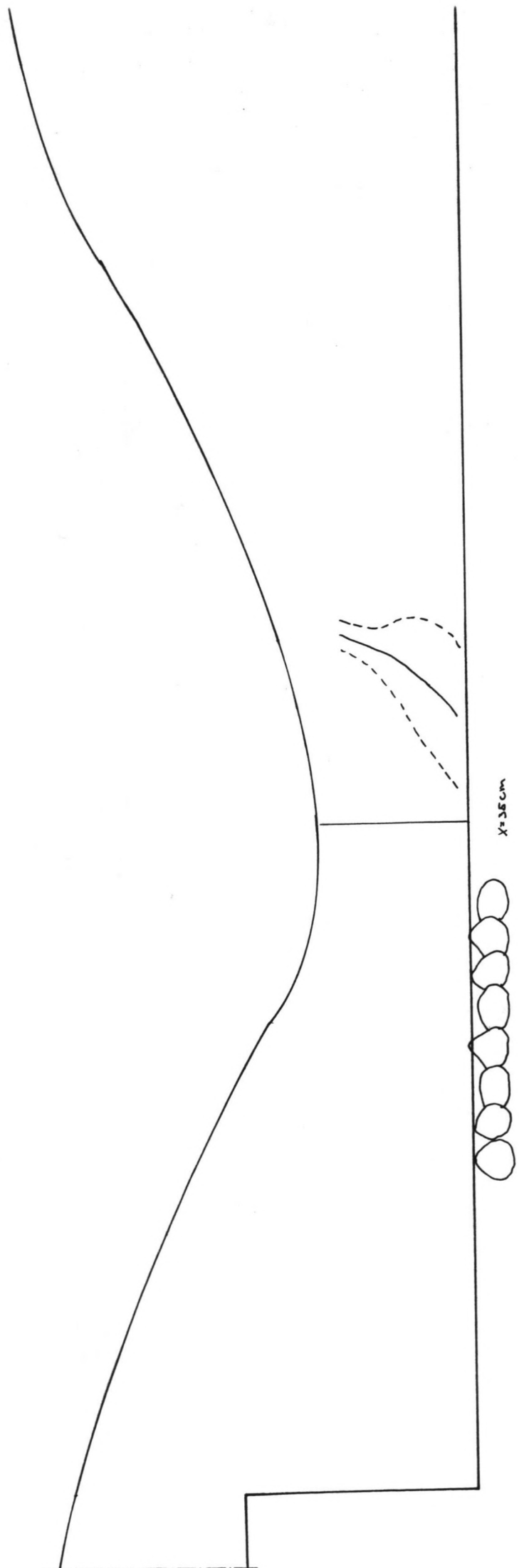
RUN: xvii	M 1834: I 12 C 2
stabiliteitkriterium: KANTELEN	
$h_s = .12$ m	$k = .164$ m $D50 = .02$ m
snelheidschaal: 1 CM = .4 M/S	
lengteschaal: 1 : 2	



KANTELEN; $50 < X < 200$



RUN: XVII	M1834: I ₂ C ₂
stabiliteitskriterium: KANTELEN	
$h_s = .12$ m	$k = .164$ m D50 = .02 m
snelheidschaal: 1CM = .4 M/S	
lengteschaal: 1:2	



RUN: XVIII	M 1834:	/
stabiliteitskriterium: /		
$h_s = .12$ m	$k = .126$ m	$D50 = .02$ m
snelheidschaal: 1 CM = .4 M/S		
lengteschaal: 1:2		

