Composition and exchange capacity
of deep sea sediments

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Report of work carried out in 1967/68
by D. Eisma, Netherlands Institute for
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on sediment cores used by E.K. Duursma,
I.A.E.A. (Monaco) for sorption experiments.

Introduction

The purpose of this study was to determine the composition and base exchange properties of about 41 deep sea sediment cores (Table I). These have been collected by various institutions and sent to the Monaco laboratory of the I.A.E.A. to be used for sorption experiments by Dr. E.K. Duursma. The sedimentological part, carried out by the author, sedimentologist at the Netherlands Institute for Sea Research, Den Helder, Netherlands, involved determination of grain size by sieve and pipette methods, mineralogical composition, X-ray diffraction, content of heavy metals (in cooperation with Dr. H.A. Das, Reactor Centrum, Petten) and base exchange capacity. Moreover, a number of extracts were made with solutions of increasing acidity in order to determine the strength whereby several elements are bound to the sediment particles.

This study started in June 1967 and being not yet completed at this moment (October 1968) will be continued during 1969 at the Den Helder laboratory. Meanwhile this progress-report is being made on completion of the last term of the special service agreement with the I.A.E.A.

Analytical techniques

Most cores had been cut at the Monaco laboratory into segments of 2-5 cm length. Core I had been divided into segments of 10 cm, core II into segments of 13 cm and cores III and VI into segments of variable length. The segments were stored in plastic vials and kept at room temperature during the period of analysis. No analyses were made of core IX, which was kept frozen for later use, and of cores XXVII and XXVIII, which were sent subdivided in small plastic bottles which contained too small amounts of sediment for most analyses. Also some other cores contained too little amounts of sediments for all analyses mentioned below , so that only a few analyses were carried out on these cores.

a. Grain size

Grain size was determined by sieving the wet samples over 250 μ, 63 μ and 25 μ sieves. The percentages of the fraction 25-16 μ, 16-2 μ and <2 μ were determined with pipette-analysis. All determinations were done twice: once after a pretreatment with only cold 30% H_2O_2 for 24 hours, and a second time after pretreatment with 30% H_2O_2 followed by heating the sample for 5 minutes with Na-pyrophosphate.

b. Microscope analysis

All size fractions >16 μ were examined under a polarisation microscope. Particles and aggregates were identified as far as possible and a qualitative estimate of their numbers was made.

c. Organic matter

The total content of organic matter was determined by the "Kürmies"-method, whereby the organic matter is oxydised with potassiumbichromate. The organic carbon content was calculated by dividing the organic matter content by 1.73. Organic nitrogen content was determined by the micro-Kjehldal method.

d. X-ray analysis

X-ray diffraction analysis of the fraction $< 2\ \mu$ was carried out on a Philips-diffractometer with Co-radiation. The samples were first run without any pretreatment apart from the addition of 30% H_2O_2 and the heating with Na-pyrophosphate. Then the samples were run again after glycolation with ethyleneglycol for the identification of montmorillonite. Peak height was measured at the following d-values:

illite	10-11 Å
chlorite	7 Å and 3.54 Å (or 14 Å)
kaolinite	7 Å and 3.58 Å
montmorillonite	17 Å (after glycolation)
quartz	3.3 Å
feldspar	3.2 Å
calcite	3.03 Å
aragonite	3.4 Å
amfibole	8.4 Å

e. Acid extracts

In order to determine the strength whereby several elements (Na, K, Ca, Mg, Fe) are bound to the sediment particles, extracts were made with an acetic acidammonium acetate buffer solution with a pH of 5.4 and with solutions of 0.1N, 0.2N, 0.5N, 1.0N, 2.0N, 3.0N, 6.0N, 10.0N and 12.0N HCl. For each extraction about 2 gr of sediment (dry weight) was used to which 100 ml. acid solution was added. After heating for 15 minutes the sample was filtered and the filtrate diluted to one liter. Then Ca, Mg and Fe were determined by titration with EDTA and Na and K with a Zeiss flame-photometer. The remainder was set apart for the determination of Mn, Zn, Co, Cu, Ni and Mo by the Reactor Centrum at Petten.

f. Cl-content

Since the samples were dried before chemical analysis they also contained salts precipitated on evaporation of the interstitial water. In order to know the original amount of interstitial salts Cl-content was determined by shaking the samples for three hours with distilled water and determining the amount of Cl in solution by titration. From the Cl-content the amounts of Na, K, Ca, Mg and Fe in the salts precipitated from the interstitial water were determined, assuming the interstitial water to have the same ratio's between the elements as average sea water. For the macro-constituents (Na, K, Mg) this is about true (Siever et al. 1961; Brooks et al. 1968), although enrichment up to 10% may be expected for potassium and up to 5% for magnesium.

Calcium content of the interstitial water, however, was found by Brooks et al (1968) to decrease with depth down to 40% of its value in the overlying sea water, whereas iron content increases. By substracting the amounts of Na, K, Ca, Mg and Fe present in the interstitial salts from the amounts found in the acid extracts, the amounts extracted from the sediment particles are obtained. The uncertainty regarding the exact composition of the interstitial salts is negligable in the case of Na, K, Mg, Fe and also of Ca for most of the samples: the amounts present in the extracts are much larger than those in the interstitial salts. Only in cores V, VI, X and XXIX, which have a very low Ca-content, a possibly 60% lower Ca-content of the interstitial water may result in a possibly somewhat higher value for Ca extracted from the sediment. The difference, however, is still small.

Results

a. Grain size and microscope investigations

The results of sieve analysis and the microscope study of the fraction >25 μ are given in Table II, the results of pipette analysis in Table III and those of the microscope study of the fraction 16-25 μ in Table IV. According to grain size and calciumcarbonate content the sediment cores can be grouped into three groups as shown in Table V. Four cores (nrs. VIII, XXII, XXXIII and XXXV) can not be grouped because of their variability.

The effect of the treatment with Na-pyrophosphate, a strong peptisator, was used as a measure for the strength of inter-particle bonds. When treatment with pyrophosphate leads to a significantly lower percentage of the fraction > 25 μ, as compared with a treatment of only H_2O_2, this indicates that the destruction of organic matter by H_2O and the physical pressures due to the formation of bubbles were not able to destroy comparatively large aggregates, indicating rather strong bonds. Similarly differences in the 16-25 μ and the 2-16 μ fractions would indicate medium strong and rather loose aggregates, whereas no difference in grain size would indicate very loose or no inter-particle bonds. In the latter case, however, aggregates can also be very strong so that they cannot be broken down even by a peptisator. This is true for the aggregates held together by $CaCO_3$ or SiO_2 and for the Fe-Mn concretions.

The type of aggregates in the sediment (strong bonding, medium strong, loose or none) is not related to the percentage of the fraction < 2 μ (fig. 1), which contains the particles with the most active surfaces (clay minerals).

In order to compare grain size with other properties of the sediment, the median diameter (d_{50}) and a measure of sorting ( ) were determined from the frequency distributions following Inman (1952). There is a relation between d_{50} and sorting (fig. 2): the finest clays are better sorted than the coarser sediments. The larger spread of the coarser samples is due to the presence of organic skeletons (foraminifera, radiolaria), of fragments of variable size and of coarser mineral grains (quartz, feldspar, heavy minerals)

b. <u>Organic matter</u>

Organic matter content, given in Table VI, varies from 0.123% to 6.204%, the C/N ratio varying between 1.2 and 44.4. In seven samples the amount of organic N was lower than the lower limit of determination.

The total content of organic matter was found to be not related to the median diameter (fig. 3), the percentage $< 2\ \mu$ (fig. 4), the type of aggregate in the sediment (fig. 5), or the C/N ratio (fig. 6).

c. Clay mineral composition

The results of X-ray diffraction analyses of the fraction $< 2\ \mu$ are given in Table VII. The dominant clay mineral is illite, followed by chlorite and montmorillonite with relatively few occurrences of kaolinite in small percentages except in one sample (XXIV). Quartz is nearly everywhere present in this size fraction. Calcite dominates in most of the typical carbonate cores (group IIIa) and is still important in the mixed cores (group IIIb). Feldspar and amfibole particles $< 2\ \mu$ occur in some cores, mostly in minor quantities. From the clay mineral composition and the grain size data a measure was calculated for the base exchange capacity of the sediments as follows:

$$q = K \sum \left\{ \left(\frac{p}{\sum p} \times 100 \right) \times f \right\}$$

where p = peak height, K = percentage $< 2\ \mu$ and f a conversion factor for the base exchange capacity. For kaolinite f has been assumed to be 10, for illite and chlorite 25, for montmorillonite 100 (Grim 1958), and for all other grains 0. It is assumed 1) that the clay mineral particles in the sediment cores are not larger than 2 microns, and 2) that the base exchange of the other particles <2 μ (quartz, calcite, amfibole, feldspar etc.) is negligable. The values for q thus found are listed in Table VIII. Although q is calculated using the percentage <2 μ the factor $\left(\frac{p}{1-p} \times 100 \times f\right)$ is so variable that there is no correlation between q and the % <2 μ (fig. 7).

d. Sodium content

In a number of cores (nrs. II, V, VI, XV, XXVI, XXXVIII, XL) no sodium is extracted from the sediment apart from the sodium present in the interstitial salts. In the other cores sodium is extracted from the sediment in two ways: 1) with no or little increase of the amount of extracted sodium with higher acidity of the solution (cores nrs. I, III, IV, XIII, XIV, XVII, XVIII, XXII, XXV, XXXVI, XXXVII, XXXIX), and 2) with a marked, often strong increase of the amount of extracted sodium with higher acidity of the solution (c.f. fig. 8).

Fig. 9 and 10 show the relation between the calculated base exchange capacity (q) and the amount of sodium extracted with 0.1 NHCl and with a high concentration of HCl (6-12N) respectively. There is a rough correlation, apart from some marked deviations (e.g. very high amounts of sodium extracted from cores XX and XXI), indicating that the sodium is mainly held to the clay particles in exchange positions. Relatively low values of extracted sodium suggest (as for cores V and XXXVI) that part of the available space on the clay particles normally filled up with sodium is filled up with other kations.

There is no correlation between the amounts of extracted sodium and the amounts of organic matter, Ca (+Mg) and Fe in the cores (fig. 11, 12 and 13), suggesting that adsorption on the organic matter, the carbonate and the ironhydroxyde is not important. This is also indicated by the fact that the carbonate cores (for which $q \approx o$) have very low amounts of extractable sodium.

Apart from the deviations mentioned above the correlation between q and the amount of sodium extracted with 0.1NHCl is better than the correlation between q and the maximum amount of sodium extracted: at higher acidity of the solution probably some sodium is extracted from (weathered?) feldspars or from structural positions in the clay minerals. The increase in the amounts of sodium extracted with solutions of higher acidity can be indicated by a value t, which is the difference between the average percentage of sodium extracted with concentrated HCl minus the percentage of sodium extracted with 0.1NHCl. There is no correlation between t_{Na} and q (fig. 14), or between t_{Na} and the percentage $< 2\ \mu$ (fig. 15), indicating that higher values for t_{Na} are not due to the extraction of sodium from exchange positions or from structural positions in the clay minerals.

The frequency distribution curve of t_{Na} has a maximum between 0 and 0.1 and a smaller secondary one between 0.2 and 0.3 which suggests that the higher values for t_{Na} are due to sodium extracted from one or more minerals which are significantly less frequent, or absent, from the cores with low values for t_{Na}.

e. Potassium content

Potassium is extracted from the sediment of all cores in excess of the potassium present in the interstitial salts and more is extracted with solutions of higher acidity. The difference between the amount of potassium extracted with 0.1NHCl and with conc. HCl is small, however, in cores I, II, III, X, XII, XXXV, XXXVII, XXXVIII and XLI, whereas it is high in the other cores (c.f. fig. 17).

The correlation between q and the amount of potassium extracted with 0.1NHCl and with conc. HCl respectively is quite good (fig. 18, 19), apart from the deviations (cores IV and XXXVI), indicating that the potassium thus extracted is mainly held to the clay minerals in exchange positions. At values of $q \to o$ however (i.e. mainly in the carbonate cores) still a considerable amount of potassium is extracted. Plotting $\%K_{0.1NHCl}$ and $\%K_{max}$ (at values of $q < 5$) against the percentages of organic matter, Ca (+Mg) and Fe (fig. 20, 21, 22) both potassium percentages tend to decrease with increasing contents of organic matter and iron but to increase with the Ca (+Mg) content. The increase however is not large: from sample VI (81), with a low value for q and a low carbonate content still about 0.12%K is extracted with 0.1NHCl, whereas about the same amounts are extracted from samples with 20% Ca and 35% Ca. Sample VI (81) contains many mica grains from which K may have been extracted, but this is not the case with the carbonate cores (XXXII, XXXVII, XXXIX). This suggests that adsorption of potassium to the particle grains is a general phenomenon, with probably a somewhat higher adsorption to carbonate grains.

As for sodium a value t_K was calculated and plotted against q (fig. 22). t_K generally increases with q but the correlation is much worse than for q with the actual potassium percentages. Thus, depending on the type of sediment, potassium is not only increasingly removed from exchange positions when the extracting solution is more acid, but also from other positions, presumably mainly from structural positions in the grains (clay minerals, micas, feldspars). Plotting t_K against the $\% < 2\ \mu$ shows no marked correlation between t_K and $\% < 2\ \mu$ so that in some cases (e.g. cores XXI and XXIX) potassium is also extracted from the clay minerals.

The frequency distribution curve of t_K shows two distinct maxima: at 0.0-0.1 and at 0.2 -0.3 (fig. 25). This suggests that cores with t_K-values of 0.2-0.3 contain one or more minerals from which potassium is extracted with strong acids and which are absent, or significantly less frequent, in the cores with t_K-values of 0.0-0.1.

f. Calcium content

In most cores calcium occurs only as carbonate which is dissolved in 0.1N HCl so that there is no significant difference between the amounts extracted with 0.1N HCl and conc. HCl. Only in three cores (V, VI and XXIX) the amount of calcium extracted increases with the acidity of the solution (fig. 26). The amounts extracted from these cores are rather low but not exceptionally so. Especially in core VI the extractable calcium is mainly present in a not very soluble form.

About 20-50% of the calcium carbonate is dissolved by the acetate buffer. The variations of this percentage are at least partly due to the variable origin of the calciumcarbonate: most of it has been formed by different types of organisms (foraminifera, coccoliths, pteropods, other mollusks), while some of it is limestone detritus.

g. Magnesium content

The magnesium dissolved in 0.1NHCl can be regarded as mainly incorporated in the calcium carbonate (except in cores V, VI and XXIX), although some of it may have been extracted from exchange positions on the clay minerals. The Ca/Mg ratio of the carbonates thus varies from about 1 to more than 600, with most of the values between 20 and 50. This is in good agreement with the variable origin of the carbonates. Extraction with stronger acid solutions does not dissolve significantly more Mg from cores I, X, XIII, XVI, XXII, XXXVIII and XLI. With the other cores there is an increase when the solution is more acid. A value t_{Mg} has been calculated (similar to t_{Na} and t_{K}) and plotted against q (fig. 27). There is no correlation between t_{Mg} and q indicating that the magnesium extracted by more acid solutions is extracted from structural positions in the grains, or was adsorbed to the grain surfaces. There is also no correlation between t_{Mg} and the 1% < 2 μ so that the magnesium is not predominantly extracted from the clay minerals. The frequency distribution curve of the t_{Mg} values does not show two maxima as for t_K (fig. 29).

h. Iron content

In all cores the amount of iron extracted with conc. HCl is higher than the amount extracted with 0.1 NHCl, while no iron is being extracted with acetate buffer. The relation between the amount of iron extracted and the acidity of the solution however is not the same for all cores (fig. 30). A value t_{Fe} was calculated, similar to t_{Na}, t_K and t_{Mg}. The correlations between t_{Fe} and q, and between t_{Fe} and $\% < 2\ \mu$ are not very strong (fig. 31, 32) but indicate that the iron extracted with solutions of higher acidity, is predominantly extracted from the exchange positions of the clay minerals, whereas some is also extracted from clay minerals. There is no relation between t_{Fe} and t_{Mg} (fig. 33).

The amounts of iron extracted with 0.1 NHCl and conc. HCl are roughly correlated with q (fig. 34, 35), apart from four deviations (cores X, XXIX, XXXVI and XL), indicating that in most cases the iron is predominantly removed from exchange positions in the clay minerals. However, iron will also be dissolved from the brown and orange concretions which are present in the fraction $> 25\ \mu$ in several cores. Since these concretions do not occur in the carbonate cores (group IIIa) the correlation between the amount of extracted iron and q may be influenced by a positive correlation between q and the amount of iron dissolved from concretions. Therefore in fig. 35 the points which belong to cores with brown/orange concretions in the fraction > 25 µ, are indicated separately. Except for two cores (XXIX and XXXVI, which are generally exceptional) all these points are concentrated on the left upper side of the diagram, indicating that in general the iron is indeed extracted from the exchange positions on the clay minerals but that in a number of cores solution of iron from concretions has resulted in a higher amount of extracted iron found in the solution than would have been found if the concretions had not been there. A relatively small amount of iron will also be dissolved from thin brown/orange coatings, which can be seen on the grains in most cores.

The frequency distribution curve of t_{Fe} does not show a maximum between 0.0 and 0.3 and decreases towards higher values. This is as could be expected from fig. 31 and fig. 32.

Conclusions

The cores discussed in this report present a wide variety of types, ranging from coarse grained to fine grained and from predominantly organogene carbonate composition to predominantly mineral composition, while two cores contain a relatively large amount of amorphous (organogene) silica. Also the composition of the clay fraction varies widely, resulting in a broad range of values for base exchange capacity.

Extracts were made with a series of solutions ranging from acetate buffer and 0.1 NHCl up to conc. HCl. The extracts were analysed for Na, K, Ca, Mg and Fe. For these elements two fractions can be distinguished, apart from the amounts firmly fixed within the crystal structure of the particles: an easily removable fraction, extracted with 0.1 NHCl and a more difficultly removed fraction, extracted with conc. HCl. The amounts thus extracted are present in the sediment as follows:

<u>Na</u>: easily soluble: mainly in exchange positions on clay minerals,
difficultly soluble: in structural positions in the grains (or adsorbed?),

<u>K</u>: easily soluble: adsorbed to the particles and partly also in exchange positions on clay minerals,
difficultly soluble: partly in exchange positions on clay minerals, partly in structural positions in the grains (in some cores for a large part in clay minerals).

<u>Ca</u>: easily soluble: calcium carbonate (some in exchange positions?),
difficultly soluble: absent, except in three cores,

<u>Mg</u>: easily soluble: as carbonate (some in exchange positions?)
difficultly soluble: in structural positions in the grains (or adsorbed?),

<u>Fe</u>. easily soluble: mainly in exchange positions on clay minerals (some in concretions and in thin coatings on the grains),
difficultly soluble: partly in exchange positions on clay minerals, partly in clay minerals (some also in concretions and probably some in coatings).

Program for further work

As stated above this study is not yet completed. In the course of 1969 the following analyses will be carried out:

a. direct determination of base exchange capacity for as many cores as possible,

b. more precise determination of particle composition (mainly by X-ray diffraction and some chemical analysis),

c. analysis of 20 sediment cores and samples received during 1968.

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TABLE I

Composition of the fraction >25 μ

Sample nr.	size fraction	% weight	Composition
I - 1	>250 μ	0.14	mostly soft brown concretions (tubeform mainly: worm tubes? also fragments), so[illegible] foraminifera, some mineral grains, mica.
	63-250 μ	6.46	mostly mineral grains, mica, some foraminifera, rather many fibers (plant remains?), many brown loose concretions.
	25-63 μ	11.42	as 63-250 μ, but no foraminifera and f[illegible] fibers.
I - 5	>250 μ	0.03	mainly foraminifera, a few mineral grains
	63-250 μ	3.27	mostly mineral grains, some foraminifer[illegible], an ostracode, many mica grains, some brown concretions (less soft than in sample 1).
	25-63 μ	11.32	as 63-250 μ, but no foraminifera; a few fibers.
I - 10	>250 μ	0.22	foraminifera and a few pteropods
	63-250 μ	1.64	mostly mineral grains, some foraminifer[illegible] pteropods, a few black pieces of wood.
	25-63 μ	7.17	as 63-250 μ but very few foraminifera (mainly some fragments).

I - 15	>250 μ	0.70	mainly foraminifera, some mineral grains, an ostracode, a small piece of wood, a brown concretion
	63-250 μ	4.18	mainly mineral grains, many foraminifera and pteropods, a few fragments of radiolarians, some brown concretions (harder than in sample 1), some pieces of wood.
	25-63 μ	6.75	as 63-250 μ but less foraminifera and virtually no pteropods.
II - 16	>250 μ	7.06	foraminifera pteropods (many broken) all filled with light yellow-brown clay.
	63-250 μ	6.82	as 250 μ, a few mineral grains
	25-63 μ	3.56	as 63-250 μ but mainly fragments, somewhat more mineral grains.
II - 18	>250 μ	12.86	mainly foraminifera, some soft yellow concretions (sometimes a foraminifer is visible as nucleus), a few pteropods, an ostracode.
	63-250 μ	7.53	as 250 μ, somewhat more remains of pteropods, a few pelecypods, a few fragments of radiolarians.
	25-63 μ	3.23	as 63-250 μ but mainly fragments, some light dark brown pieces (wood?).

II - 21	> 250 μ	1.77	mainly foraminifera, some pteropods and ostracods, many yellow concretions, so... rather hard with a brown nucleus formed around a white foraminifer. Concretions all branching forms.
	63-250 μ	2.29	mainly foraminifera, some yellow concre-tions, some pteropods.
	25-63 μ	1.78	foraminifera (mainly fragments), some concretions.
III - 22	> 250 μ	0.14	mainly foraminifera, some concretions (worm tubes?) a few mineral grains.
	63-250 μ	0.70	many foraminifera, many mineral grains, many mica, some pteropods, brown con-cretions, fibers, dark wood-like parti-cles.
	25-63 μ	6,99	mainly mineral grains, many fibers (li... and dark coloured).
III - 25	> 250 μ	0.01	foraminifera, a quartz grain, a soft da... grey concretion.
	63-250 μ	0.16	mainly foraminifera, some mineral grai...
	25-63 μ	1.65	mainly mineral grains, many mica grain... black fibers (wood?).
III - 29	> 250 μ	1.27	foraminifera, pteropods, a few dark gr... concretions (worm tubes?).
	63-250 μ	1.72	mainly foraminifera, and pteropods, so... mineral grains (a few mica), some dark grey concretions.
	25-63 μ	5.28	mainly mineral grains, some foramini... (mainly fragments), rather many mica ...

IV - 31	>250 µ	0.05	fragments of pteropods.
	63-250 µ	2.88	mainly brown grey brittle flakes (insolu in conc. HCl), some mineral grains, diatoms, spiculae (sponges?).
	25-63 µ	12.31	as 63-250 µ.
IV - 34	>250 µ	0.01	mainly foraminifera, some diatoms, a soft orange-brown concretion.
	63-250 µ	7.34	mainly brown-grey flakes, some diatoms.
	25-63 µ	10.49	as 63-250 µ.
IV - 37	>250 µ	0.06	browngrey flakes, a clear brown-orange concretion.
	63-250 µ	7.51	mainly brown-grey flakes, some mineral grains, some diatoms, an orange brown concretion.
	25-63 µ	12.43	as 63-250 µ.
IV - 40	>250 µ	0.07	brown-grey flakes, some orange-brown concretions.
	63-250 µ	13.28	as >250 µ.
	25-63 µ	16.41	as >250 µ.
IV - 44	>250 µ	0.01	browngrey flakes, some orange-brown concretions.
	63-250 µ	6.98	as >250 µ.
	25-63 µ	11.07	as >250 µ, some mica, mineral grains.
IV - 49	>250 µ	0.02	browngrey flakes, an orange-brown concretion.
	63-250 µ	13.24	mainly brown-grey flakes, a few orange-brown concretions, some mica grains, a few diatoms, some mineral grains.

	25-63 μ	14.11	as 63-250 μ, more mineral grains.
V - 55	>250 μ	0.05	foraminifera, brown grey flakes, fibers,
	63-250 μ	1.00	mineral grains, flakes, dark grey soft c cretions, pieces of wood, orange-brown concretions.
	25-63 μ	4.51	as 63-250 μ.
V - 58	>250 μ	0.05	mineral grains, fibers
	63-250 μ	0.82	mineral grains, brown-yellow brittle grains, dark grey concretions, a few foraminifera, some fibers
	25-63 μ	2.57	as 63-250 μ.
V - 63	>250 μ	0.15	fibers, a mineral grain, a black-grey concretion, an orange-brown concretion.
	63-250 μ	0.66	mainly mineral grains, some yellow brittle grains, grey-black concretions.
	25-63 μ	2.17	as 63-250 μ.
V - 68	>250 μ	0.10	foraminifera, a brown concretion, a grey black concretion
	63.250 μ	1.19	mainly mineral grains, many brown brit grains, some grey-black concretions.
	25-63 μ	3.94	as 63-250 μ, but more mica.
V - 73	>250 μ	0.05	broken foraminifera, a brown concretio
	63-250 μ	0.14	mineral grains, brown brittle grains, s grey-black concretions.
	25-63 μ	9.80	as 63-250 μ but more mica.

V - 79	>250 μ	0.29	orange-brown concretions, a quartz grain.
	63-250 μ	1.30	brown-orange brittle grains, mineral grains some grey-black concretions.
	25-63 μ	3.73	mainly mineral grains, many brown-orange brittle grains.
VI - 81	>250 μ	0.26	shell fragments, a foraminifera, a brownish concretion, a few quartz grains, some mica.
	63-250 μ	39.10	mainly mineral grains, some diatoms, some brown-orange and grey-black concretions.
	25-63 μ	31.68	as 63-250 μ but many mica grains.
VI - 83	>250 μ	0.04	mainly fibers, a mineral grain, an orange concretion, a grey-black concretion.
	63-250 μ	36.83	mainly mineral grains, some diatoms, some brown-orange and grey-black concretions.
	25-63 μ	29.29	as 63-250 μ, many mica grains.
VII - 85	>250 μ	0.07	mineral grains, a shell fragment, an ostracode.
	63-250 μ	6.16	mainly mineral grains, some yellow-brown brittle grains, some grey-black concretions, rather many mica grains.
	25-63 μ	10.95	as 63-250 μ
VII - 88	>250 μ	0.19	mineral grains, orange-brown concretions.
	63-250 μ	9.11	mainly mineral grains, some yellow brown brittle grains, some gray-black concretions, many mica grains.
	25-63 μ	15.42	as 63-250 μ.

VII - 92	>250 μ	0.66	mineral grains, orange-brown concretions, an ostracode.
	63-250 μ	15.93	mainly mineral grains, some brown brittle grains, some black brittle grains (shiny surface)!
	25-63 μ	18.05	as 63-250 μ.
VII - 96	>250 μ	0.14	orange-brown concretions, a few foreminifer
	63-250 μ	1.86	mineral grains, orange-brown concretions many mica grains.
	25-63 μ	9.39	as 63-250 μ.
VIII-100	>250 μ	0.49	orange-brown concretions, a foraminifer, a quartz grain.
	63-250 μ	2.96	mineral grains, orange-brown concretions many mica grains.
	25-63 μ	9.34	as 63-250 μ.
VIII-102	>250 μ	0.34	brown brittle grains.
	63-250 μ	3.87	mainly brown brittle grains, many mineral grains, some brown concretions, a few pelecypods, spiculae.
	25-63 μ	35.98	as 63-250 μ.
VIII-107	>250 μ	0.63	mainly brown brittle grains, some ostracods and foraminifera, some fibers.
	63-250 μ	13.40	mainly brown brittle grains, many mineral grains, some ostracods, some brown concretions, fibers.
	25-63 μ	15.40	as 63-250 μ but more concretions.

VIII-112	> 250 µ	0.60	brown brittle grains, some fibers
	63-250 µ	10.79	mainly brown brittle grains, some mineral grains, fibers.
	25-63 µ	9.88	as 63-250 µ.
VIII-117	> 250 µ	0.03	orange concretions, some yellow-grey brittle grains, an ostracode.
	63-250 µ	0.26	mineral grains, yellow-grey brittle grains, some orange concretions, some fibers
	25-63 µ	1.25	Mainly yellow grey brittle grains, some orange concretions, some mineral grains, some fibers.
VIII-126	> 250 µ	0.06	yellow-grey brittle grains, some ostracods, some fibers, a quartz grain
	63-250 µ	0.75	yellow-grey brittle grains, many orange concretions, some mineral grains, fibers.
	25-63 µ	2.43	as 63-250 µ but less concretions.
X - 146	> 250 µ	0.08	foraminifera
	63-250 µ	0.59	foraminifera, many micronodules, some yellow brown brittle grains, a few orange-brown concretions, some mineral grains(?).
	25-63 µ	0.94	mainly yellow-brown brittle grains, some foraminifera, few mineral (?) grains.
X - 149	> 250 µ	0.09	grey-white brittle grains, some mineral grains.
	63-250 µ	0.59	yellow-grey-white brittle grains, micronodules, some mineral grains, orange brown concretions, fibers.
	25-63 µ	1.40	as X-146-25 µ, no foraminifera.

X - 152	> 250 μ	0.01	micronodules, a few fragments with Mn-coating
	63-250 μ	0.25	micronodules, some yellow-brown brittle grains, some mineral grains, fibers.
	25-63 μ	1.12	as X-149-25 μ.
X - 156	> 250 μ	0.25	micronodules
	63-250 μ	0.54	mainly micronodules, some brown brittle grains, some orange-brown concretions, mineral grains, fibers.
	25-63 μ	0.63	as X-152-25 μ, more micronodules.
X - 161	> 250 μ	0.38	micronodules
	63-250 μ	1.14	mainly micronodules, many mineral grains, some orange-brown concretions, a few yellow-brown grains.
	25-63 μ	0.73	yellow-brown brittle grains, mineral grains, some micronodules.
X - 166	> 250 μ	0.67	micronodules
	63-250 μ	1.88	mainly micronodules, some mineral grains, a few yellow-brown grains, some fibers
	25-63 μ	2.27	as X-161-25 μ, less micronodules.
X - 170	> 250 μ	0.47	micronodules, a few yellow-brown grains.
	63-250 μ	1.65	as X-166-63 μ, a forminifera
	25-63 μ	2.45	mainly yellow-brown brittle grains, few mineral grains and micronodules.

- 172	> 250 µ	17.46	foraminifera, many broken, some with iron coating.
	63-250 µ	10.17	foraminifera, many fragments.
	25-63 µ	6.29	foraminifera, mainly fragments.
XI - 175	> 250 µ	12.95	foraminifera, pteropods, fragments, some pelecypods, some particles with coating.
	63-250 µ	15.96	as > 250 µ.
	25-63 µ	5.70	as > 250 µ.
XI - 178	> 250 µ	12.50	foraminifera, pteropods, fragments.
	63-250 µ	13.65	as > 250 µ, more fragments.
	25-63 µ	3.93	as 63-250 µ.
XI - 182	> 250 µ	15.24	foraminifera, pteropods, fragments, many grains with black-brown coating.
	63-250 µ	15.35	as > 250 µ, more fragments
	25-63 µ	4.79	as 63-250 µ.
XI - 187	> 250 µ	12.59	foraminifera, few pteropods.
	63-250 µ	11.82	as > 250 µ, more fragments.
	25-63 µ	3.73	as 63-250 µ.
XI - 191	> 250 µ	13.74	foraminifera, few pteropods, some coati...
	63-250 µ	12.68	as > 250 µ, more fragments
	25-63 µ	5.02	as 63-250 µ.
XI - 195	> 250 µ	12.92	foraminifera, very few pteropods, fragments.
	63-250 µ	11.87	as > 250 µ, more fragments.
	25-63 µ	4.30	as 63-250 µ.

XII - 197	>250 µ	12.21	foraminifera, hard dull-white grains, some spiculae, spines, a few bryozoa and pelecypods.
	63-250 µ	32.12	dull-white grains, foraminifera, some spiculae, a few mineral grains.
	25-63 µ	34.64	as 63-250 µ.
XII - 199	>250 µ	0.46	foraminifera, pteropods, some soft egg-shaped aggregates (pseudofaeces?), a few mineral grains (some with brown coating), a few spiculae, some ostracods.
	63-250 µ	27.39	dull-white grains, ostracods, foraminifera, pteropods, some spiculae.
	25-63 µ	30.36	as 63-250 µ.
XII - 203	>250 µ	0.40	foraminifera, pteropods, ostracods, soft egg-shaped aggregates.
	63-250 µ	32.64	hard dull-white grains, soft egg-shaped aggregates, foraminifera, ostracods, pteropods, spiculae.
	25-63 µ	29.03	mainly dull-white grains, some foraminifera, a few grains with brown coating.
XII - 207	>250 µ	0.78	foraminifera, pteropods, a few spiculae, some grains with brown coating.
	63-250 µ	39.92	dull-white grains, foraminifera, pteropods, spiculae.
	25-63 µ	29.58	as 63-250 µ, some mineral grains.
XII - 212	>250 µ	0.66	foraminifera, pteropods, an ostracode.
	63-250 µ	40.41	dull-white grains, foraminifera, pteropods, ostracods, some mineral grains.
	25-63 µ	22.71	as 63-250 µ.

XII - 216	> 250 μ	0.89	foraminifera, pteropods, a dull-white gra[...]
	63-250 μ	28.81	dull-white grains, foraminifera, pteropods
	25-63 μ	29.09	as 63-250 μ.
XII - 222	> 250 μ	0.69	foraminifera, pteropods, some ostracods, pelecypods, some grains with brown coating
	63-250 μ	30.16	mainly dull-white grains, foraminifera, some pteropods, ostracods, pelecypods.
	25-63 μ	24.94	as 63-250 μ, some mineral grains.
XIII	> 250 μ	0.67	fibers, some foraminifera, pteropods, pelecypods, gastropods, a few grey-black concretions, some pieces of limestone, some bryozoa, ostracods, fragments, some mineral grains.
	63-250 μ	9:55	as 250 μ, more mineral grains.
	25-63 μ	18.31	more mineral grains, many fibers, many organic ($CaCO_3$) fragments.
XIV	> 250 μ	1.38	mainly fibers, as XIII (> 250 u).
	63-250 μ	13.62	as 250 u, but about 50% mineral grains.
	25-63 μ	30.65	as 63-250 μ.
XV	> 250 μ	0.24	foraminifera, some pteropods, some pelecypods, some orange-brown concretions, a [...] shell particles, ostracods.
	63-250 μ	2.34	about 50% mineral grains, foraminifera, orange-brown concretions.
	25-63 μ	8.81	mainly mineral grains, some orange-brown concretions, brown brittle grains, rather many mica grains, fibers.

XVI	>250 μ	0.18	foraminifera, fragments, brown concretions, (worm-tubes? sometimes branching)
	63-250 μ	0.71	foraminifera, fragments, some brittle grains mineral grains, pteropods, fibers, brown concretions.
	25-63 μ	4.21	mainly mineral grains, some foraminifera, brownish concretions, fibers.
XVII	>250 μ	0.18	foraminifera, tube-like brown concretions, grey-black round concretions (hard shell, softer, brittle inside).
	63-250 μ	0.86	mainly foraminifera and fragments, many mineral grains, some brown concretions (some tubes), grey-black concretions, some fibers.
	25-63 μ	3.37	mainly mineral grains, some foraminifera, brownish concretions, fibers.
XVIII	>250 μ	0.19	many fibers, many mica grains, some limestone pieces, shell fragments, foraminifera.
	63-250 μ	9.88	mainly mineral grains, many mica grains, many fibers, some orange-brown concretions.
	25-63 μ	11.55	as 63-250 μ, much more mica.
XIX	>250 μ	29.67	some rock fragments, mica, some brittle concretions, dark (Mn?) coating, angular soft aggregates.
	63-250 μ	37.98	mainly mineral grains, some soft aggregates, some foraminifera and radiolarians.
	25-63 μ	7.58	as 63-250 μ.

XX	>250 µ	22.65	foraminifera (few broken)
	63-250 µ	12.35	foraminifera (few broken)
	25-63 µ	4.43	foraminifera, many fragments, some black fiber-like particles (chitine?).
XXI	>250 µ	5.48	foraminifera, some ostracods
	63-250 µ	11.20	as 250 µ, many fragments, some radiolarians
	25-63 µ	13.62	mainly mineral grains, many yellow brittle grains.
XXII - 224	>250 u	4.49	foraminifera
	63-250 µ	33.74	mainly yellowish-white brittle flakes, foraminifera and fragments.
	25-63 µ	18.17	as 63-250 µ, less foraminifera and fragments.
XXII - 229	>250 µ	10.34	foraminifera, a few ostracods and spines.
	63-250 µ	26.63	yellow-white flakes, foraminifera, some mica grains.
	25-63 µ	12.70	as 63-250 µ, some orange-brown concretions.
XXII - 234	>250 µ	2,08	foraminifera
	63-250 µ	30.41	mainly yellow-white brittle flakes, some mica, foraminifera, fragments.
	25-63 µ	29.74	as 63-250 µ, some orange-brown concretion
XXIII-236	>250 µ	23.82	foraminifera
	63-250 µ	17.88	foraminifera and fragments
	25-63 µ	7.63	as 63-250 µ.

XXIII-240	>250 μ	73.41	foraminifera, a few ostracods
	63-250 μ	13.28	foraminifera,
	25-63 μ	2.23	foraminifera, mainly fragments, a few black shiny concretions.
XXIII-245	>250 μ	10.17	foraminifera
	63-250 μ	18.73	foraminifera, fragments
	25-63 μ	9.52	as 63-250 μ, many dull-white grains
XXIV-247	>250 μ	56.87	dark-grey loose aggregates (flakes), some foraminifera
	63-250 μ	21.82	as >250 μ
	25-63 μ	2.61	as >250 μ.
XXIV-252	>250 μ	43.29	dark-grey loose aggregates (flakes), some foraminifera
	63-250 μ	35.62	as >250 μ, some orange-brown concretions
	25-63 μ	3.32	as 63-250 μ, some mineral grains, some mica
XXIV-257	>250 μ	1.07	dark-grey loose aggregates (flakes), some foraminifera, some orange-brown concretions
	63-250 μ	61.84	as 250 μ, some mica
	25-63 μ	9.25	as 250 μ, somewhat more mica
XXV	>250 μ	23.62	mineral grains, rock fragments, some foraminifera, ostracods, fibers
	63-250 μ	4.07	yellow brittle grains, mineral grains, foraminifera, ostracods, orange-brown and black shiny concretions, fibers fragments
	25-63 μ	4.82	mainly mineral grains, many yellow brittle grains, some fibers, orange-bro concretions

XXVI	> 250 μ	0.08	many fibers, some foraminifera, a few orange-brown concretions, black concretio[ns], shell fragments
	63-250 μ	20.13	mainly mineral grains, many fibers, some pieces of limestone, some orange-brown concretions, some black concretions, some spiculae
	25-63 μ	37.25	as 63-250 μ, some mica
XXIX-285	> 250 μ	0.06	brownish brittle grains, Mu-coating on a foraminifer
	63-250 μ	1.09	orange-brown aggregates, a few foraminifer[a]
	25-63 μ	0.13	mineral grains(?), yellowish aggregates, black concretions
XXIX-293	> 250 μ	0.06	foraminifera, brown yellow aggregates
	63-250 μ	0.83	mainly brown-yellow aggregates, some micronodules, a few foraminifera
	25-63 μ	0.17	mineral grains(?), yellowish aggregates.
XXIX-303	> 250 μ	0.15	a foraminifera, a quartz grain, 2 pelecy-pods
	63-250 μ	0.21	mainly yellow-brown aggregates, some micronodules, a few foraminifera, some "mineral"(?) grains ("mineral" grain is: sharp edged transpar[ent] flakes, silicious).
	25-63 μ	0.17	as 63-250 μ.
XXIX-313	> 250 μ	0.09	foraminifera, yellow-brown aggregates
	63-250 μ	0.17	mainly aggregates, some foraminifera, so[me] fibers
	25-63 μ	0.06	mainly aggregates, some mineral(?) grain

XXIX-323	> 250 μ	0.08	a few aggregates
	63-250 μ	0.46	brownish aggregates, a few "mineral" grai[ns] some radiolarians
	25-63 μ	0.29	as 63-250 μ, some micronodules
XXIX-333	> 250 μ	0.05	micro-nodules, brown-yellow aggregates, foraminifera
	63-250 μ	0.18	mainly micronodules, some aggregates, some loose soft aggregates
	25-63 μ	0.22	mainly micronodules, brown-yellow aggrega[tes] (or brittle grains), some "mineral" grains.
XXIX-343	> 250 μ	0.35	pteropods
	63-250 μ	0.25	brown-yellow aggregates, many micronodules, some foraminifera and fragments
	25-63 μ	0.28	as 63-250 μ, some "mineral" grains and fragments of radiolarians
XXX-345	> 250 μ	0.08	brown-yellow aggregates, micronodules, a quartz grain
	63-250 u	1.93	brown-yellow sticky aggregates, a quartz grain with dark coating
	25-63 μ	0.70	as 63-250 μ, some mineral grains, a pelecypod.
XXX-353	> 250 μ	0.03	foraminifera, fragments
	63-250 μ	0.05	yellow brittle grains, some foraminifera, mineral grains
	25-63 μ	0.17	as 63-250 μ

XXX-361	> 250 µ	0.10	orange-brown aggregates, a few foraminifera
	63-250 µ	0.76	orange-yellow aggregates (round, angular, long [illegible], or spool form)
	25-63 µ	0.61	as 63-250 µ, some mineral grains, mica
XXXI-363	> 250 µ	13.65	mineral grains, dark grey concretion, orange concretions, a few foraminifera, a diatom.
	63-250 µ	31.94	white brittle flakes, many diatoms, dark black nodules, mineral grains
	25-63 µ	11.31	many diatoms, spiculae, white brittle flakes, mineral grains
XXXI-371	> 250 µ	9.09	as XXXI-363
	63-250 µ	35.38	" " " "
	25-63 µ	14.95	" " " "
XXXI-381	> 250 µ	21.41	as XXXI-363
	63-250 µ	33.15	as XXXI-363
	25-63 µ	9.20	as XXXI-363
XXXII-384	> 250 µ	8.81	foraminifera
	63-250 µ	11.84	foraminifera, many radiolarians and fra[illegible]
	25-63 µ	7.63	as 63-250 µ, more radiolarians.
XXXII-391	> 250 µ	12.11	foraminifera, a radiolarian
	63-250 µ	14.37	foraminifera, many radiolarians (many fragments), spiculae
	25-63 µ	6.56	as 63-250 µ, more radiolarians (spiculae)
XXXII-399	> 250 µ	18.73	as XXXII-391
	63-250 µ	22.98	as XXXII-391
	25-63 µ	9.08	as XXXII-391

XXXIII-428	> 250 µ	0.56	foraminifera, some pteropods, a few pele cypods
	63-250 µ	1.25	foraminifera, dull white grains, some pte ropods, radiolarians, mica. Some brown-o coating on some grains.
	25-63 µ	8.13	mainly dull white grains, many mineral grains, some mica.
XXXIII-433	> 250 µ	1.09	foraminifera, a few with orange-brown coating
	63-250 µ	2.09	foraminifera, fragments, spiculae, mineral grains, some mica
	25-63 µ	12.10	mainly mineral grains, some foraminifera, dull white grains, fragments
XXXIII-440	> 250 µ	0.40	foraminifera
	63-250 µ	7.50	dull white grains, a few foraminifera and mineral grains
	25-63 µ	20.27	as 63-250 µ, a few spiculae
XXXIII-447	> 250 µ	1.41	foraminifera
	63-250 µ	3.08	foraminifera, many fragments, mica
	25-63 µ	10.98	as 63-250 µ, many mineral grains
XXXIII-454	> 250 µ	2.17	foraminifera, some orange-brown coating
	63-250 µ	1.49	foraminifera, fragments, some orange-brow coating and concretions
	25-63 µ	5.84	many mineral grains and dull white grai many foraminifera, fragments, some spic

XXXIII-462	> 250 µ	0.20	foraminifera, an ostracod, pteropods, a quartz grain
	63-250 µ	5.35	foraminifera, dull white grains, some orange-brown concretions
	25-63 µ	4.40	mainly dull white grains, many mineral grains, some orange-brown concretions
XXXIV-465	> 250 µ	0.09	foraminifera, an orange-brown concretion, a quartz grain
	63-250 µ	2.15	mainly mineral grains, some foraminifera, a few orange-brown concretions, a few micronodules
	25-63 µ	9.73	as 63-250 µ, some spiculae
XXXIV-474	> 250 µ	0.07	foraminifera
	63-250 µ	3.34	mainly mineral grains, some foraminifera, yellow brittle grains, spiculae, mica
	25-63 µ	12.28	as 63-250 µ, few foraminifera
XXXIV-483	> 250 µ	0.05	foraminifera, an ostracode
	63-250 µ	4.03	mainly mineral grains, some foraminifera, yellow brittle grains, mica, yellow-oran… concretions, spiculae, fibers
	25-63 µ	15.25	as 63-250 µ, but very few foraminifera.
XXXIV-493	> 250 µ	0.09	foraminifera, some ostracods, fibers, an orange-brown concretion
	63-250 µ	4.56	mainly mineral grains, some foraminifera, spiculae, orange-brown coating, pelecypo…
	25-63 µ	12.70	mainly mineral grains, as 63-250 µ.

XXXIV-504	> 250 μ	0.17	foraminifera, some loose soft grey aggregates, pteropods, fragments, some orange-brown coating
	63-250 μ	3.57	mainly mineral grains, lightgrey soft aggregates, some orange-brown coating and concretions, foraminifera, fragments mica
	25-63 μ	12.23	as 63-250 μ, few foraminifera, many mica grains
XXXV-512	> 250 μ	8.06	mainly brown-grey soft aggregates, a few brown-yellow brittle grains, some black concretions, some fragments
	63-250 μ	12.86	mainly brown brittle grains, some black concretions, some dull white grains spiculae
	25-63 μ	11.20	many brown-yellow brittle grains, many spiculae
XXXV-521	> 250 μ	1.08	micronodules, many brown-yellow brittle grains
	63-250 μ	7.34	mainly brown-yellow grains, some micronodules, many spiculae
	25-63 μ	5.25	many spiculae, many brown-yellow grains
XXXV-530	> 250 μ	1.93	micronodules, brown yellow brittle aggregates, a foraminifera
	63-250 μ	13.01	mainly yellow brown grains, some micronodules, foraminifera, many spiculae
	25-63 μ	7.85	many brown-yellow grains, many spiculae, some mineral grains(?).

XXXV-540	> 250 µ	1.81	micronodules, yellow brown brittle aggregates
	63-250 µ	16.93	mainly yellow-brown grains, some micronodules, mineral grains, spiculae
	25-63 µ	8.62	mainly yellow-brown grains, many spiculae
XXXV-550	> 250 µ	0.90	micronodules, yellow-brown aggregates
	63-250 µ	11.15	yellow-brown grains, spiculae, some micronodules and mineral grains
	25-63 µ	14.68	many spiculae, some yellow brown grains, mineral grains
XXXV-560	> 250 µ	0.97	micronodules, yellow-brown brittle aggregates
	63-250 µ	8.44	mainly yellow-brown grains, many spiculae, some micronodules, mineral grains
	25-63 µ	9.45	mainly spiculae, many brown yellow grains, some mineral grains
XXXV-570	> 250 µ	0.40	micronodules, yellow-brown grains, a foraminifera, a pteropod
	63-250 µ	6.20	mainly yellow-brown grains, many micronodules, spiculae
	25-63 µ	8.66	as 63-250 µ, more spiculae
XXXVI-572	> 250 µ	0.14	mainly pteropods, many foraminifera
	63-250 µ	2.06	mainly foraminifera, some pteropods, some orange grains
	25-63 µ	3.16	mainly foraminifera, many fragments, some yellow-orange grains, mineral grains

XXXVI-579	>250 μ	2.07	light brown loose aggregates (flakes), foraminifera, pteropods
	63-250 μ	14.42	as >250 μ
	25-63 μ	6.49	as >250 μ, less foraminifera
XXXVI-582	>250 μ	1.71	pteropods, foraminifera, fragments, some spines
	63-250 μ	2.02	foraminifera, fragments, some mineral gr mica
	25-63 μ	3.63	many mineral grains, many foraminifera, fragments, some dull white grains, some orange-brown coating
XXXVI-586	>250 μ	1.11	foraminifera, some pteropod fragments, ostracods.
	63-250 μ	3.58	foraminifera, pteropods, some orange concretions, some mineral grains, mica
	25-63 μ	6.88	mainly mineral grains, some orange concretions, foraminifera.
XXXVII-589	>250 μ	6.54	foraminifera
	63-250 μ	19.19	foraminifera, fragments
	25-63 μ	4.04	as 63-250 μ
XXXVII-595	>250 μ	11.44	foraminifera
	63-250 μ	23.15	foraminifera, fragments
	25-63 μ	4.06	foraminifera, mainly fragments
XXXVIII-598	>250 μ	3.04	foraminifera, a quartz grain
	63-250 μ	10.46	foraminifera, fragments
	25-63 μ	3.73	as 63-250 μ.

[illegible]II-604	> 250 μ	2.82	foraminifera
	63-250 μ	8.32	foraminifera, some fragments, ostr[illegible]
	25-63 μ	4.00	as 63-250 μ, more fragments
XXXIX-608	> 250 μ	4.17	foraminifera
	63-250 μ	14.78	foraminifera, many fragments
	25-63 μ	4.11	as 63-250 μ, some spiculae
XXXIX-612	> 250 μ	2.77	foraminifera, some ostracods
	63-250 μ	8.41	as > 250 μ
	25-63 μ	2.55	as > 250 μ, some fragments
XL - 615	> 250 μ	9.80	foraminifera, pteropods, brown and yellow concretions
	63-250 μ	15.05	foraminifera, pteropods, fragments, many brown and yellow-orange grains.
	25-63 μ	7.58	as 63-250 μ
XL - 622	> 250 μ	18.72	foraminifera, pteropods, some yellow-brown brittle grains
	63-250 μ	26.08	foraminifera, many fragments, many orange-brown grains
	25-63 μ	16.46	as 63-250 μ, spiculae, mica
XL - 627	> 250 μ	1.18	foraminifera, pteropods, some brown concretions
	63-250 μ	2.21	as > 250 μ, fragments
	25-63 μ	2.62	mainly brown concretions, few foraminifera, fragments, some mineral grains

XL - 638	> 250 μ	1.18	foraminifera, pteropods, brown brittle aggregates
	63-250 μ	3.90	mainly brown aggregates, foraminifera, pteropods, mica
	25-63 μ	5.18	as 63-250 μ, few foraminifera, no pteropods.
XLI - 642	> 250 μ	15.27	foraminifera, a quartz grain
	63-250	24.09	foraminifera, fragments, a few quartz grains
	25-63 μ	7.63	as 63-250 μ.
XLI - 650	> 250 μ	20.21	foraminifera
	63-250 μ	23.60	foraminifera, fragments
	25-63 μ	7.35	as 63-250 μ.

TABLE III

Grain size frequency distributions after treatment with only H_2O_2 and after treatment with H_2O_2 and Na-pyro phosphate.

Core nr.	sample nr.	% $2<\mu$	% 2-16 μ	% 16-25 μ	% $25>\mu$	
I	1	3.66	52.20	23.91	20.23	H_2O_2
	1	23.56	29.25	22.74	24.45	H_2O_2 + pept.
II	16	5.29	57.64	21.36	15.71	H_2O_2
	16	39.71	24.53	19.10	16.66	H_2O_2 + pept.
III	22	6.48	52.52	28.21	12.79	H_2O_2
	22	28.74	29.19	31.58	10.49	H_2O_2 + pept.
IV	31	20.76	31.46	32.42	15.36	H_2O_2
	31	35.48	41,54	17.55	5.43	H_2O_2 + pept.
	34	32.67	26.22	25.04	16.07	H_2O_2
	34	36.19	33,86	26.27	3.68	H_2O_2 + pept.
V	55	25.56	48.81	21.59	4.04	H_2O_2
	55	38.48	35.56	22.28	3.68	H_2O_2 + pept.
	63	45.09	34.09	18.14	2.68	H_2O_2
	63	41.14	37.11	19.08	2.67	H_2O_2 + pept.
VI	81	3.16	3.07	20.84	72.93	H_2O_2
	81	1.77	2.29	22.69	73.25	H_2O_2 + pept.
VII	85	33.71	17.62	32.36	16.31	H_2O_2
	85	32.46	20.44	31.78	15.32	H_2O_2 + pept.
VIII	102	7.46	10.66	41.28	40.60	H_2O_2
	102	16.70	9.63	39.68	33.99	H_2O_2 + pept.
	107	12.43	36.15	20.48	30.94	H_2O_2
	107	29.85	27.64	22.42	20.09	H_2O_2 + pept.
X	145	2.55	37.34	59.21	0.90	H_2O_2
	145	31.65	10.78	57.06	0.51	H_2O_2 + pept.

	147	5.94	34.52	59.12	0.42	H O
	147	29.68	11.95	57.95	0.42	H_2O_2 + pept.
XI	172	2.29	32.78	26.52	38.41	H_2O_2
	172	27.03	10.49	26.91	35.57	H_2O_2 + pept.
	175	1.34	34.19	28.95	35.52	H_2O_2
	175	24.61	14.37	25.67	35.35	H_2O_2 + pept.
XII	197	1.68	3.02	13.55	81.75	H_2O_2
	197	2.48	2.22	11.90	83.40	H_2O_2 + pept.
	199	5.65	3.07	30.52	60.76	H_2O_2
	199	5.68	5.36	31.89	57.07	H_2O_2 + pept.
XIII	-	3.09	10.72	57.38	28.81	H_2O_2
	-	6.47	9.12	54.40	30.01	H_2O_2 + pept.
XIV	-	2.60	17.71	35.59	44.10	H_2O_2
	-	9.05	13.79	32.07	45.09	H_2O_2 + pept.
XV	-	0.43	62.27	23.36	13.94	H_2O_2
	-	24.02	37.93	23.39	14.66	H_2O_2 + pept.
XVI	-	2.85	79.84	10.97	6.34	H_2O_2
	-	36.60	45.70	11.31	6.39	H_2O_2 + pept.
XVII	-	6.82	74.74	12.83	5.61	H_2O_2
	-	39.81	41.34	13.26	5.59	H_2O_2 + pept.
XVIII	-	1.48	19.44	56.35	22.73	H_2O_2
	-	10.46	12.11	56.65	20.78	H_2O_2 + pept.
XIX	-	4.87	1.32	15.37	78.44	H_2O_2
	-	4.72	5.10	18.56	71.62	H_2O_2 + pept.
XX	-	0.57	10.82	50.80	37.81	H_2O_2
	-	10.00	2.76	52.54	34.70	H_2O_2 + pept.
XXI	-	13.20	23.66	33.76	29.38	H_2O_2
	-	23.13	16.07	35.22	25.58	H_2O_2 + pept.
XXII	224	7.82	8.86	32.31	51.01	H_2O_2
	224	41.30	0.39	33.13	25.18	H_2O_2 + pept.

	229	4.86	7.99	34.98	52.17	H_2O_2
	229	18.01	9.61	35.55	36.83	H_2O_2 + pept.
XXIII	236	7.77	5.52	35.39	51.32	H_2O_2
	236	11.37	3.78	31.97	52.88	H_2O_2 + pept.
	245	1.76	6.62	51.19	40.43	H_2O_2
	245	17.90	20.61	18.49	43.00	H_2O_2 + pept
XXIV	252	0.47	0.49	15.72	83.32	H_2O_2
	252	62.57	4.29	30.78	2.36	H_2O_2 + pept.
XXV	-	0.23	29.98	36.28	33.51	H_2O_2
	-	17.92	5.79	41.23	35.06	H_2O_2 + pept.
XXVI	-	0.67	6.37	28.72	64.24	H_2O_2
	-	3.25	5.20	27.17	64.38	H_2O_2 + pept.
XXIX	285	63.39	26.74	8.62	1.25	H_2O_2
	285	63.22	33.10	2.46	1.22	H_2O_2 + pept.
	293	67.10	23.49	9.29	0.12	H_2O_2
	293	59.69	32.42	7.51	0.38	H_2O_2 + pept.
XXX	345	13.17	51.27	33.80	1.76	H_2O_2
	345	57.91	35.42	4.68	1.99	H_2O_2 + pept.
	353	60.17	29.75	9.95	0.13	H_2O_2
	353	57.69	37.53	4.64	0.14	H_2O_2 + pept.
XXXI	371	1.56	4.88	32.27	61.29	H_2O_2
	371	22.30	20.23	28.16	29.31	H_2O_2 + pept.
	381	2.04	4.90	23.96	69.10	H_2O_2
	381	9.75	15.18	29.63	45.44	H_2O_2 + pept.
XXXII	384	5.65	31.57	28.36	34.42	H_2O_2
	384	23.83	16.43	28.28	31.46	H_2O_2 + pept.
	391	1.13	23.94	39.57	35.36	H_2O_2
	391	20.16	17.23	32.43	30.18	H_2O_2 + pept.
XXXIII	428	5.12	40.30	40.32	14.26	H_2O_2
	428	17.01	30.69	36.48	15.82	H_2O_2 + pept.

	433	18.60	22.54	40.82	18.04	H_2O_2
	433	17.49	28.09	36.73	17.69	H_2O_2 + pept.
XXXIV	465	7.52	47.69	29.88	14.91	H_2O_2
	465	24.13	33.14	26.79	15.94	H_2O_2 + pept.
XXXV	512	21.97	19.82	24.13	34.08	H_2O_2
	512	26.78	25.92	17.76	29.54	H_2O_2 + pept.
	521	11.06	9.44	63.96	15.54	H_2O_2
	521	10.83	10.81	63.12	15.24	H_2O_2 + pept.
XXXVI	572	1.40	28.37	63.70	6.53	H_2O_2
	572	37.90	37.96	17.47	6.67	H_2O_2 + pept.
XXXVII	589	0.56	10.59	57.20	31.65	H_2O_2
	589	21.78	18.72	26.55	32.95	H_2O_2 + pept.
XXXVIII	598	0.66	17.42	59.69	22.23	H_2O_2
	598	36.95	27.14	19.76	16.15	H_2O_2 + pept.
XXXIX	608	0.62	8.68	64.36	26.34	H_2O_2
	608	47.39	4.71	24.48	23.42	H_2O_2 + pept.
XL	615	0.37	4.15	64.44	31.04	H_2O_2
	615	5.31	8.37	49.90	36.42	H_2O_2 + pept.
XLI	642	0.59	5.00	45.15	49.26	H_2O_2
	642	9.93	12.17	29.53	48.37	H_2O_2 + pept.

TABLE IV

Composition of the 16-25 u fraction after treatment with H_2O_2 and peptisator.

Core nr.	sample nr.	General composition
I	1	clay particles, some aggregates, mineral grains, some fragments of (sponge) needles.
II	16	clay particles, few aggregates, some needles.
III	22	clay particles, some aggregates, mineral grains, some needles.
IV	31	aggregates, some mineral grains, diatom fragments, needles.
	34	as 31.
V	55	small aggregates, mineral grains.
	63	as 55, some fibers.
VI	81	aggregates, mineral grains.
VII	85	
VIII	102	aggregates, SiO_2 flakes.
	107	small aggregates, some coccoliths.
X	145	aggregates.
	147	aggregates, a few mineral grains and diatom fragments.
XI	172	aggregates, needles, coccoliths.
	175	small aggregates, coccoliths.
XII	197	some aggregates, mineral grains, needles, coccoliths.
	199	small aggregates, some mineral grains, [illegible] coccoliths.
XIII	–	small aggregates, mineral grains.
XIV	–	" " " "

XV	–	small aggregates, mineral grains.
XVI	–	" " " "
XVII	–	very small aggregates, mineral grains.
XVIII	–	aggregates, needles, coccoliths.
XIX	–	aggregates.
XX	–	clay particles, aggregates, needles.
XXI	–	aggregates, some mineral grains, coccoliths.
XXII	224	aggregates, mineral grains.
	229	aggregates, mineral grains, diatom fragments.
XXIII	236	mineral grains, clay particles, coccoliths.
	245	small aggregates, mineral grains, coccoliths, diatom (and radiol.?) fragments.
XXIV	252	aggregates, mineral grains.
XXV	–	some aggregates, clay particles, mineral grains, needles.
XXVI	–	aggregates, some mineral grains.
XXIX	285	aggregates, mineral grains.
	293	aggregates, mineral grains, organic fragments.
XXX	345	small aggregates, mineral grains.
	353	" " " "
XXXI	371	aggregates, diatom fragments, needles (fragm.).
	381	small aggregates, diatom fragments, needles, coccoliths, a few mineral grains.
XXXII	384	aggregates, diatom fragments, needles.
	391	few aggregates, diatom fragments, needles, coccoliths, silico-flagellates.
XXXIII	425	small aggregates, a few mineral grains, needles.
	435	small aggregates, mineral grains, needles, diatom fragments, coccoliths.

XXXIV	465	few aggregates, coccoliths, lime fragments.
XXXV	512	clay particles, radiolarian fragments.
	521	small aggregates, diatom and radiol. fragments, some coccoliths.
XXXVI	572	aggregates, mineral grains, fibers.
XXXVII	589	small aggregates, some mineral grains, needles, many coccoliths.
XXXVIII	598	small aggregates, needles, many coccoliths.
XXXIX	608	many coccoliths, needles, clay particles (?).
XL	615	brownish aggregates, coccoliths, needles.
XLI	642	aggregates, diatoms, needles, coccoliths.

TABLE V

Classification of the sediment cores according to grain size and calcium content.

	aggregates: very loose or none	loose	medium strong	strong	% org. matter	C/N	% Fe
I. Coarse grained cores (>50%>25 µ;<5%<2 µ)							
a) mainly mineral grains (<10 % Ca)							
VI. (many mica grains)	X	-	-	-	- X -	X -	- X -
XIX. (few aggregates)	-	-	-	X	- X -	X -	- X -
b) mainly carbonate particles							
XII. (>34% Ca)	X	-	-	-	- X -	- X	X - -
c) mixed composition							
XXVI. (±22.5% Ca: many limestone fragments)	X	-	-	-	- X -	- X	- X -
II. Fine grained cores (mainly clay minerals) (50-70%<2 µ;<2.5%>25 µ;<5% Ca)							
XXIV. (>25 µ; foraminifera, mineral grains, mica)	-	-	-	X	- X -	- -	- - X
XXIX. (>25 µ; foraminifera, pteropods, radiolarians, some mineral grains, a few coarse strong aggregates)	X	-	-	-	X - -	X -	- X -
XXX. (>25 µ, foraminifera, mineral grains, mica)	-	X	X	-	X - -	X -	- - X

III. <u>Medium grained cores</u>

($<50\% < 2\ \mu$; $<50\% > 25\ \mu$)

a) <u>mainly carbonate particles</u>

($>20\%$ Ca)

<u>1°. 20-50% < 2 µ; 30-50% > 25 µ</u>				
XI. (> 25 µ: foraminifera, pteropods, fragments)	– X – –	X – –	X –	– X –
XXXII. (> 25 µ: foraminifera and fragments, considerable admixture of radiolarians and fragments)	– X + +	X – –	– –	X – –
XXXVII. (> 25 µ: foraminifera and fragments)	– – X –	X – –	– –	X X –
<u>2°. 20-50% < 2 µ: 10-30% > 25 µ</u>				
XXXVIII. (> 25 µ: foraminifera and fragments; some ostracods)	– – X +	X – –	– –	X X –
XXXIX. (> 25 µ: foraminifera and fragments, some ostracods and spiculae)	– – X –	X – –	X –	X X –
<u>3°. 0-20% < 2 µ: 30-50% > 25 µ</u>	– X – –	X – –	– X	X – –
XX. (> 25 µ: foraminifera and fragments)				
XXIII. (> 25 µ: foraminifera and fragments, some ostracods)	X – X –	X – –	– X	X – –
XLI. (> 25 µ: foraminifera and fragments, a few quartz grains)	– – X –	X – –	– –	X – –

b) <u>mineral grains and carbonate particles</u>

(5-20% Ca)

<u>1°. 20-50% < 2 µ: 10-30% > 25 µ</u>				
I. (> 25 µ: mixed (= mineral grains + organic carbonate grains)	– X – –	– X –	– X	– X –
II. (> 25 µ: foraminifera, pteropods)	– X – –	X – –	– –	– X –

III.(>25 µ:mixed)	–	X	–	–	X	–	–	X	–	–	X	–
XV.(>25 µ:mixed)	–	X	–	–	–	X	–	–	–	–	X	–
XXI.(>25 µ:mixed)	–	X	–	–	–	X	–	X	–	–	X	–
2°. 20-50%<2 µ;<10%>25 µ												
XVI.(>25 µ:mixed)	–	X	–	–	X	–	–	X	–	–	X	–
XVII.(>25 µ:mixed)	–	X	–	–	–	X	–	X	–	–	X	–
XXXVI.(>25 µ:foraminifera and pteropods)	–	–	X	–	X	–	–	X	–	–	X	–
3°. 0.20%<2 µ;30-50%>25 µ												
XIV.(>25 µ:mixed,limestone fragments many fibers)	–	X	–	–	–	X	–	X	–	–	X	–
XXV.(>25 µ:mixed)	–	X	–	–	–	X	–	X	–	–	X	–
XL.(>25 µ:mainly foraminifers and pteropods,some mineral grains)	–	–	X	–	–	X	–	–	X	–	X	X
c) mainly mineral grains (<5% Ca)												
1°. 20-50%<2 µ:10-30%>25 µ												
VII.(>25 µ:mainly mineral grains, many mica grains)	X	–	–	–	X	–	–	X	–	–	X	–
XXXIV.(>25 µ:mainly mineral grains; rather many mica grains)	–	X	–	–	–	X	–	X	–	–	X	–
2°. 20-50%<2 µ;<10%>25 µ												
IV.(>25 µ:mainly mineral grains, some diatoms)	–	–	X	X	–	–	X	X	–	–	X	X
V.(>25 µ;mainly mineral grains)	X	X	–	–	X	–	–	X	–	–	X	X
X.(>25 µ;mainly micronodules and concretions)	–	X	–	–	X	–	–	X	–	–	X	X
3°. 0-20%<2 µ;30-50%>25 µ												
XXXI.(>25 µ;mainly mineral grains, many diatoms)	–	–	–	X	X	–	–	X	–	–	X	–

Cores that cannot be classified because of their variability

	% < 2 µ	% > 25 µ	aggregates	% org.matter	C/N	% Fe	% Ca	
VIII.	16-30	20-34	strong	6.2	17.1	1-5	2-13	(> 25 µ: mineral grains, concretions, brown brittle grains)
XXII.	13-41	25-36	strong	1.0	6.2	1-5.5	3-21	(> 25 µ: mainly foraminifera)
XXXIII.	17	15-13	loose to medium strong	1.7	13.7	0.5-3	3-26	(> 25 µ: mixed)
XXXV.	11-27	15-30	strong to none	0.2	2.7	1-7	3-6	(> 25 µ: mainly brown-yellow brittlegrains)

TABLE VI

Content of organic matter, organic nitrogen and the C/N ratio.

Core nr.	Sample nr.	Total % organic matter	%N	C/N
I	1	1.302	0.017	44.4
II	16	0.743	<0.001	–
III	22	0.971	0.061	9.2
IV	31	4.650	0.247	10.9
V	55	0.984	0.113	5.1
VI	81	1.131	0.067	9.8
VII	88	0.981	0.110	5.2
VIII	102	6.204	0.210	17.1
X	153	0.293	0.071	2.4
XI	172	0.513	0.061	4.9
XII	197	1.878	0.782	14.0
XIV	–	1.414	0.070	11.7
XV	–	1.056	<0.001	–
XVI	–	0.979	0.092	6.3
XVII	–	1.158	0.063	11.2
XIX	–	2.175	0.128	9.7
XX	–	0.735	0.031	14.2
XXI	–	2.012	0.139	8.3
XXII	224	1.000	0.093	6.2
XXIII	236	0.753	0.018	24.3
XXIV	257	1.461	<0.001	–
XXV	–	1.683	0.009	9.8
XXVI	–	1.406	0.041	20.4
XXIX	285	0.667	0.056	6.9
XXX	345	0.123	0.062	1.2

XXXI	371	0.716	0.052	8.0
XXXII	384	0.375	0.001	–
XXXIII	454	1.655	0.070	13.7
XXXIV	465	2.013	0.121	9.7
XXXV	512	0.183	0.039	2.7
XXXVI	572	0.557	0.042	7.7
XXXVII	589	0.282	0.001	–
XXXVIII	598	0.274	0.001	–
XXXIX	608	0.292	0.017	9:9
XL	615	1.527	0:045	19.7
XLI	642	0.184	0.001	–

TABLE VII

Approximate mineralogical composition of the fraction < 2 μ.

Sample No.	% illite	% chlorite	% montmorillonite	% kaolinite	% quartz	% feldspar	% calcite	% aragonite	% amfibole	% remainder
Group I										
XXVI	30	13	–	–	36	–	21	–	–	–
XII (197)	64	–	–	–	–	–	16	20	–	–
XI'	–	41	21	–	38	–	–	–	–	–
VI (81)	17	29	12	–	35	7	–	–	–	–
Group II										
XXIV (252)	–	–	–	63	37	–	–	–	–	–
XXII (235)	18	13	14	–	45	10	–	–	–	–
XXX (345)	24	14	–	–	57	9	–	–	–	–
Group III (a)										
XI (172)	23	–	6	9	11	–	51	–	–	–
XXXII (334)	4	–	–	–	–	–	96	–	–	–
XXXVII (589)	–	3	–	–	5	–	81	–	11	–
XXXVIII (593)	–	–	–	–	6	–	36	–	8	–
XXXIX (608)	–	2	–	–	2	–	96	–	–	–
XX	18	–	–	–	2	–	80	–	–	–
XXIII (236)	–	–	–	–	–	–	50	–	46	4
XLI (642)	–	–	–	–	4	–	74	–	22	–
(b)										
I (1)	15	9	–	–	38	–	38	–	–	–
II (16)	12	10	–	–	29	–	49	–	–	–
III (22)	11	8	–	–	37	–	41	–	3	–
XV	10	5	–	–	35	–	50	–	–	–
XXI	35	–	8	10	6	–	33	–	3	–
XVI	20	12	4	–	28	–	24	–	4	–
XVII	17	11	–	–	37	–	35	–	–	–
XXXVI (572)	53	–	12	5	7	–	23	–	–	–
XIV	17	–	–	7	33	–	43	–	–	–
[illegible]	–	–	–	–	–	–	69	–	31	–

TABLE VII

Approximate mineralogical composition of the fraction < 2 μ.

Sample No.	% illite	% chlorite	% montmorillonite	% kaolinite	% quartz	% feldspar	% calcite	% aragonite	% amfibole	% remainder
Group I										
XXVI	30	13	–	–	36	–	21	–	–	–
XII (197)	64	–	–	–	–	–	16	20	–	–
XI[illegible]	–	41	21	–	38	–	–	–	–	–
VI (81)	17	29	12	–	35	7	–	–	–	–
Group II										
XXIV (25[illegible])	–	–	–	63	37	–	–	–	–	–
XXIX (235)	18	13	14	–	45	10	–	–	–	–
XXX (345)	24	14	–	–	57	9	–	–	–	–
Group III (a)										
II (172)	23	–	6	9	11	–	51	–	–	–
XXXII (384)	4	–	–	–	–	–	96	–	–	–
XXXVII (589)	–	3	–	–	5	–	81	–	11	–
XXXVIII (593)	–	–	–	–	6	–	33	–	8	–
XXXIX (608)	–	2	–	–	2	–	96	–	–	–
XV	18	–	–	–	2	–	30	–	–	–
XXIII (236)	–	–	–	–	–	–	50	–	46	4
XLI (642)	–	–	–	–	4	–	74	–	22	–
(b)										
I (1)	15	9	–	–	33	–	38	–	–	–
II (16)	12	10	–	–	29	–	49	–	–	–
III (22)	11	8	–	–	37	–	41	–	3	–
XV	10	5	–	–	35	–	50	–	–	–
XXI	35	–	6	10	6	–	33	–	3	–
XVI	20	12	4	–	28	–	24	–	4	–
XVII	17	11	–	–	37	–	35	–	–	–
XXXVI (572)	53	–	12	5	7	–	23	–	–	–
XIV	17	–	–	7	33	–	43	–	–	–
[illegible]	–	–	–	–	–	–	69	–	21	–

Sample No.	% illite	% chlorite	% montmorillonite	% kaolinite	% quartz	% feldspar	% calcite	% aragonite	% amfibole	% remainder
(c)										
VII (35)	27	20	18	–	35	–	–	–	–	–
XXXIV (465)	–	19	11	–	44	13	13	–	–	–
IV (31)	17	14	6	–	53	7	3	–	–	–
V (55)	16	15	7	–	52	10	–	–	–	–
X (145)	22	–	14	15	34	6	9	–	–	–
XXXI (371)	27	10	20	–	38	5	–	–	–	–

TABLE VIII

q-values

Core nr.	Sample nr.	q	Group
I	1	14	III-b
II	16	22	III-b
III	22	15	III-b
IV	31	46	III-c
V	55	58	III-c
VI	81	4	I
VII	85	97	III-c
VIII	-	-	-
X	145	65	III-c
XI	172	36	III-a
XII	197	3	I
XIII	-	-	-
XIV	-	4	III-b (?)
XV	-	8	III-b
XVI	-	37	III-b
XVII	-	27	III-b
XVIII	-	-	-
XIX	-	14	I
XX	-	10	III-c
XXI	-	40	III-b
XXII	-	-	-
XXIII	236	11	III-b
XXIV	252	39	II
XXV	-	-	-
XXVI	-	3	I
XXIX	28[illegible]	139	II

XXX	345	55	II
XXXI	371	65	III-c
XXXII	384	2	III-a
XXXIII	–	–	–
XXXIV	465	38	III-c
XXXV	–	–	–
XXXVI	572	97	III-b
XXXVII	589	1	III-a
XXXVIII	598	0	III-a
XXXIX	608	2	III-a
XL	615	0	III-b
XLI	642	0	III-a

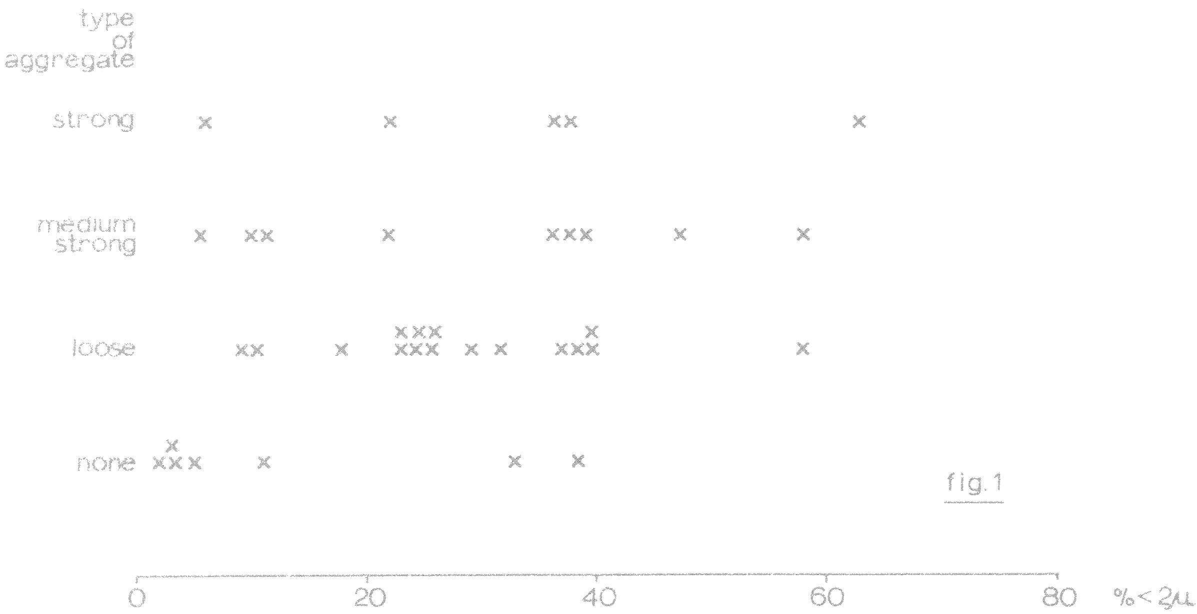
TABLE 1

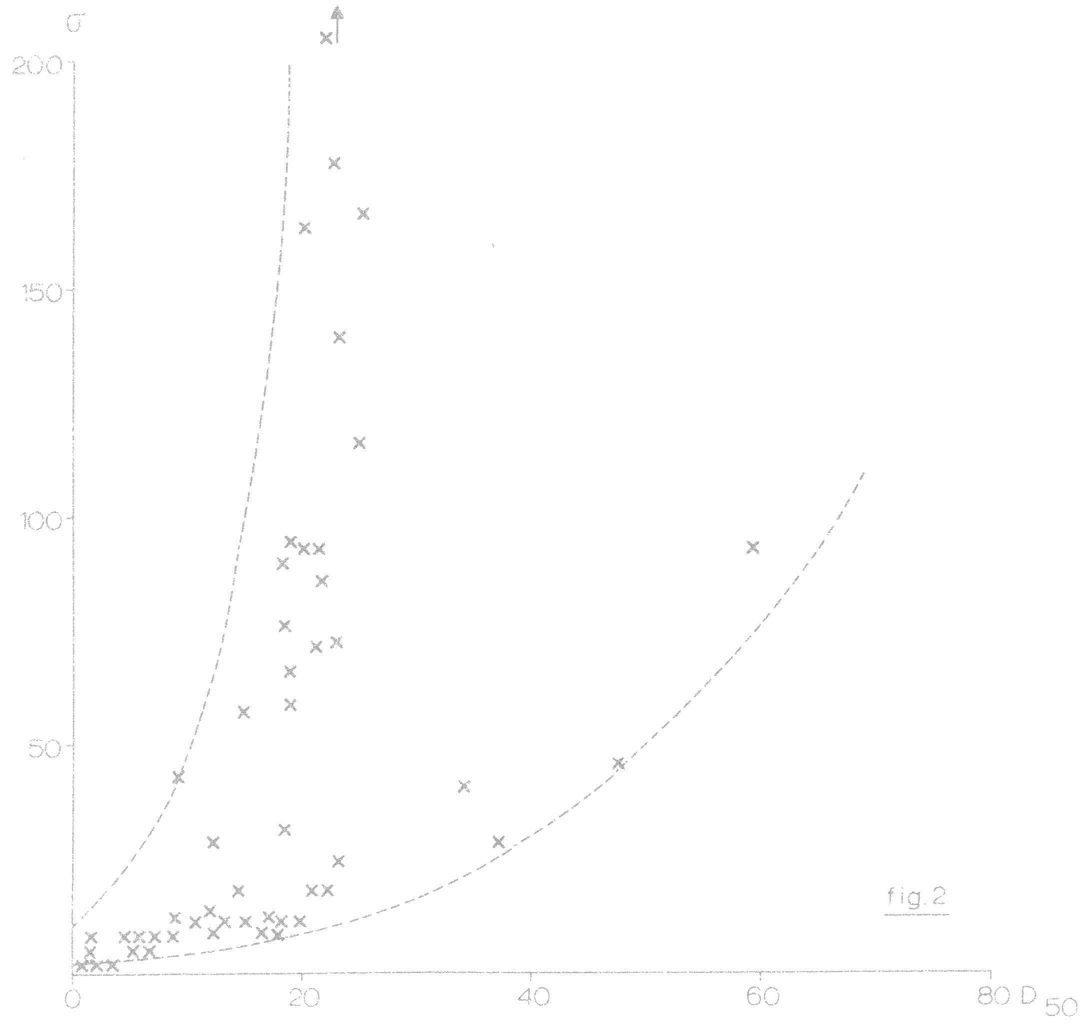
List of sediments

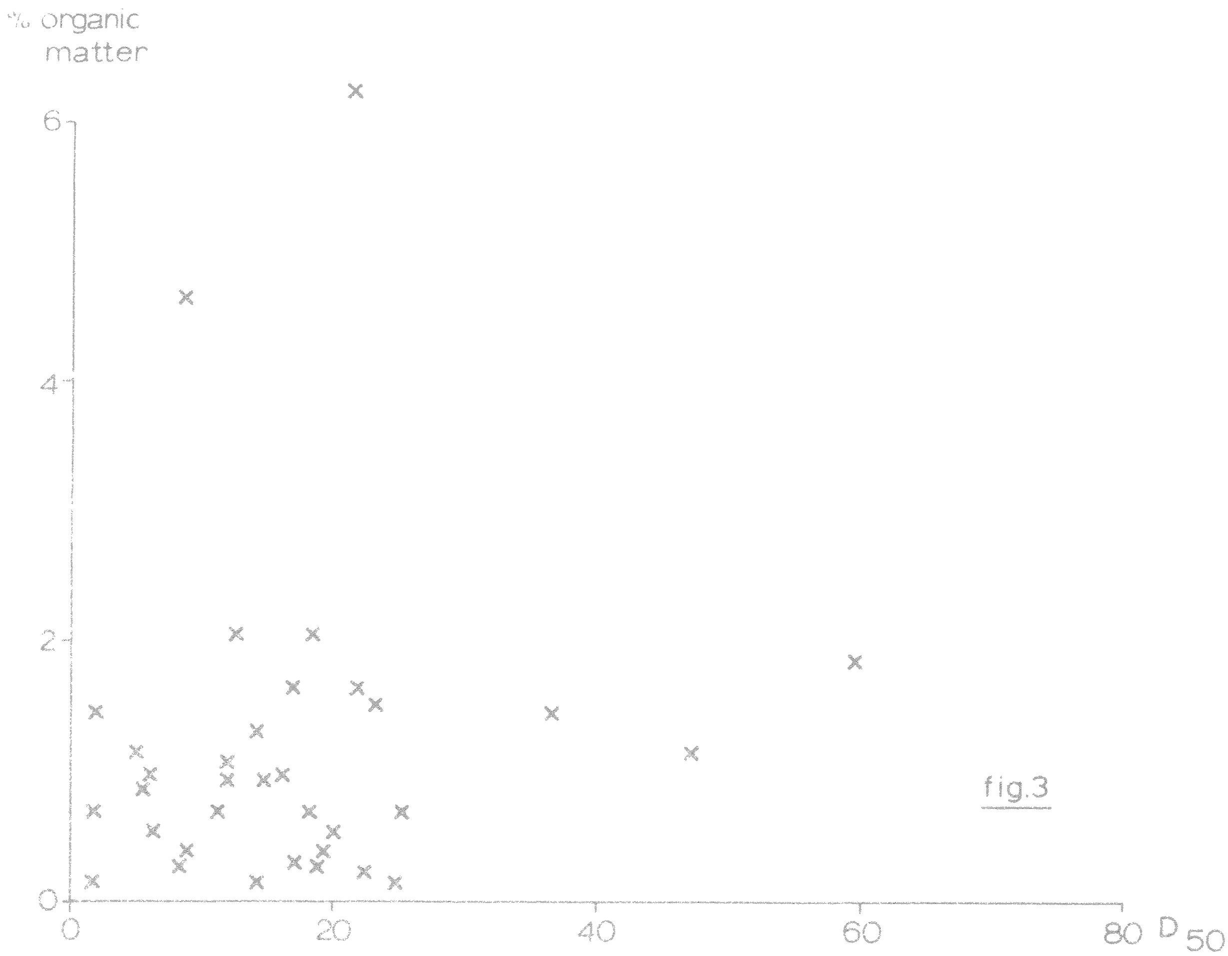
Number of sediment core	Sample numbers	Length of core	Details on colour, moisture etc.	Area and depth	Location	Donor	Remarks
I	1– 15	150 cm	grey,moist	Mediterranean 2720 m	37°26' N 01°05' E	METEOR M7/66/6a Prof.Dr.F.Seibold, Kiel	Oct. 1966
II	16– 21	74 cm	ibid	ibid depth?		METEOR M7/66/7a ibid.	Oct.1966
III	22– 29	49 cm	ibid, thin and thicker layers	ibid depth?	42°47' N 07°29' E	METEOR Dr.H.Kautsky,Hamburg	Oct.1966,24
IV	30– 53	48 cm	grey, dry	Chukchi Sea 54 m (Siberian Sea)	69°39' N 184°38' E	PRIBOY, 30/1966 Dr.A.F. Treshnikov Leningrad	
V	54– 79	52 cm	grey, dry	Laptev Sea 26 m (Siberian Sea)	73°31' N 135°15' E	[illegible], 3/1966 ibid.	
VI	80– 83	23 cm	grey, dry	Chukchi Sea 42 m	67°10' N 191°30' E	PRIBOY,14/1966 ibid.	
VII	84–100	34 cm	grey, dry	Laptev Sea 50 m	76°30' N 129°00' E	AZIMUTH, 17/1966 ibid.	
VIII	101–130	144 cm	black,moist	Black Sea depth?	43°50' N 35°31' E	[illegible]oczy,Dr.[illegible], Miami	P-6507-18,
IX	131–144	68 cm	black,moist,frozen	Black Sea depth?	44°22' N 35°10' E	ibid.	P-6508-H21-[illegible]
X	145–170	129 cm	brown,moist	Atlantic depth?	26°13' N 52°28' W	ibid.	P-6302-214
XI	171–195	125 cm	light-brown	Caribbean depth?	14°57' N 68°55' W	ibid.	P-6304-9
XII	196–[illegible]	134 cm	light-grey	Bahamas,Tongue of the Ocean	24°48' N 77°32' W	ibid.	P-[illegible]-23

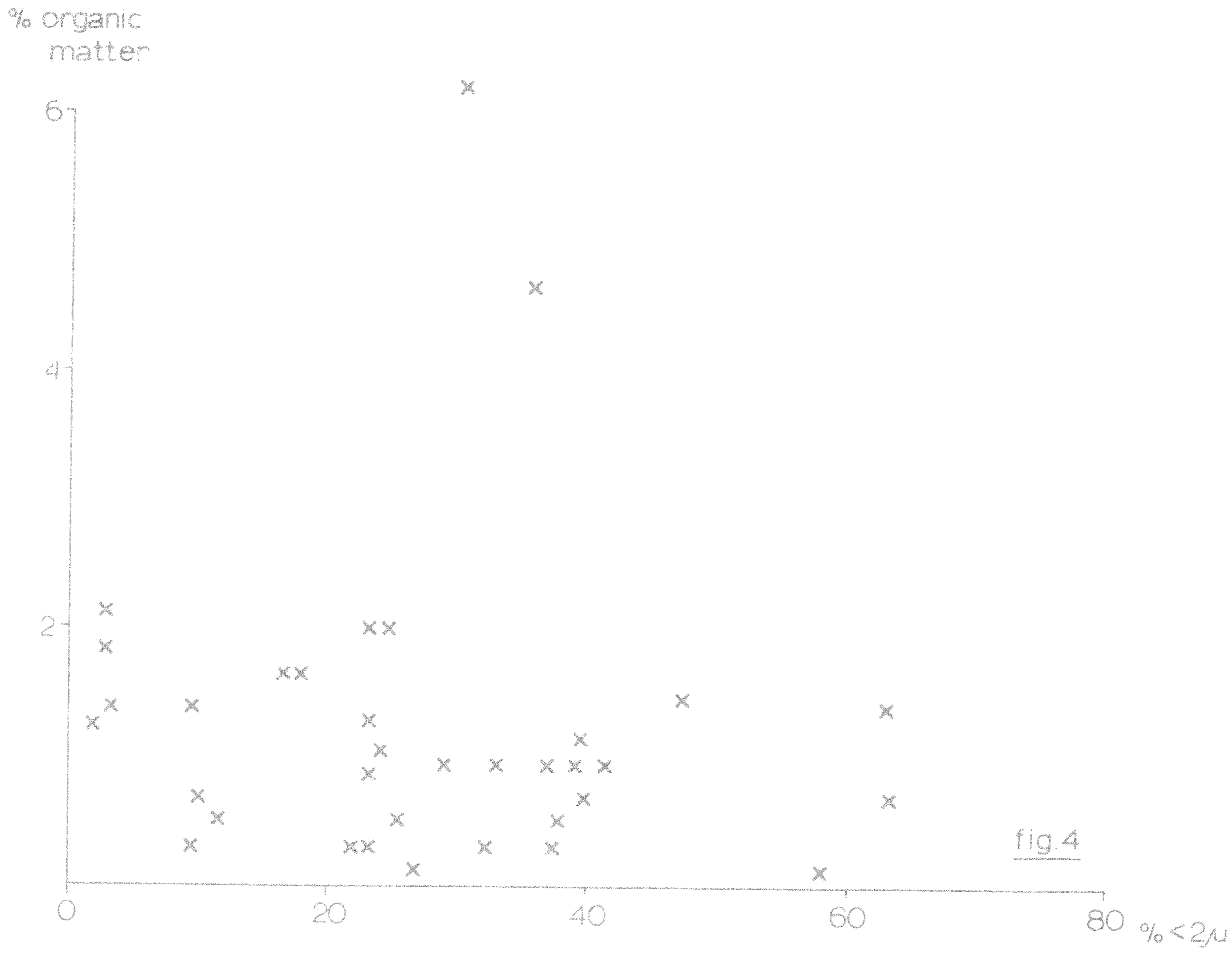
XIII	large grab (surface)		grey	Bay of Roquebrune 50 m		[illegible], March 196[illegible]
XIV	large grab (surface)		grey,moist	Bay of Roquebrune 70 m		[illegible], March, 1966
XV	grab		grey,moist	Mediterranean 550 m	43°33' N 07°20' E	CALYPSO, 11/March/1966 Dr.J.Carpine, Monaco
XVI	grab		grey,moist	Mediterranean 1000 m	43°37' N 07°23' E	CALYPSO, 11/March/1966 ibid.
XVII	grab		grey,moist	Mediterranean 1500 m	43°33' N 07°25' E	CALYPSO, 11/March/1966 ibid.
XVIII	grab		brown	Gulf de Fréjus depth?	43°22' N 06°25' E	1965 Robier, Dr. Villefranche sur Mer
XIX	grab (0-1 cm)		brown,moist	Romanch Trench - 7200 m (Atlantic)	00°09' N 18°19' W	KURCHATOV, cruise 1, Jan/Febr.1967 Dr.J.A.Bogdanov, Moscou.
XX	grab		brown,moist	Romanch Trench 4070 m	00°03' N 18°44' W	KURCHATOV, ibid, ibid.
XXI	grab		brown,moist	Romanch Trench 7200 m	00°09' N 18°19' W	KURCHATOV, ibid, ibid.
XXII	223-234	117 cm	grey,dry(60°C?)	Atlantic 2240 m	19°00' N 18°08' W	KURCHATOV, ibid, ibid.
XXIII	235-245	140 cm	dark grey,dry	Romanch Trench 4000 m	00°22' S 18°01' W	KURCHATOV, ibid, ibid.
XXIV	246-257	144 cm	dark grey,dry	Gulf of Guinee 3520 m	04°17' N 05°15' W	KURCHATOV, ibid, ibid.
XXV	grab		grey,moist	Gulf of Trieste 30 m		, Febr. 1967 Dr.G.Macchi, Trieste.
XXVI	grab		grey,moist	Gulf of Trieste 30 m		ibid, ibid.
XXVII	258-279	33 cm	grey,dry	Japan Trench, 8005 m (Pacific)	42°50' N 148°10' E	RYOFU-MARU, 1961, JEDS-2-42, Prof.Dr.H.Hamaguchi, Tokio.
XXVIII	280-283	12.5 cm	grey,dry	ibid.	ibid.	ibid,
XXIX	284-343	300 cm	brown,moist	Pacific 5210 m	13°16' N 131°46' W	, [illegible] Dr.W.R.Riedel, Scripps, La Jolla

XXX	344-361	90 cm	red clay,moist	Pacific 5879 m	24°53' N 176°16' E	VEMA, V21-67. Dr.R.Ku, Lamont
XXXI	362-381	100 cm	grey,dry	Antarctic Sea 7648 m	57°34' S 23°53' W	VEMA, V14-55 ibid.
XXXII	382-399	90 cm	light-brown,moist	Pacific 3800 m	01°20' N 114°54' W	ROBERT CONRAD, RC-10-70 Dr.R.Ku, Lamont.
XXXIII	427-463	1068 cm	grey,dry	Indian Ocean 3047 m	20°07' N 67°55' E	ATLANTIS II, PC-16 Dr.D.Wall, Woods Hole
XXXIV	464-506	255 cm	grey,moist	Pacific 965 m	41°42' S 175°23' E	, 26/March/1967 Dr.W.v.d.Linden, Wellington.
XXXV	511-570	300 cm	brown,moist	Pacific 5455 m	07°30' S 157°41' W	AMPHITRITE, AMPH-90-P Dr.T.Walsh,Scripps,La Jolla.
XXXVI	571-587	86 cm	brown,grey,black moist	Mediterranean 2360 m	35°31' N 23°12' E	CHAIN, Ch-61-50-12/9/66 Dr.E.F.K.Zarudzki,Woods Hole.
XXXVII	588-596	45 cm	light-brown moist	Atlantic 4150 m	26°42' N 39°23' W	CHAIN, Ch-61-171, 6/12/66 Dr.J.Philips, Woods Hole
XXXVIII	597-605	43 cm	light-brown moist	Atlantic 4020 m	27°53' N 45°55' W	CHAIN, Ch-61-174, 9/12/66 Dr.J.Philips, Woods Hole.
XXXIX	607-613	36 cm	light-brown moist	Atlantic 3620 m	27°53' N 44°51' W	CHAIN, Ch-61-175, 9/12/66. Dr.J.Philips, Woods Hole
XL	614-640	164 cm	brown,black,grey moist	Red Sea (Discovery 2080 m Deep)	20°17' N 38°02' E	CHAIN, Ch-61-30, Oct.1966 Dr.D.A.Ross, Woods Hole
XLI	641-651	53 cm	white,moist	Antarctic Sea 3970 m	50°02' S 127°31' W	USNS ELTANIN, PH-25-43 Dr.H.G.Goodell, Tallahasse.


type
of
aggregate
strong
medium
strong
loose
none
0
20
40
60
80
%<2μ
fig. 1


σ
200
150
100
50
0
20
40
60
80 D 50
fig. 2


% organic matter
6
4
2
0
0
20
40
60
80
D 50
fig.3


% organic matter
6
4
2
0
20
40
60
80
% < 2 μ
fig.4

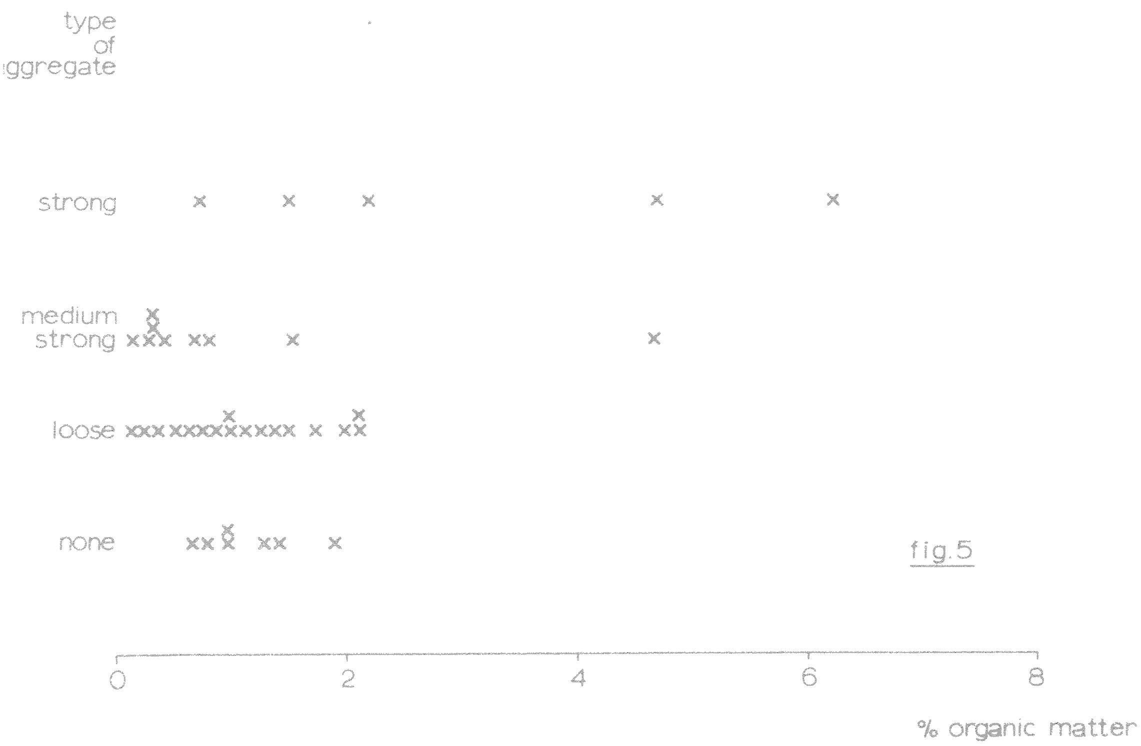

type
of
aggregate
strong
medium
strong
loose
none
0
2
4
6
8
% organic matter

fig.5

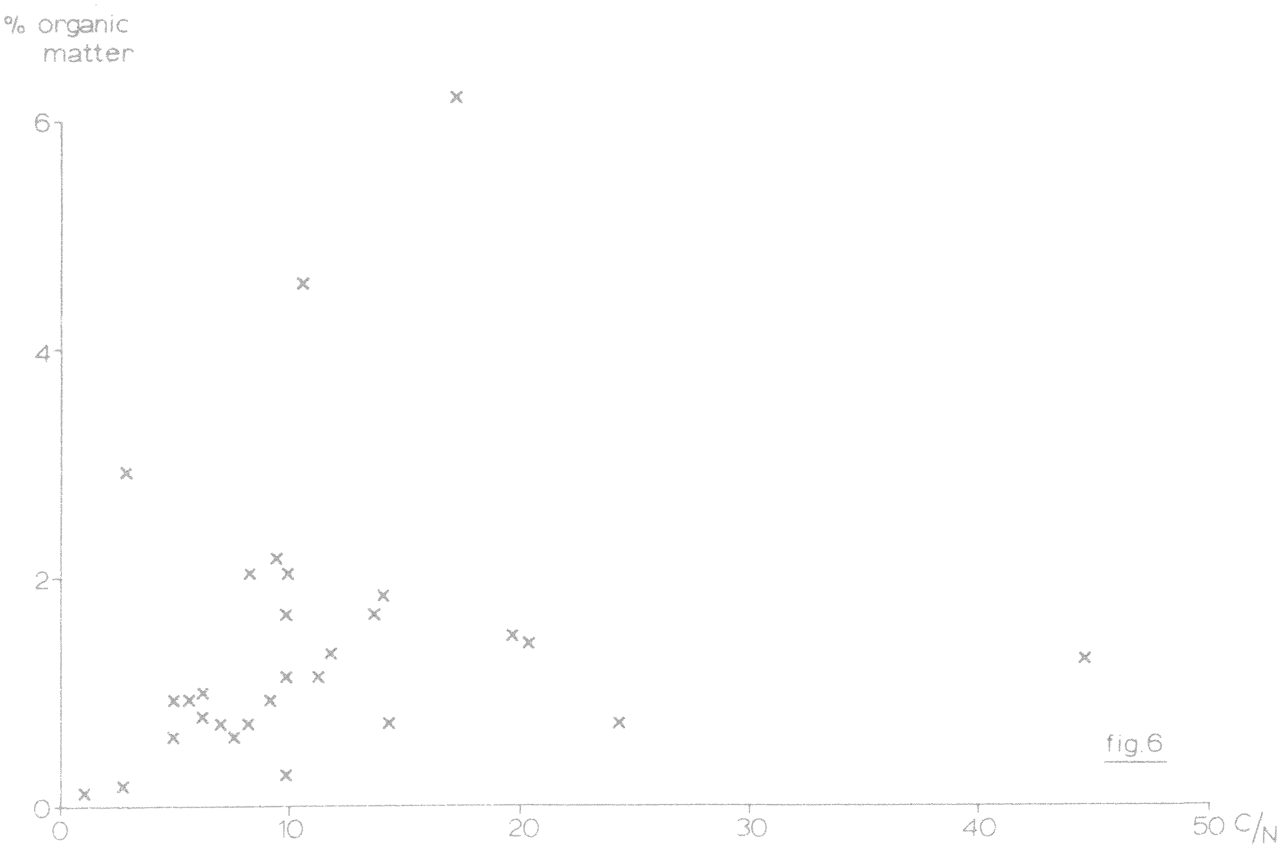

% organic
matter
6
4
2
0
0
10
20
30
40
50 C/N

fig.6

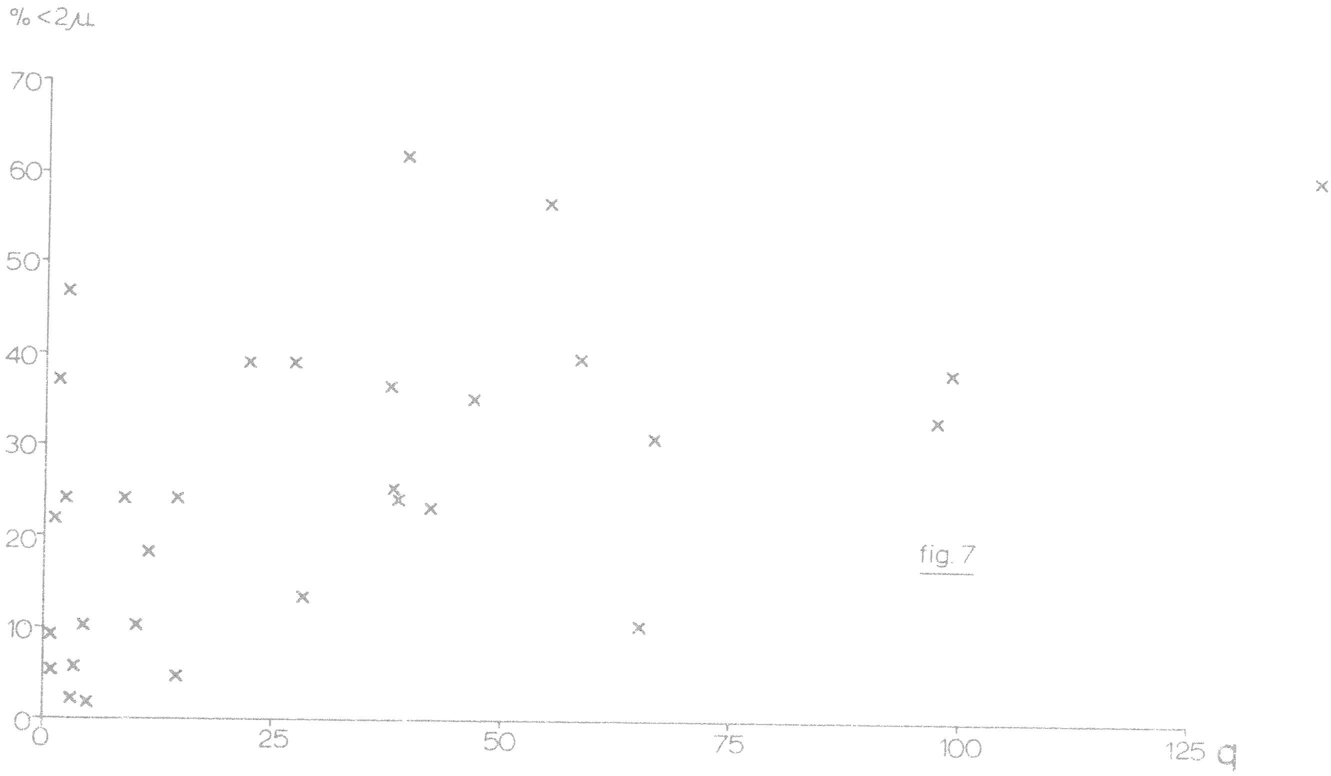

% <2µ
70
60
50
40
30
20
10
0
0
25
50
75
100
125
q

fig. 7

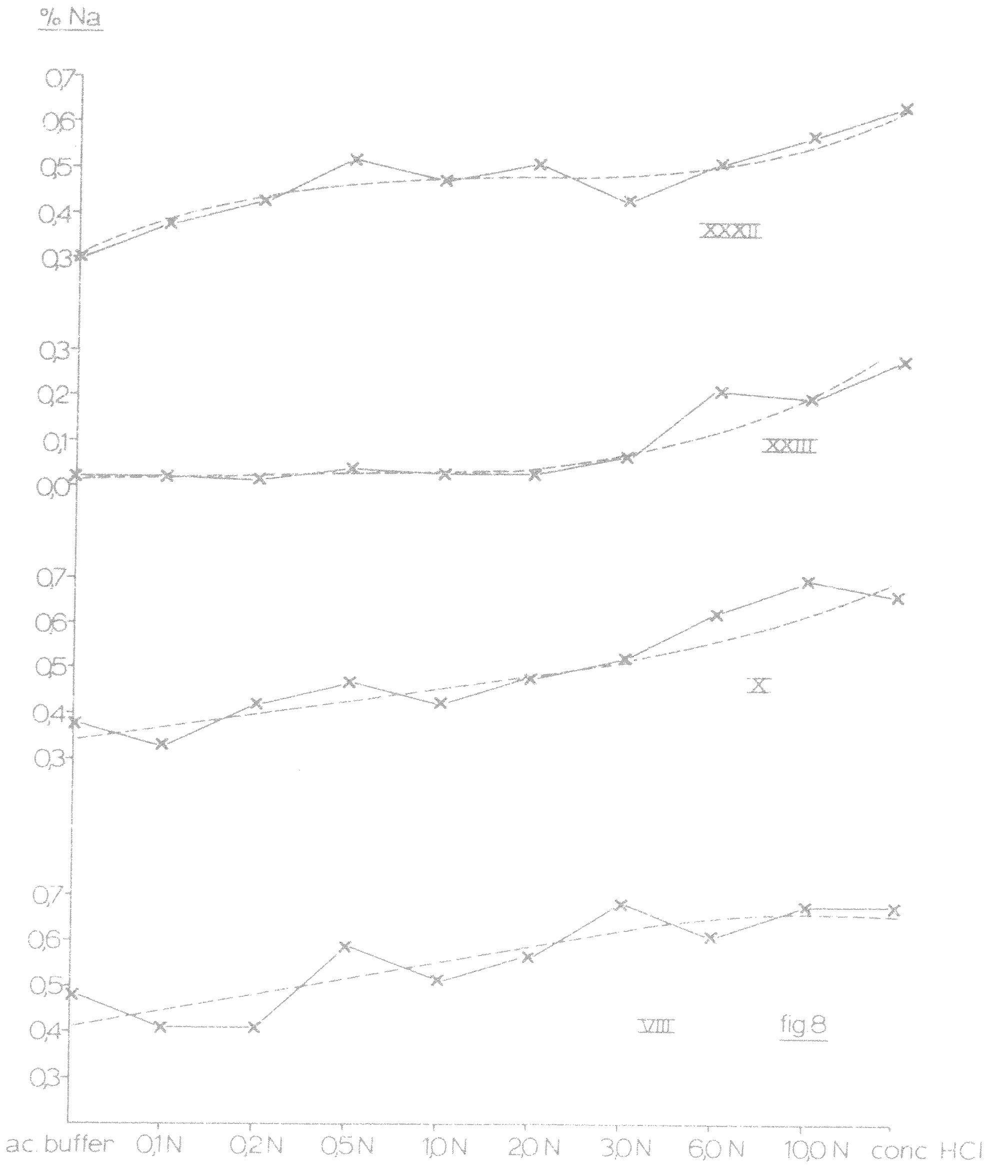
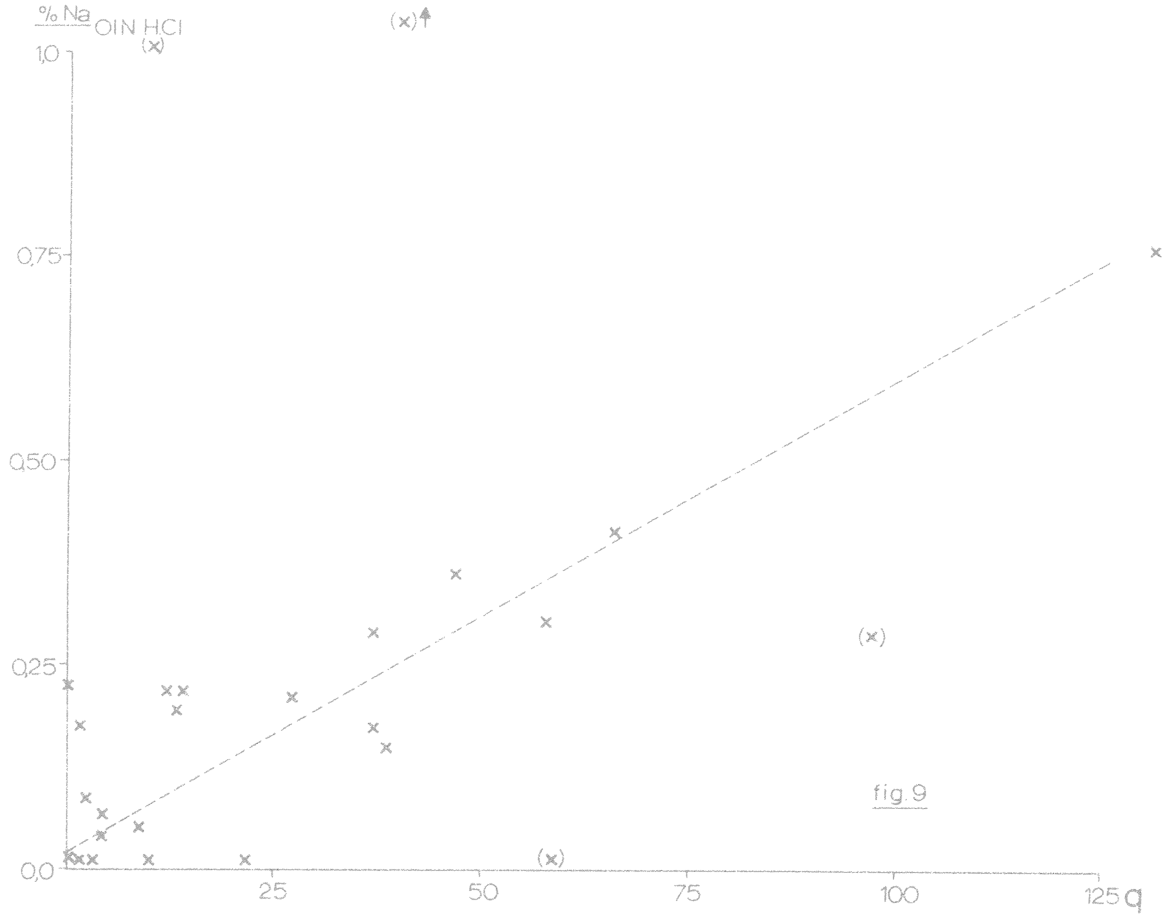
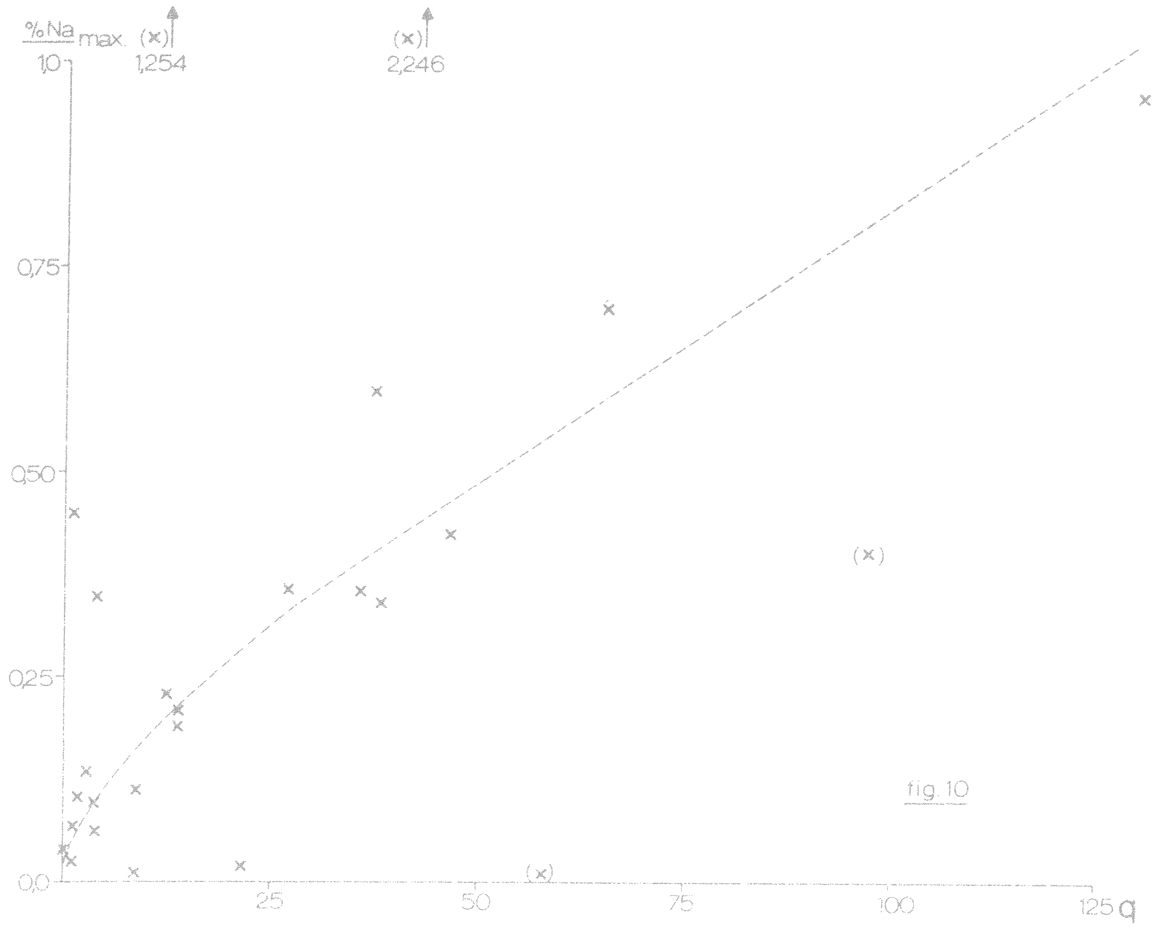

% Na
0,7
0,6
0,5
0,4
0,3
XXXII
0,3
0,2
0,1
0,0
XXIII
0,7
0,6
0,5
0,4
0,3
X
0,7
0,6
0,5
0,4
0,3
VIII
ac. buffer
0,1 N
0,2 N
0,5 N
1,0 N
2,0 N
3,0 N
6,0 N
10,0 N
conc HCl

fig 8


%Na OIN HCl
(x)
(x)
1,0
0,75
0,50
0,25
0,0
(x)
(x)
25
50
75
100
125 q
fig. 9


%Na max.
(x)
1,254
(x)
2,246
1,0
0,75
0,50
0,25
0,0
(x)
(x)
25
50
75
100
125 q
fig. 10

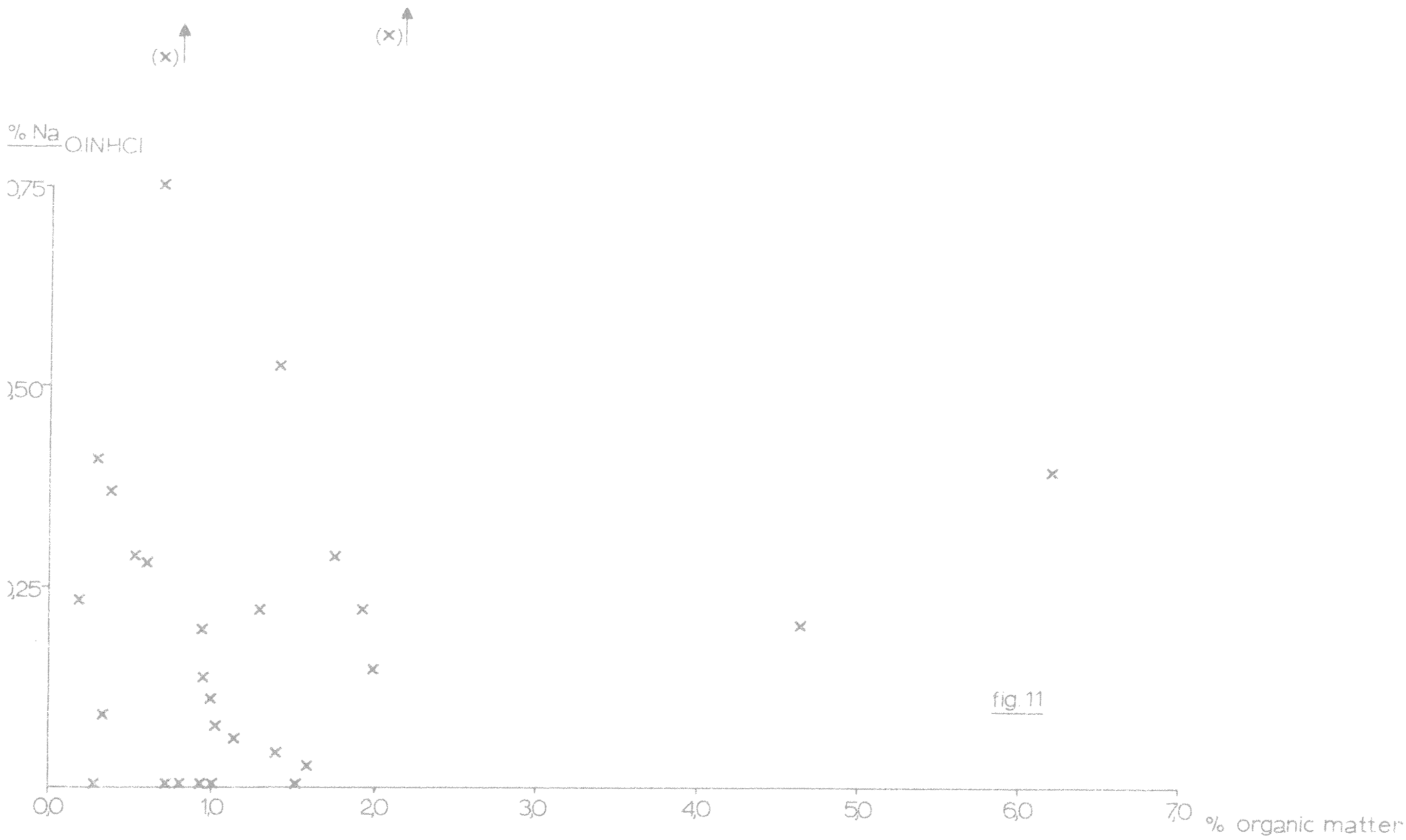

(x)
(x)
% Na
0.1N HCl
0,75
0,50
0,25
0,0
1,0
2,0
3,0
4,0
5,0
6,0
7,0
% organic matter

fig. 11

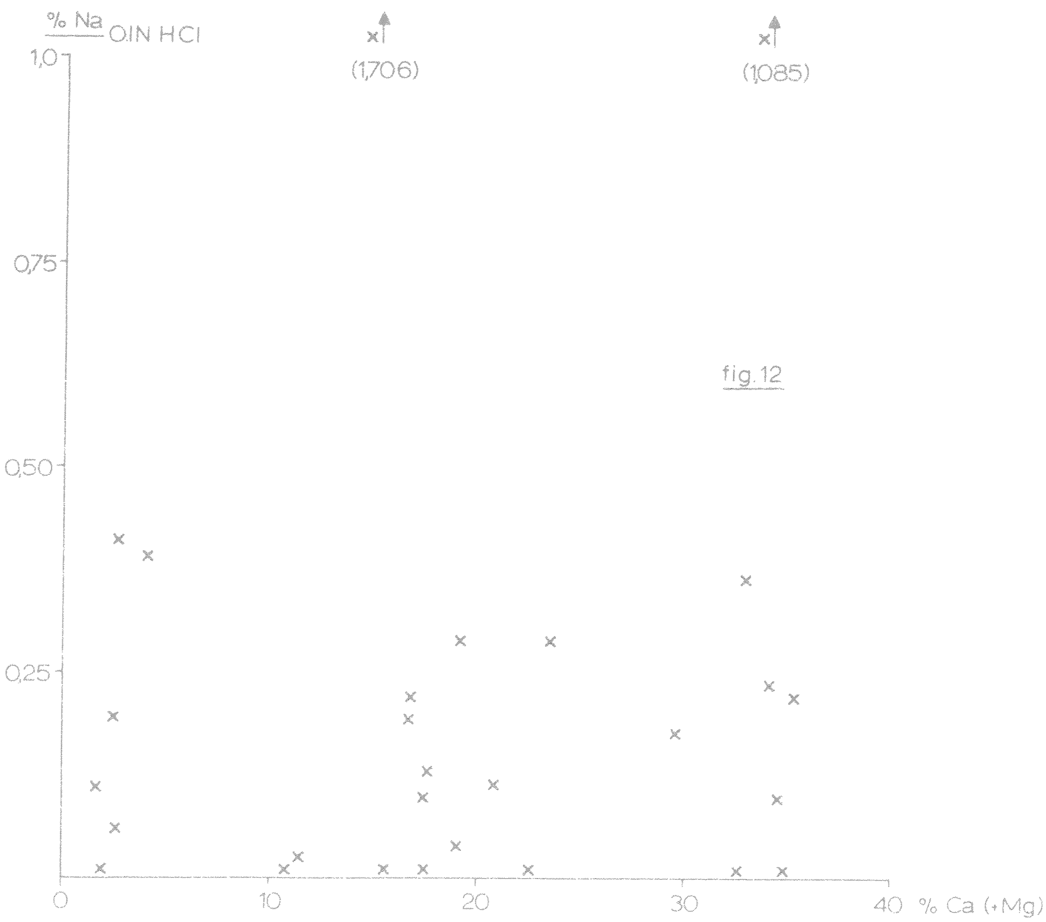

% Na
0.1N HCl
1,0
0,75
0,50
0,25
0
10
20
30
40
% Ca (+Mg)
(1,706)
(1,085)

fig. 12

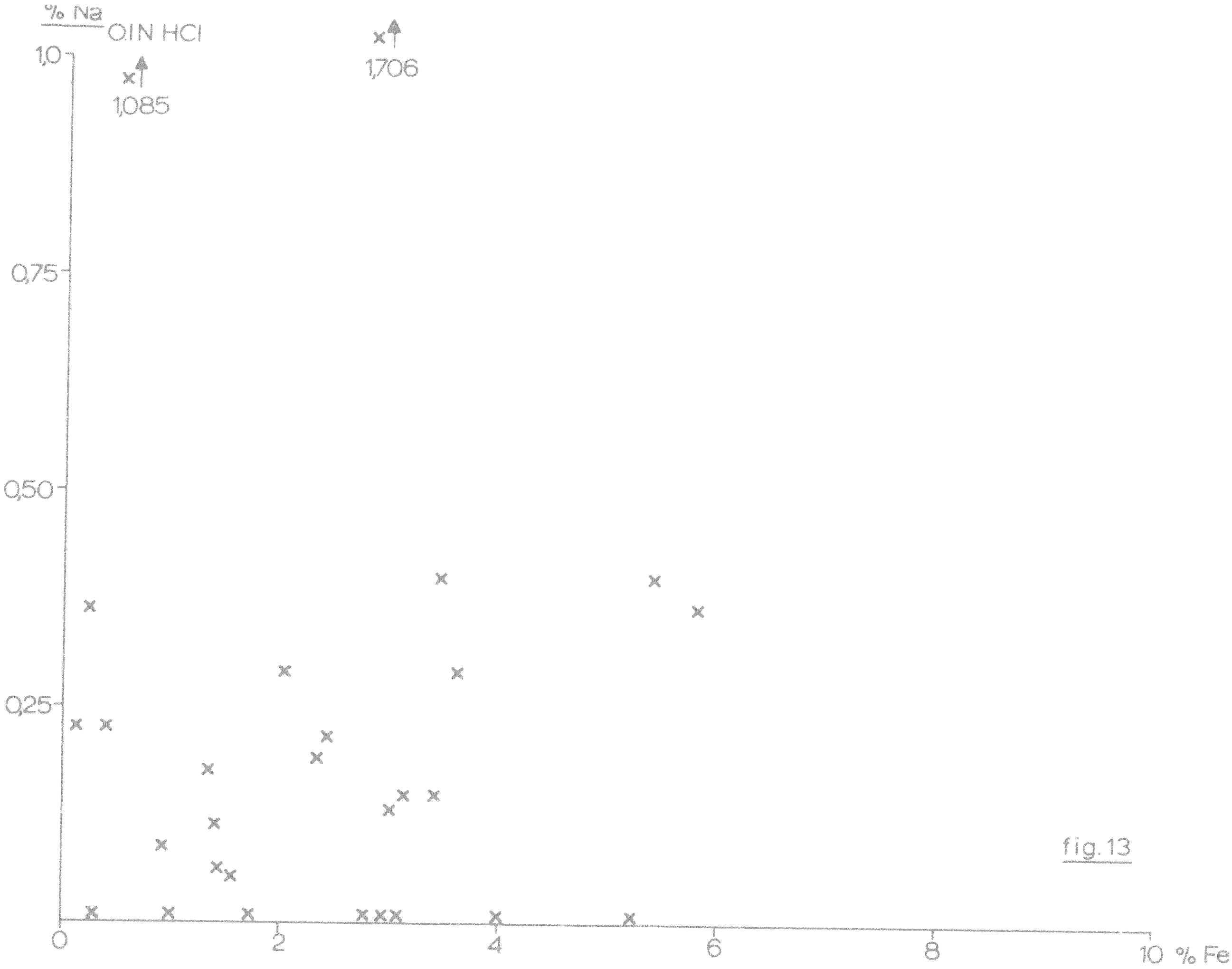

% Na
0.1N HCl
1,0
1,085
1,706
0,75
0,50
0,25
0
2
4
6
8
10 % Fe

fig. 13

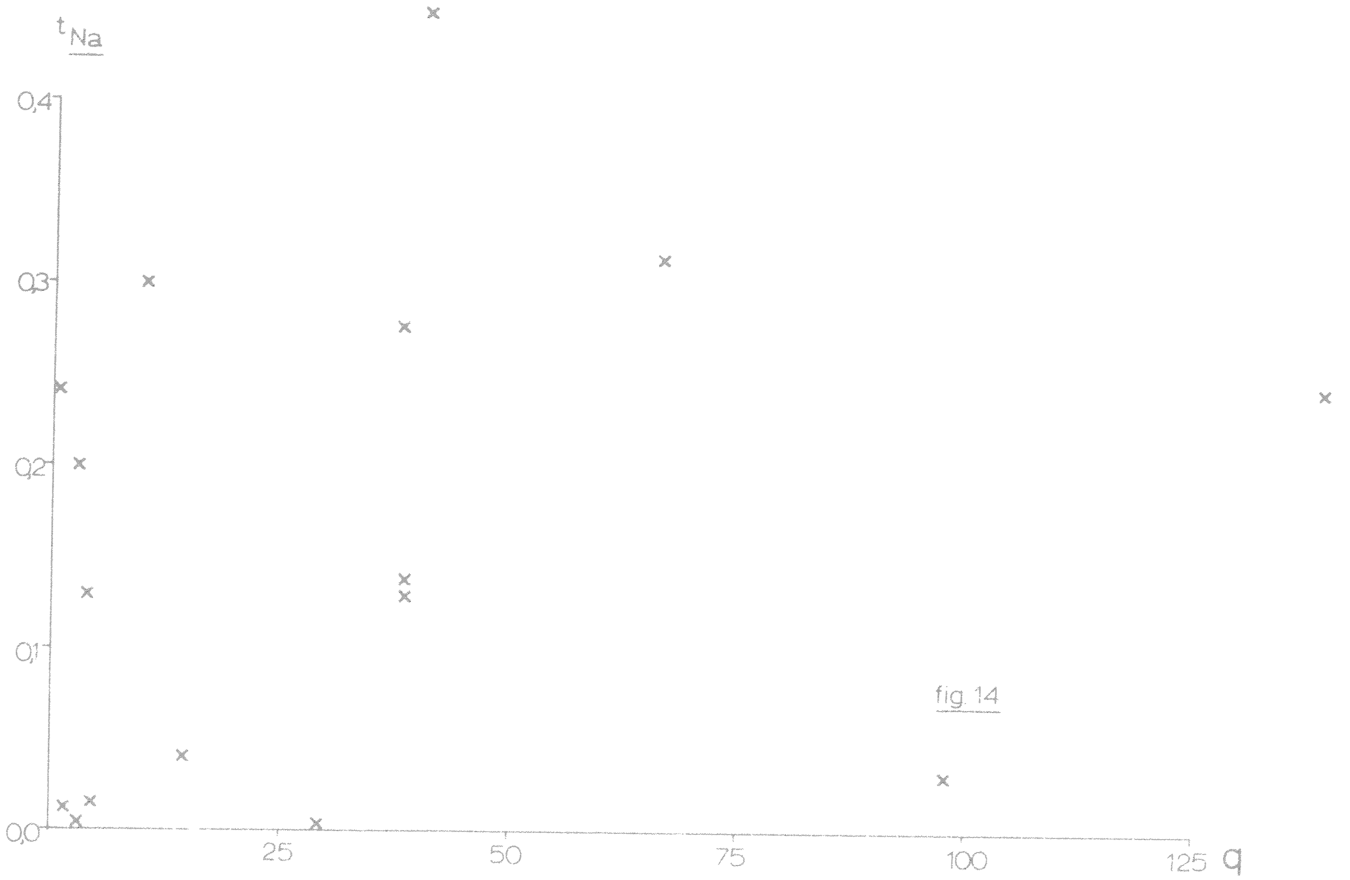

t_{Na}
0,4
0,3
0,2
0,1
0,0
25
50
75
100
125 q

fig. 14

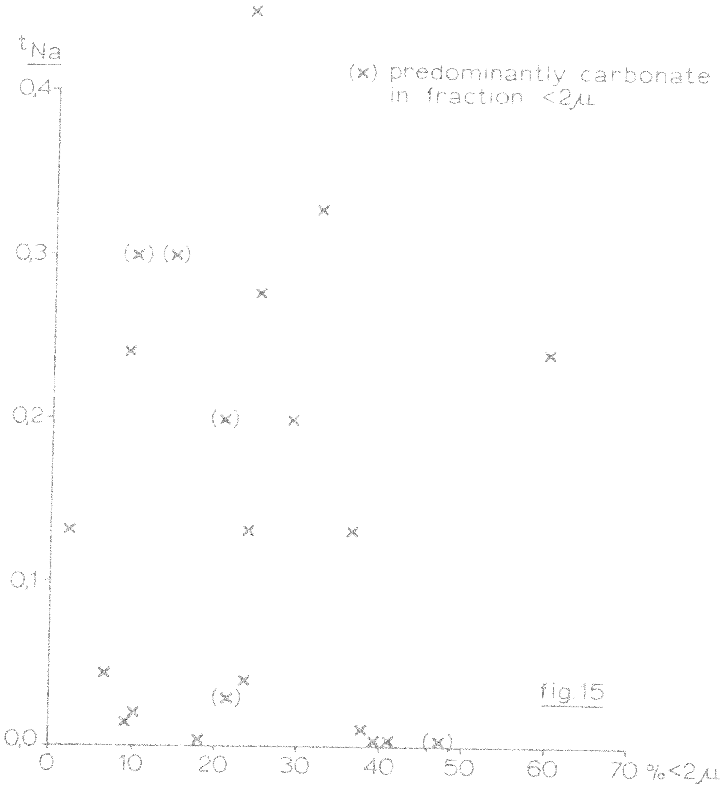


fig.15

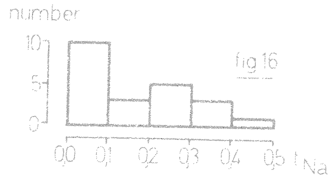


fig.16

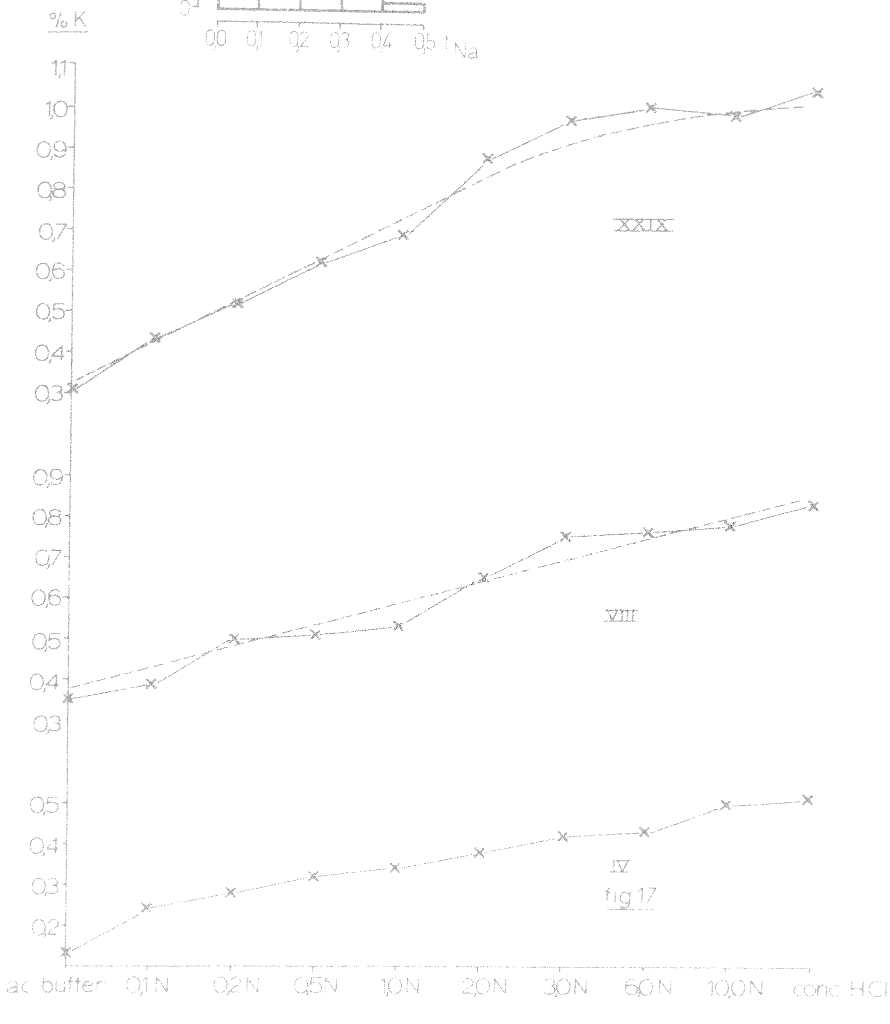
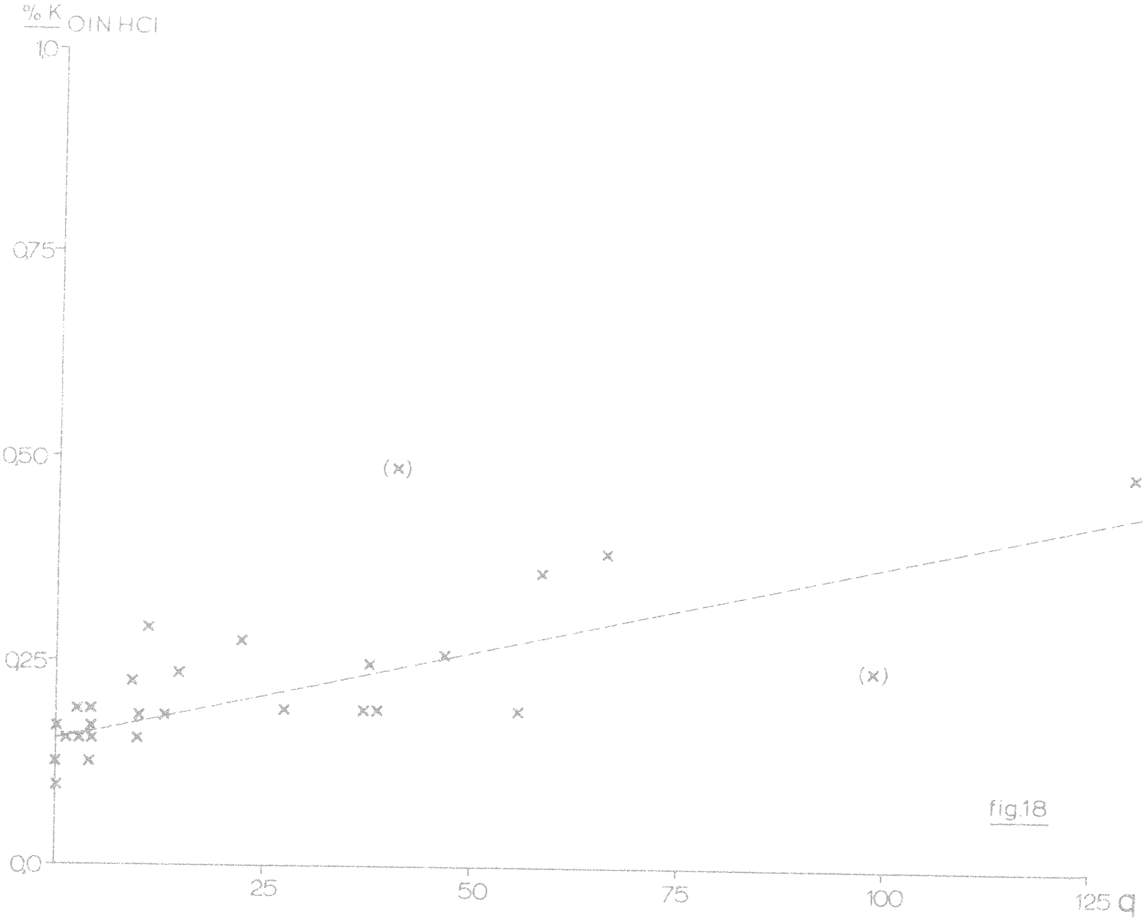
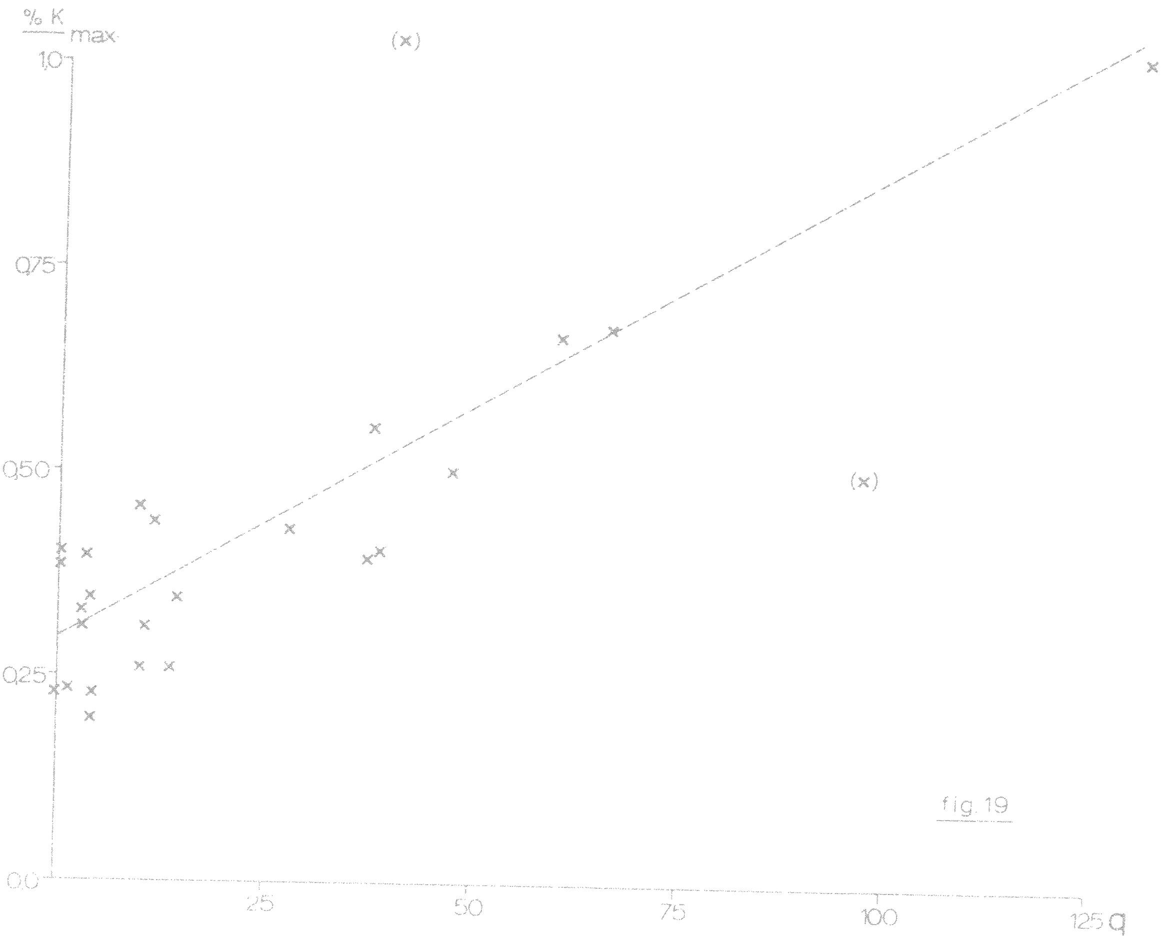
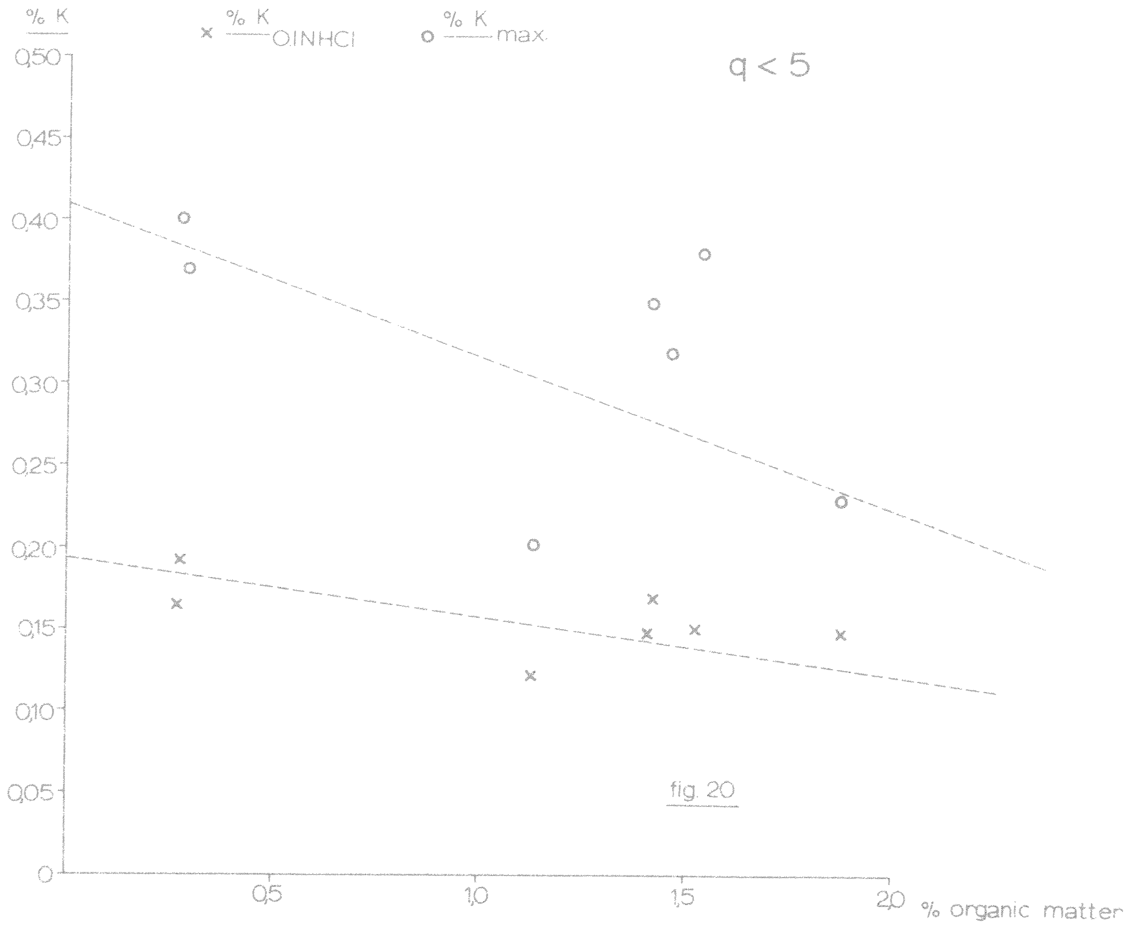


fig.17

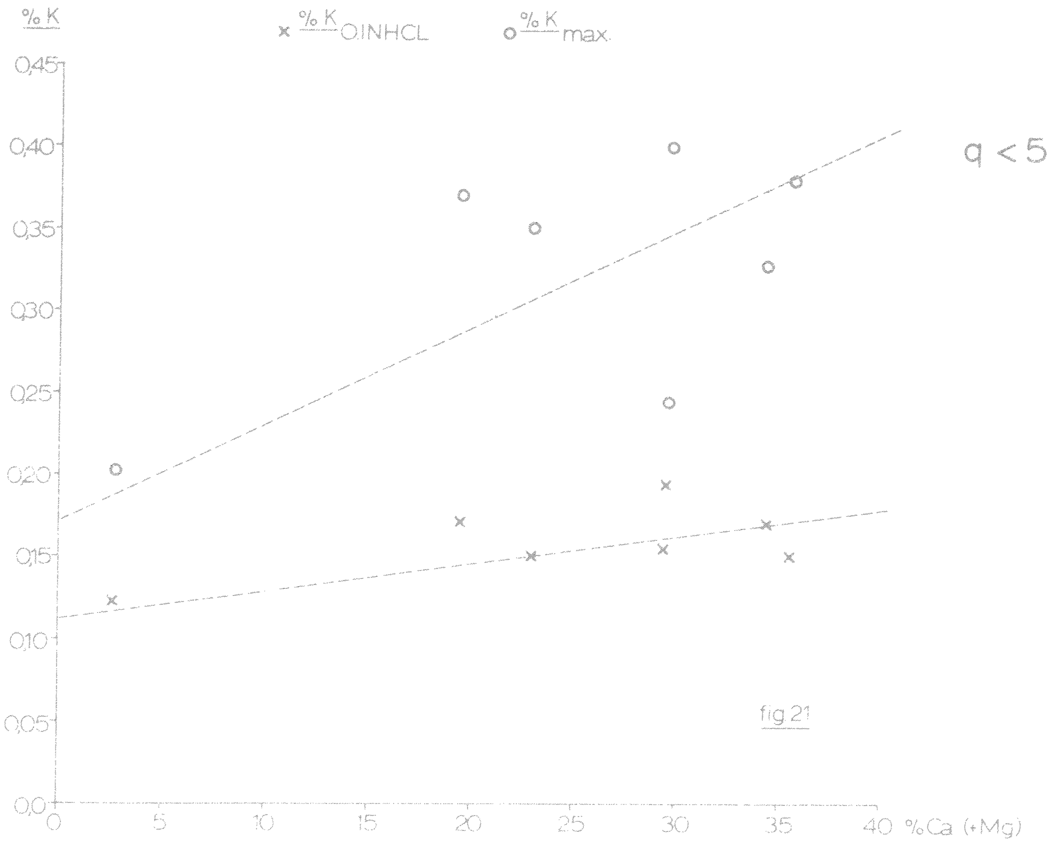

% K
0 I N HCl
1,0
0,75
0,50
0,25
0,0
25
50
75
100
125 q
(x)
(x)
fig.18


% K
max.
1,0
0,75
0,50
0,25
0,0
25
50
75
100
125 q
(x)
(x)
fig. 19



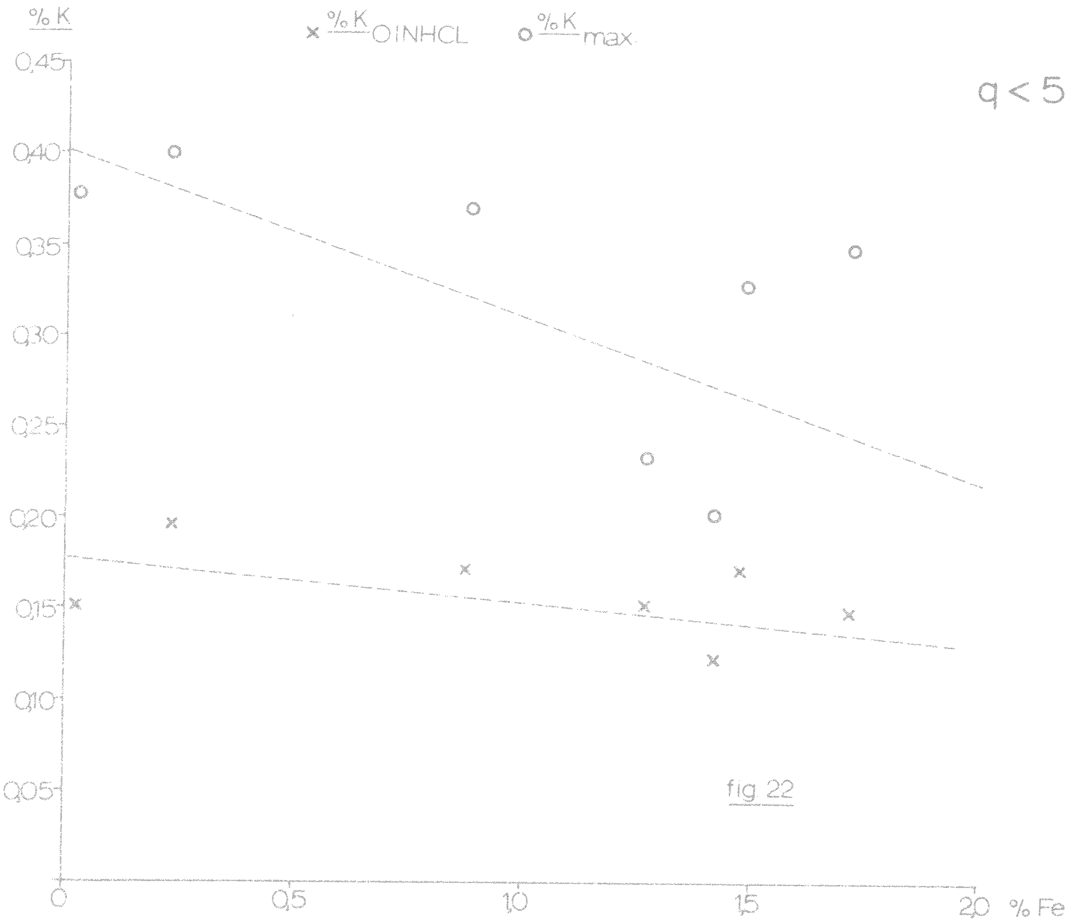
% K
× % K 0.1NHCl
o % K max.
q < 5
0,50
0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0
0,5
1,0
1,5
2,0
% organic matter

fig. 20



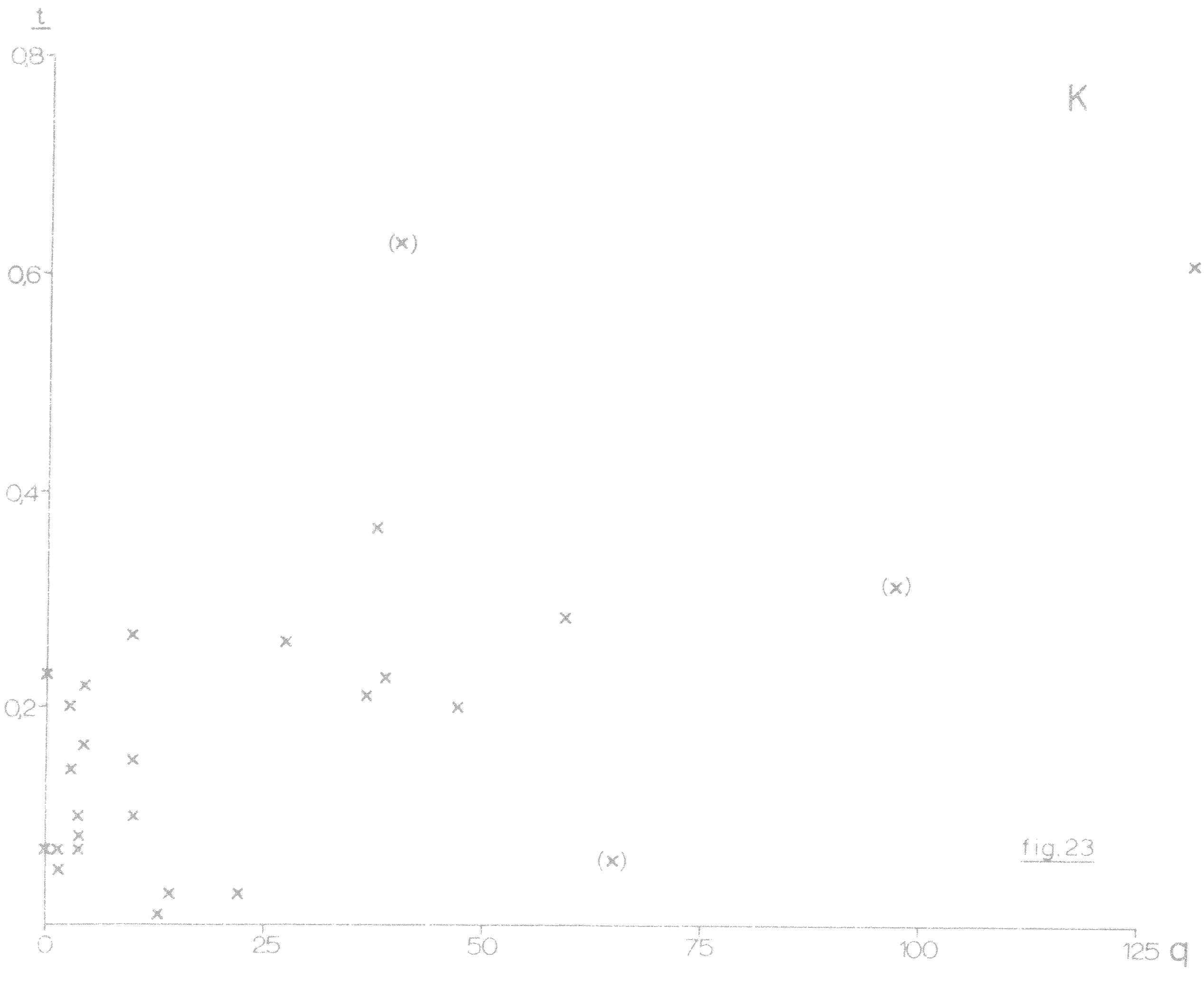
% K
× % K 0.1NHCL
o % K max.
q < 5
0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,0
0
5
10
15
20
25
30
35
40
%Ca (+Mg)

fig 21



% K
× % K 0 1 N HCL
o % K max
q < 5
0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0
0,5
1,0
1,5
2,0
% Fe

fig. 22



t
0,8
K
0,6
0,4
0,2
0
25
50
75
100
125
q

fig. 23

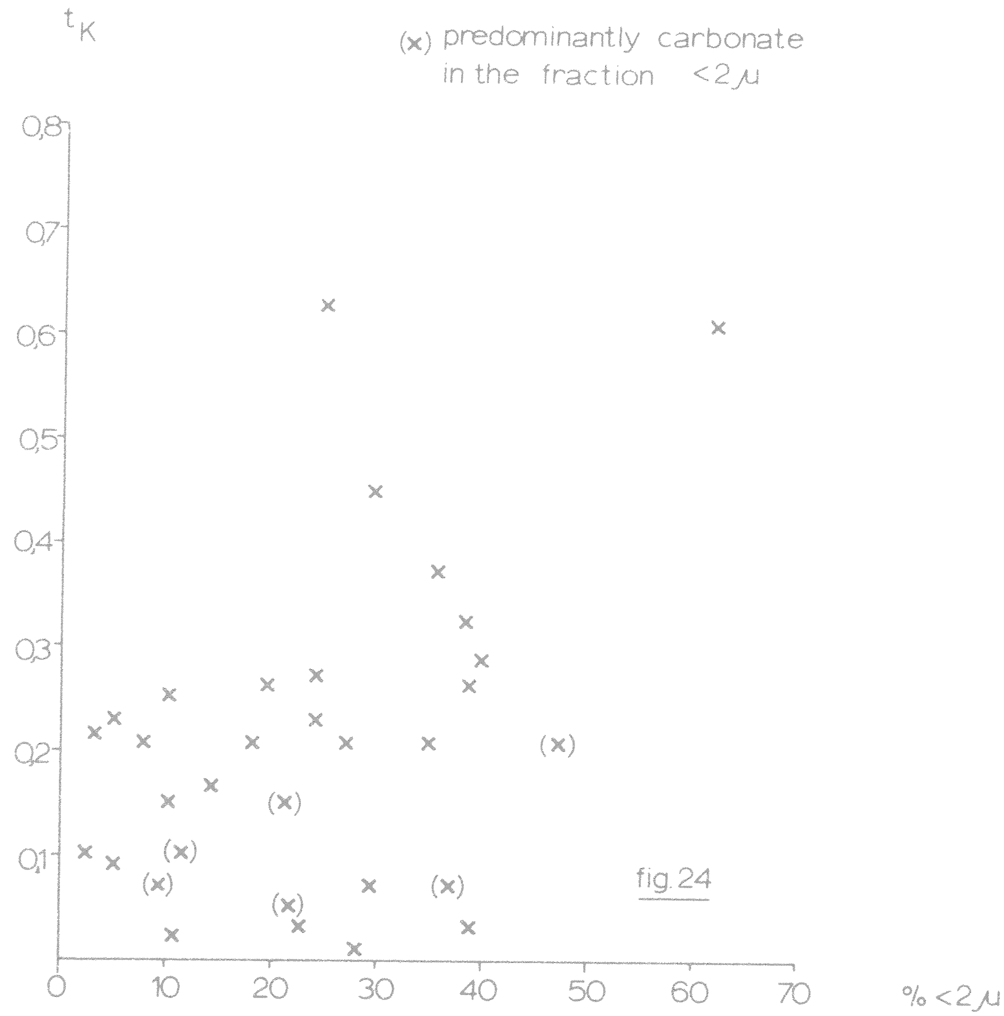


fig. 24

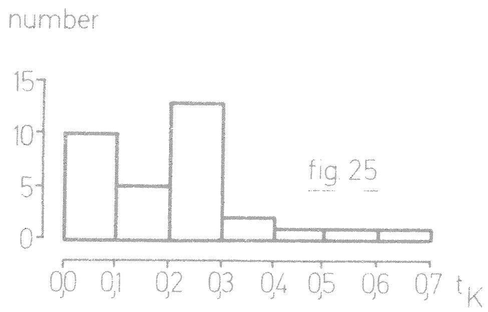


fig. 25

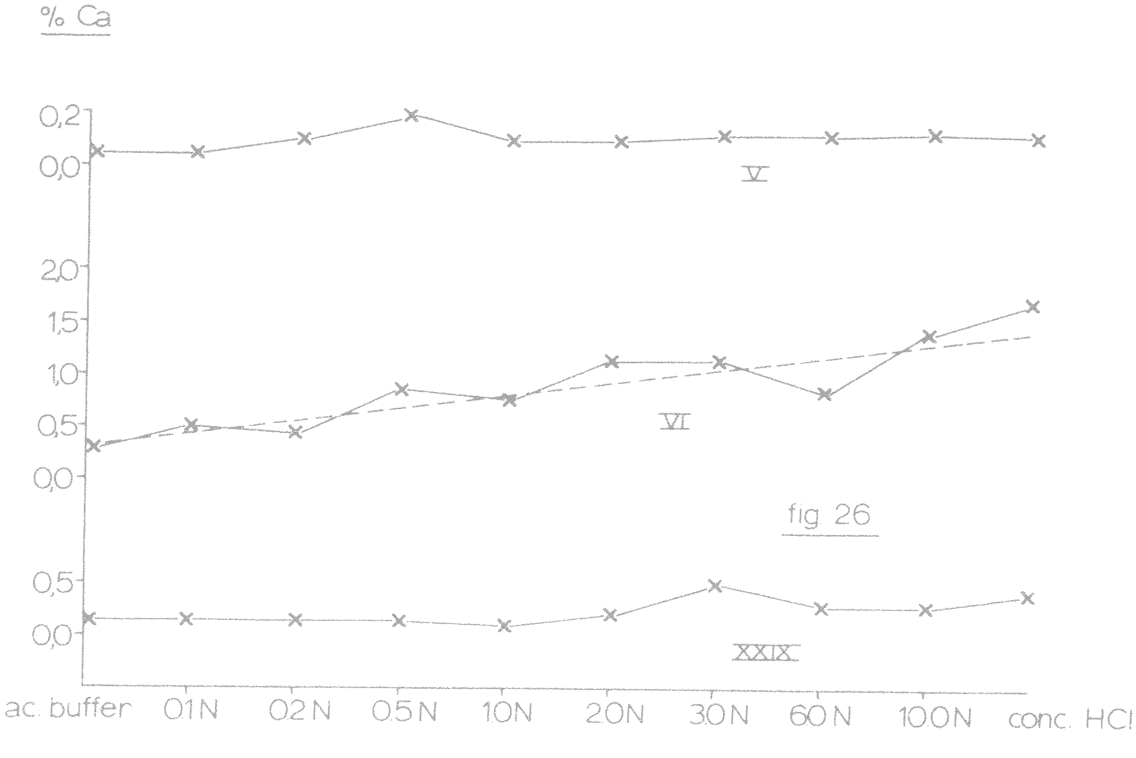
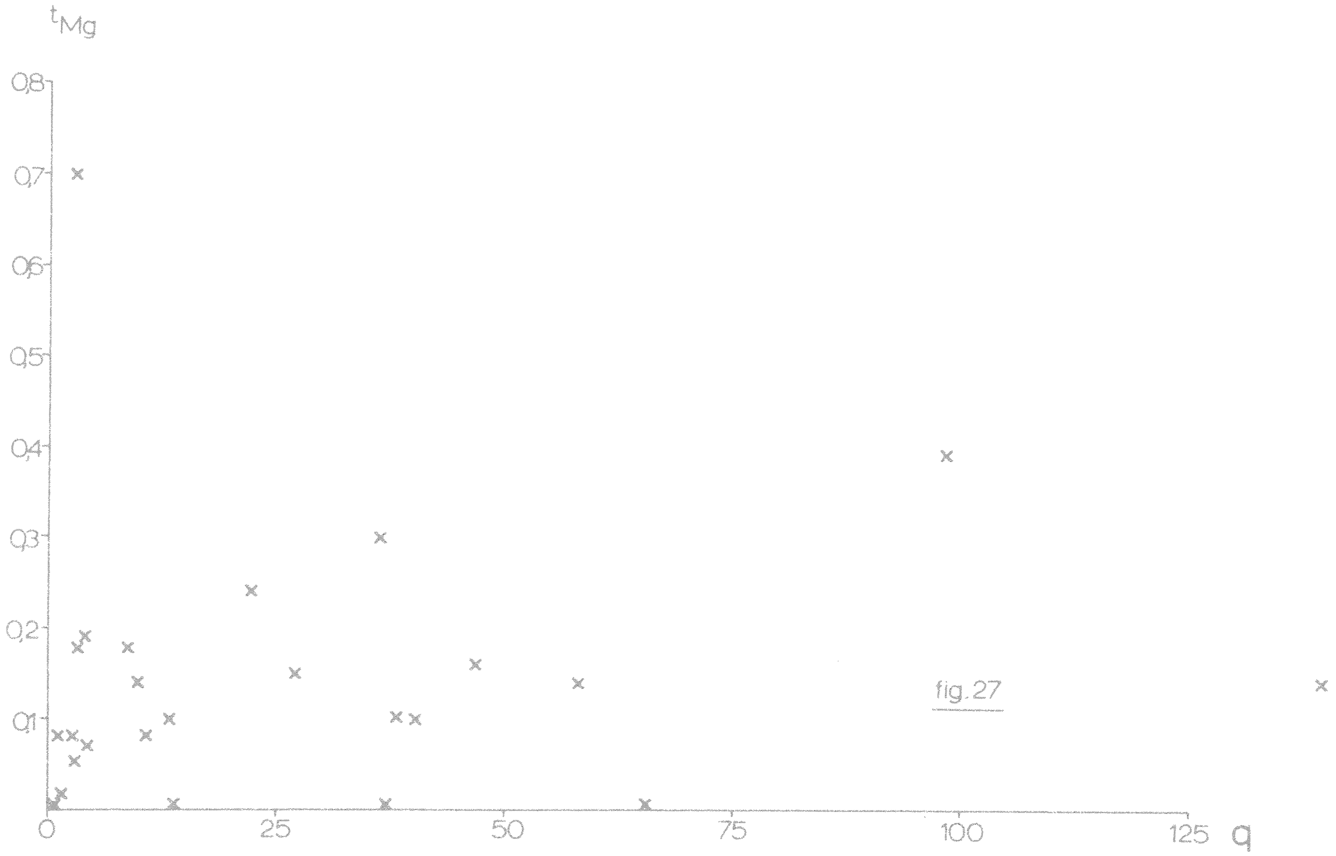
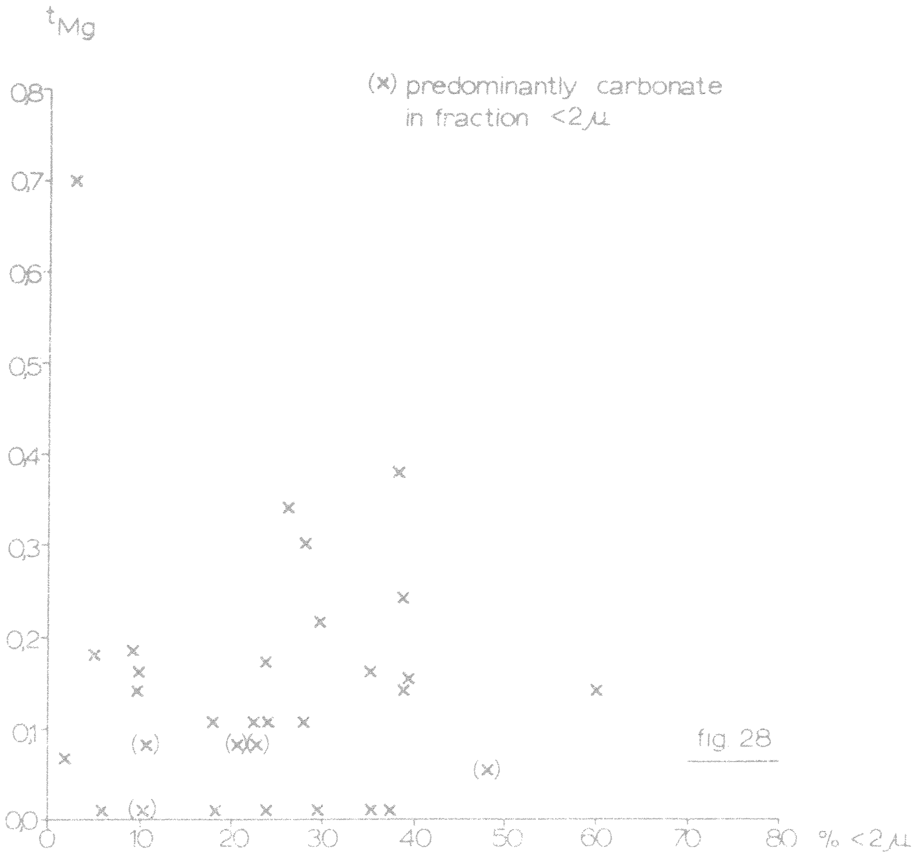


fig. 26



t_{Mg}
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
25
50
75
100
125
q
fig. 27



t_{Mg}
(x) predominantly carbonate
in fraction <2µ
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
0
10
20
30
40
50
60
70
80
% <2µ
fig. 28

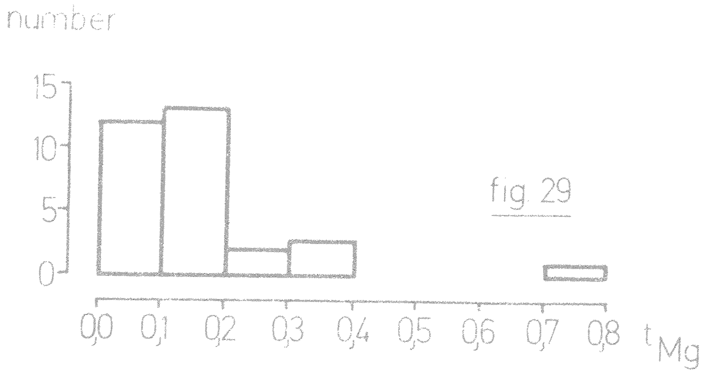

number
15
10
5
0
0,0
0,1
0,2
0,3
0,4
0,5
0,6
0,7
0,8
t_{Mg}

fig 29

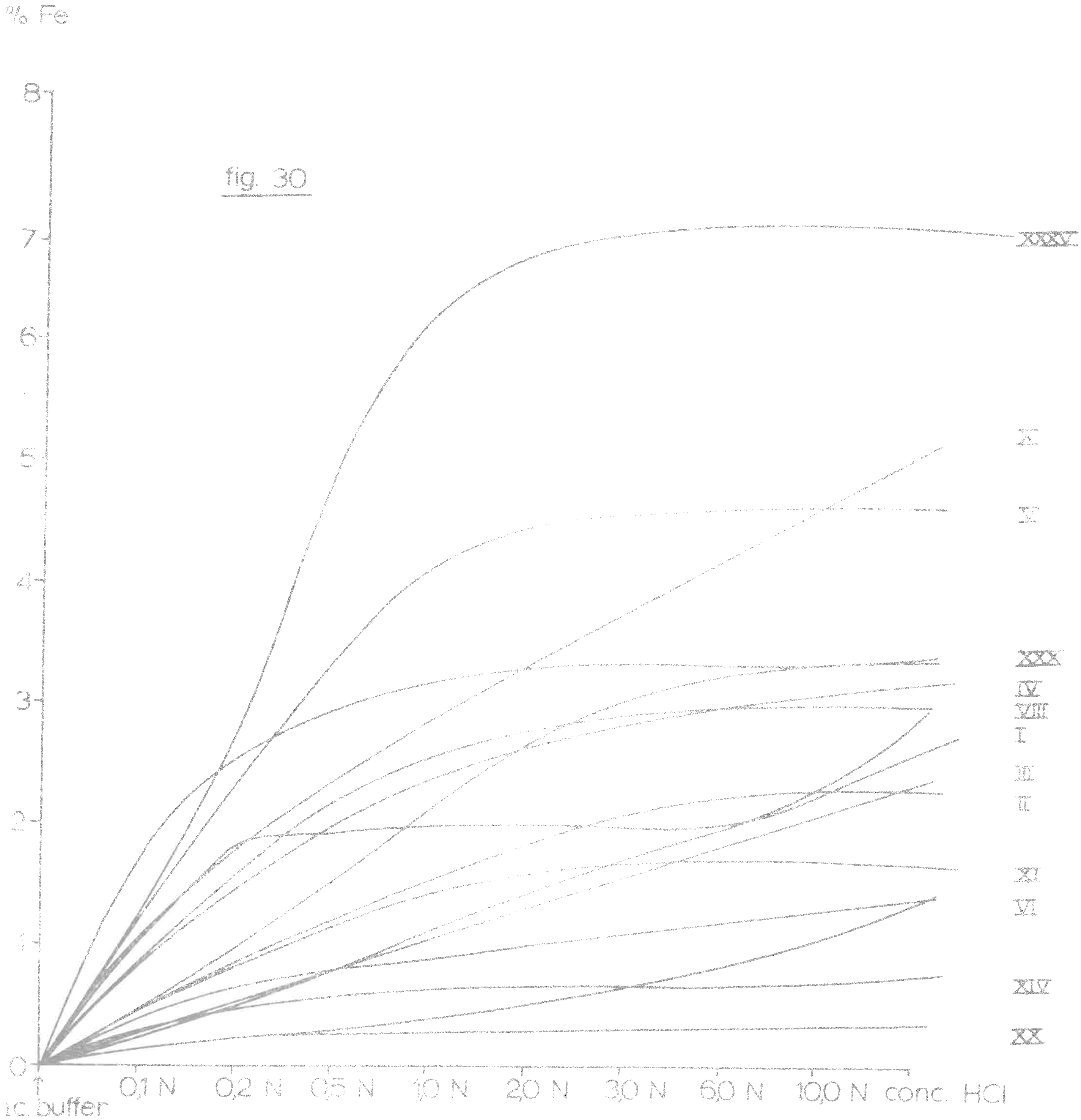
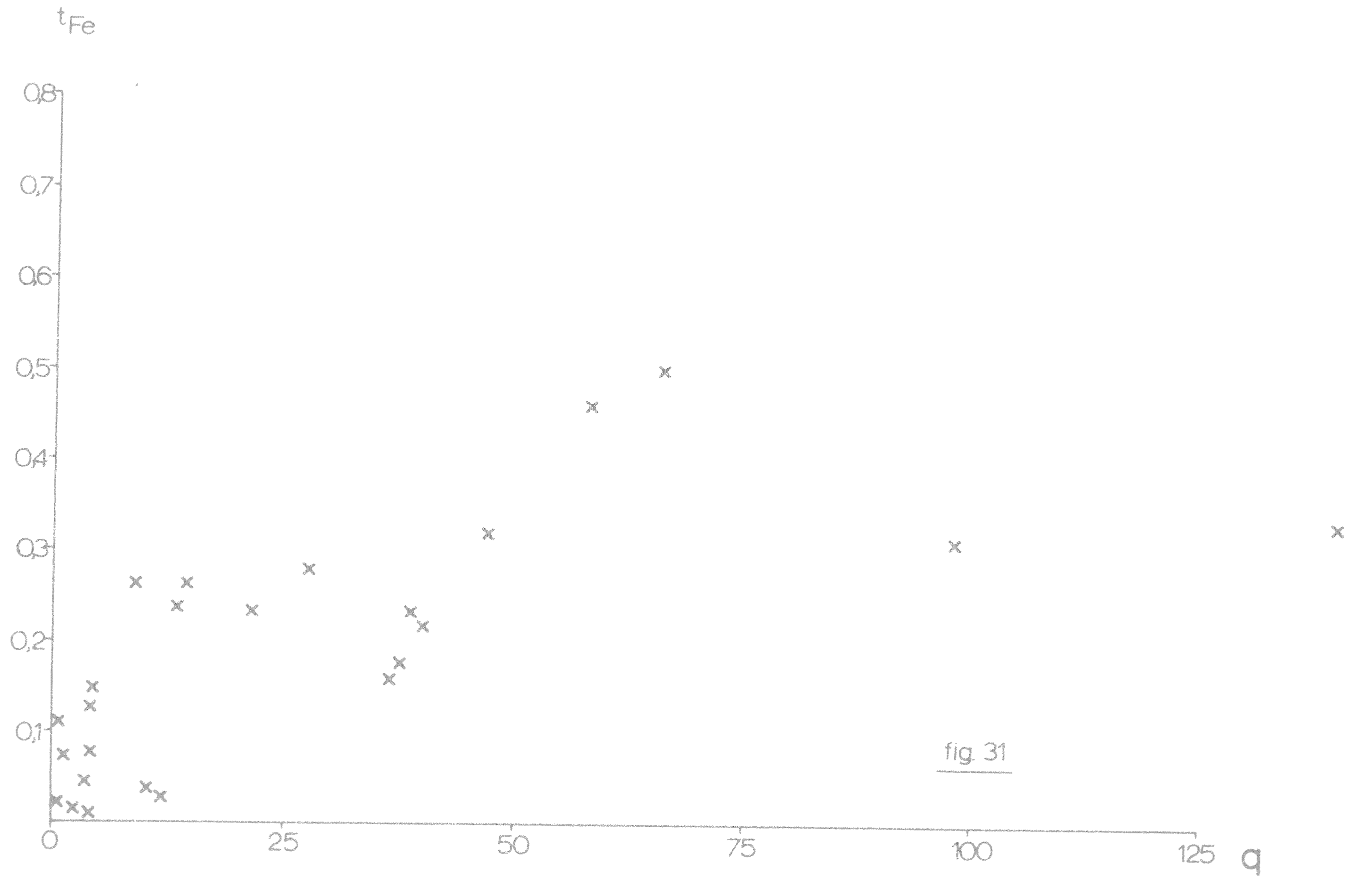
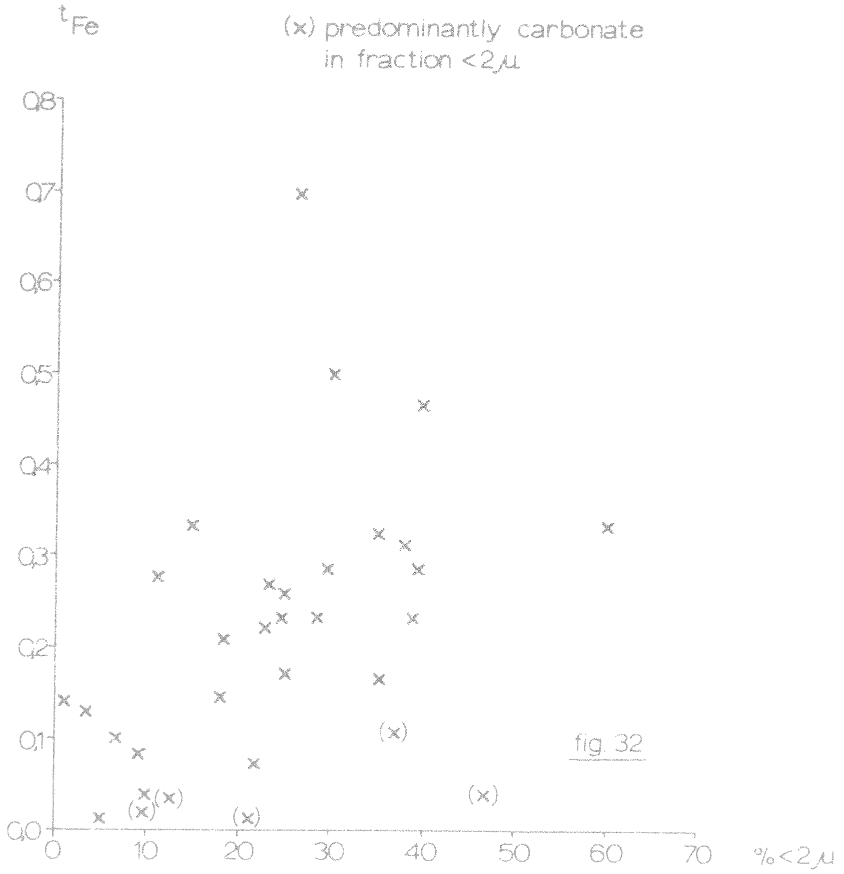

% Fe
8
7
6
5
4
3
2
1
0
XXXV
X
V
XXX
IV
VIII
I
III
II
XI
VI
XIV
XX
ac. buffer
0,1 N
0,2 N
0,5 N
1,0 N
2,0 N
3,0 N
6,0 N
10,0 N
conc. HCl

fig. 30



t_{Fe}
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
25
50
75
100
125
q

fig. 31



t_{Fe}
(x) predominantly carbonate in fraction <2 μ
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
0
10
20
30
40
50
60
70
% <2 μ

fig. 32

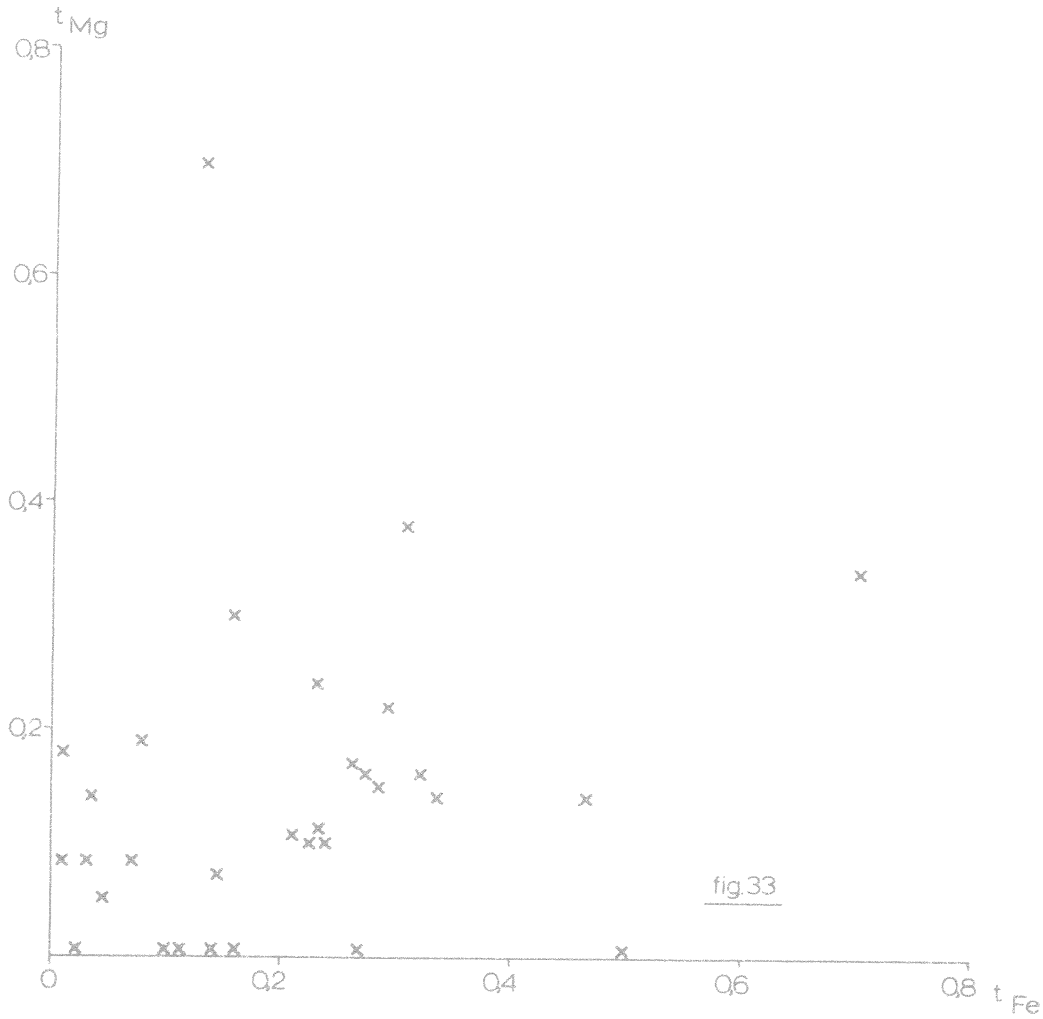

t Mg
0,8
0,6
0,4
0,2
0
0,2
0,4
0,6
0,8
t Fe

fig.33

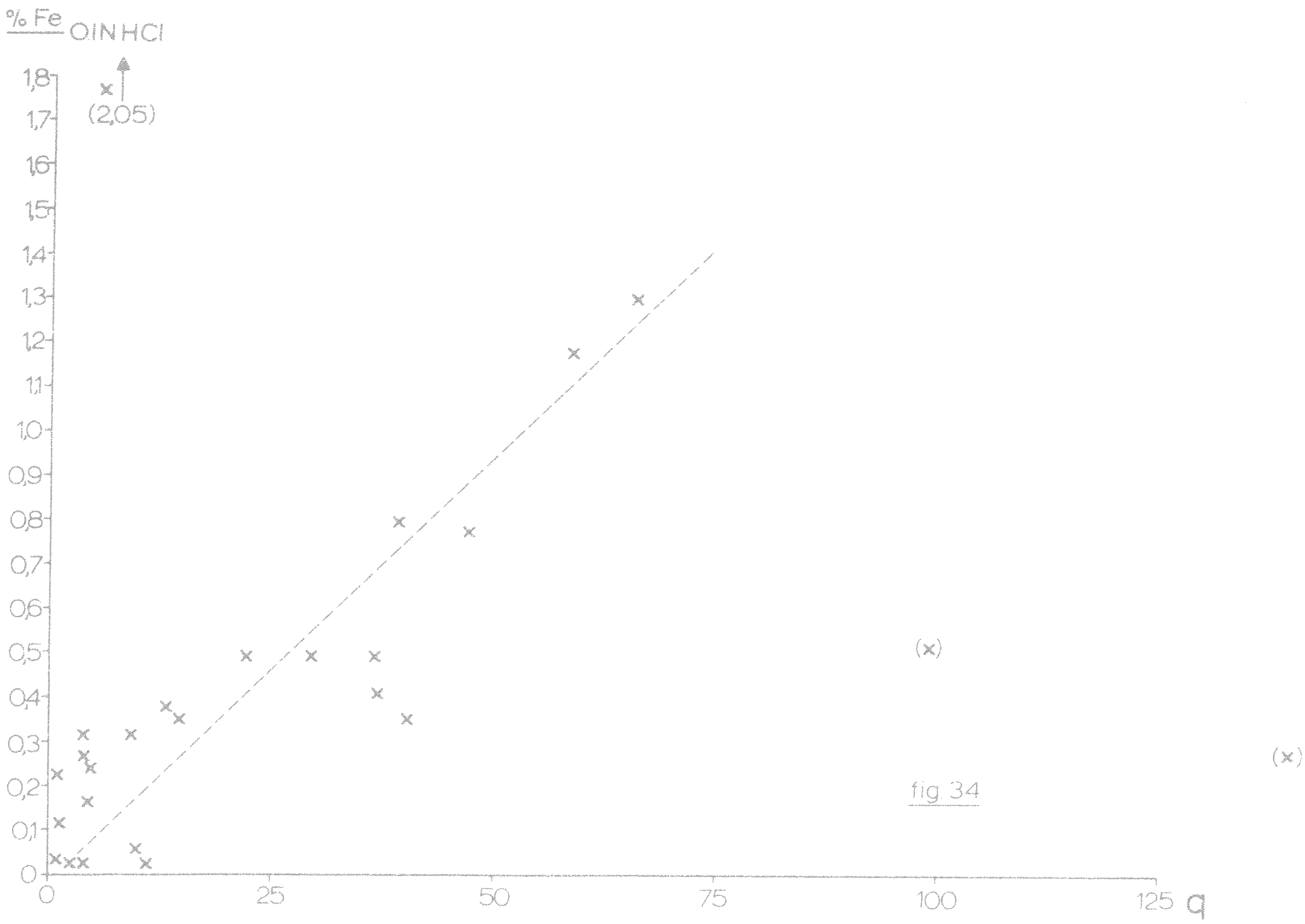
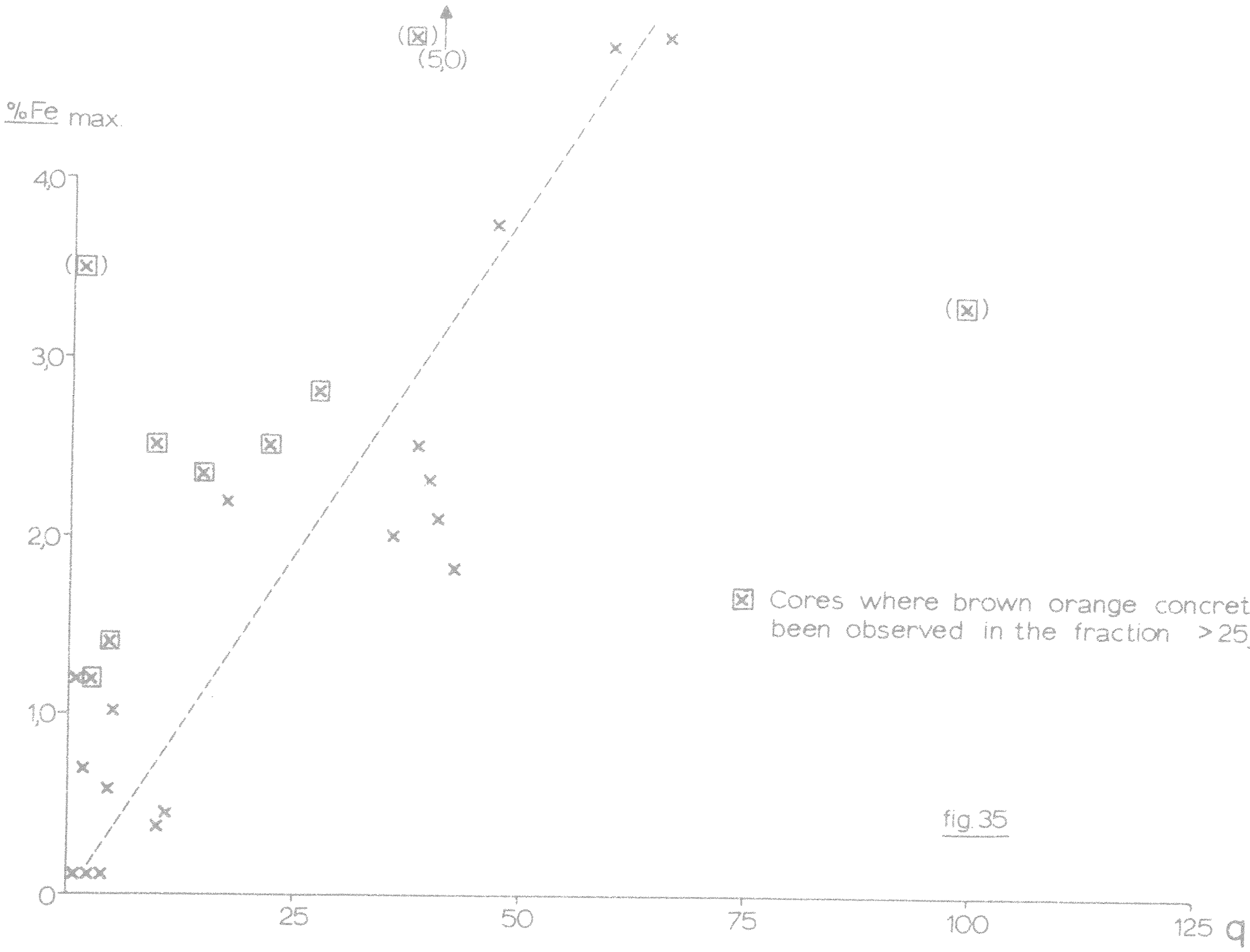
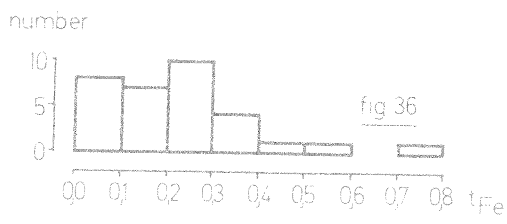

% Fe
0,1N HCl
1,8
1,7
1,6
1,5
1,4
1,3
1,2
1,1
1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
(2,05)
(x)
(x)
0
25
50
75
100
125
q

fig. 34



%Fe max.
4,0
3,0
2,0
1,0
0
25
50
75
100
125 q
(5,0)
Cores where brown orange concretions have been observed in the fraction >25μ

fig. 35



number
10
5
0
0,0 0,1 0,2 0,3 0,4 0,5 0,6 0,7 0,8 t_{Fe}

fig. 36