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This document provides a guide
to field contents.

The format in which data
appear on your tape is
entirely different.

SIO REFERENCE SERIES

SEDIMENT DATA BANK CODING INSTRUCTIONS

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17 April 1978

Scripps Institution of Oceanography

Reference Number 78-9

SEDIMENT DATA BANK CODING INSTRUCTIONS

by

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PREFACE

This report explains how to code information for input to the SIO Sediment Data Bank. The Sediment Data Bank Users' Handbook, SIO Reference 78-10, describes the data bank and available types of output and includes instructions for data retrieval.

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A. STATION RECORDS

One Station Record is to be coded for each core, dredge or other sample. If seafloor photographs were taken in conjunction with other sampling, they are not coded as separate stations but information from the photographs is entered in Columns 52-53. If seafloor photographs were taken where no other sampling occurred, they are coded as separate stations.

Station Records are identified by the numeral "0" in the first column. The information is coded as follows:

<u>Columns</u>	<u>Item</u>	<u>Explanation</u>
1	0	Card number; identifies Stations record
2-8		Leave blank
9-14 15-21	Latitude Longitude	Latitude and longitude are expressed as degrees, minutes and tenths of minutes, right justified with decimal point omitted, followed by N, S, E or W.
22-23	Sampler Type	Coded as in Table 1. Omit if unknown.
24-28	Bathymetry	Water depth in meters, as reported in the data source (may be corrected or uncorrected). Enter as a right-justified integer.
29	Institution	Data collected from one of the institutions listed below is coded as indicated. For other institutions leave column blank. <div style="margin-left: 40px;"> F = Florida State University H = Hawaii Institute of Geophysics L = Lamont-Doherty Geological Observatory O = Oregon State University R = Akademiia Nauk, USSR S = Scripps Institution of Oceanography W = Woods Hole Oceanographic Institution </div>
30-41	Station Name and Number	Identifies the station. Enter the cruise or ship name or an appropriate abbreviation and the station number or sample number, starting in Col. 30. May be up to 12 alphanumeric characters.
42-45	Reference	A letter followed by three digits to indicate the source of the information which is being coded. Each reference number is keyed to an item for which an entry has been made in the Bibliography File.

46-50	Length of Core	In meters. If decimal point is not entered, it is assumed to be at the right of Col. 50. For example, 140 m is coded as 140 or 140.; 231 cm is coded as 2.31.
51	Manganese Nodule Occurrence	Refers only to nodules collected by the sampler described in Cols. 22-23. If nodules were observed in seafloor photographs associated with the station, the information should be entered in Cols. 52-53, not here. Use the following codes: 0 or blank = unknown; no information 1 = nodules absent 2 = nodules present
52	Manganese Nodule Coverage	Code as follows: 0 or blank = no information 1 = no nodules 2 = sparse (<20% coverage) 3 = moderate (estimated 20-50% coverage) 4 = abundance (coverage estimated >50%)
53	Sampler Type From Which Coverage and/or Concentration Estimate Was Determined	Code as follows: 0 or blank = unknown 1 = box core or box grab 2 = photographs 3 = miscellaneous; other 4 = sonar 5 = television 6 = grab sampler 7 = coverage from photographs, concentration most likely from major sampler (Cols. 22-23)
54-58	Manganese Nodule Concentration	Seafloor concentration in kg/m ² . Enter as a real number to two decimal places; decimal point must be included.
59	Surface Nodules	Enter a "1" in this column if manganese nodules occurred within 10 cm of the sediment surface.
60	Buried Nodules	Enter a "1" in this column if manganese nodules occurred below 10 cm in the sediment. Both Cols. 59 and 60 may be filled if both buried and surface nodules were observed.
61-62	Surface Lithology	These codes are to give a general indication of the lithology of the surface sediment. They are not intended to constitute a comprehensive system of sediment classification such as described in Section C. If a sample does not fit into a category, do not code. Code as follows:

B. MANGANESE NODULE ANALYSES RECORDS

Manganese nodule records are identified by the digit "3" in column 1. Depending on the number of elements analyzed, there may be 3 or 4 cards for a single sample. Each subsequent card will be identified by the digits "4" and "5". Card number 5 may be used repeatedly as many times as necessary.

Card 3 is coded as follows:

<u>Columns</u>	<u>Item</u>	<u>Explanation</u>
1	3	Card number
2-4 5-8	Square number Sequence number	Square and sequence numbers are the same as on the Station Record which corresponds to the station from which the manganese sample was taken. Columns 2-3 should be completely filled; use leading zeroes.
9-10	Analysis number	Number analysis from 0-99 sequentially using a new number for each analysis.
11-12	Sample type	Enter the sample type according to the following code: 0 = unknown 1 = Mn nodule or nodules 2 = Mn nodule in sediment 3 = micronodules 4 = micronodules in sediment 5 = nodules and micronodules 6 = Mn-encrusted sediment 7 = Mn-coated rock 8 = crust, pavement 9 = Mn-coated organic material 10 = several crusts
13-27	Sample dimensions	Enter dimensions in millimeters (1 cm = 10 mm, 0.1 cm = 1 mm) as follows: 13-17 largest dimension or diameter 18-22 next largest dimension 23-27 smallest dimension You must right justify the number or include a decimal point in the dimension. If a range is given, enter the largest dimension in columns 13-17 and the smallest dimension in columns 23-27. If dimensions are in microns, you enter a minus sign (-) before the number in cols. 13-17.

- 4 = earbone
- 5 = pumice
- 6 = chert
- 7 = palagonite
- 8 = clay
- 9 = altered basalt
- 10 = volcanic
- 11 = nodule fragment
- 12 = metallic object
- 13 = sediment, unspecified
- 14 = rock, unspecified

34-37 Reference

A letter followed by three digits to indicate the source of the information being coded. Each reference number is keyed to an item for which an entry has been made in the Bibliography File.

38-72 Element concentrations (weight %)

Enter the concentrations for the following elements in the columns indicated:

- 38-42 Manganese (Mn)
- 43-47 Iron (Fe)
- 48-52 Cobalt (Co)
- 53-57 Nickel (Ni)
- 58-62 Copper (Cu)
- 63-67 Zinc (Zn)
- 68-72 Molybdenum (Mo)

If the concentration is more than 4 digits, there is an implied decimal point just before the left most column in the field. If you enter a number without a decimal point, it must be left justified. If you enter a number with a decimal point, it may be entered anywhere in the field.

73-80 These columns are to be left blank.

Card 4 is coded as follows:

<u>Column</u>	<u>Item</u>	<u>Explanation</u>
1	4	Card number. This card may be omitted if none of the information given below is given in the source.
2-4	Square Number	Same as on Card 3
5-8	Sequence number	
9-10	Analysis number	

Card 5 is coded as follows:

1	5	Card number
2-4	Square number	Same as on cards 3 and 4.
5-8	Sequence number	
9-10	Analysis number	
11-66	Additional element concentrations (weight %)	Enter concentrations in the same way as on Card 4 under Additional element concentrations. Atomic number fields begin in Cols. 11,18,25,32,39,46,53 and 60. If you have more element concentrations than the space provided on these three forms, card 5 may be used repeatedly until all elements are recorded.

DEPTH IN CORE. The depth below the seawater-sediment interface at which the sample analyzed was found is to be entered as a pseudo element concentration on either Card 4 or Card 5. The "atomic number" indicating depth is 93, and the depth in cm is entered as a right-justified integer under "element concentration." For a surface sample the depth is entered as zero (0).

67-80 These columns are to be left blank.

- 5 Calcareous ooze $\text{CaCO}_3 > 30\%$, $< 25\%$ siliceous remains. Calcareous material is biogenous debris from foraminifera, pteropods, or nannofossils. Includes: globigerina ooze, foram ooze, pteropod ooze, foram marl ooze, foram marl, foram chalk, globigerina and foram mud.
- 6 Siliceous ooze Pelagic sediments containing $> 30\%$ skeletal remains of siliceous organisms (radiolaria, diatoms, silicoflagellates, sponge spicules and echinoid spines).
- 7 Clay Pelagic clay, having $< 30\% \text{CaCO}_3$, $< 30\%$ siliceous skeletons, $\geq 10\%$ slow sedimentation indicators (zeolites, Fe and Mn micronodules, fish debris); Terrigenous clay, having $< 50\%$ volcanic particles, $< 30\% \text{CaCO}_3$, $\geq 90\%$ clay-sized particles, $< 10\%$ slow sedimentation indicators.
- 8 Volcanic ash Grain size $< 4 \text{ mm}$, and 50% or more of the sample is of pyroclastic origin.
- 9 Siliceous-calcareous ooze Biogenous sediments in which siliceous and calcareous biogenous material are each $> 25\%$. (Most sediments within this category contain enough CaCO_3 to be considered calcareous ooze, but many researchers find the indication of a large siliceous component useful).
- 10 Zeolitite Sediment containing $> 50\%$ zeolites.

Our system was designed to facilitate digital coding of sediment descriptions from a variety of sources and to serve the needs of specific research groups. It is not meant to replace schemes in current use for classifying marine sediments. In most cases data included in the DESCRIPTIONS records allow the user to reclassify the sediments according to any system using our Program SEARCH (see SIO Reference No. 78-10). Such reclassification is, of course, impossible if the original source contained only the lithological category with no additional descriptive information.

Several classification systems are summarized below along with the Sediment Data Bank lithological name which corresponds to each major category in the other systems.

The scheme devised by Murray and Renard² includes ten major sediment categories as follows:

<u>Term used by Murray & Renard</u>	<u>Definition</u>	<u>Data Bank Classification</u>
Blue mud	Characteristically bluish gray; moderately coherent and granular; made up of land detritus, mainly quartz. Frequently found in deeper water surrounding continents.	Mud (may sometimes be classified as calcareous ooze if $\text{CaCO}_3 > 30\%$)

Noting several weaknesses in the above system, in 1944 Revelle⁴ proposed a new system of sediment classifications as follows:

<u>Term used by Revelle</u>	<u>Definition</u>	<u>Data Bank Classification</u>
I. Pelagic Deposits	Sediments of red, brown, yellow or white color which have below a certain amount of allogenic mineral and rock particles > 5 μ m and which contain only small amounts of neritic organism remains	
A. Oozes	Skeletal remains of organisms >30% in amount	
Globigerina } Pteropod } Coccolith } Calcareous } ooze	CaCO ₃ >30%; skeletal remains of calcareous organisms >30%	Calcareous ooze
Siliceous Globigerina ooze	CaCO ₃ >30%; abundant siliceous remains	Siliceous-calcareous ooze
Siliceous } Diatom } Radiolarian } ooze	CaCO ₃ <30%; skeletal remains of siliceous organism >30%	Siliceous ooze
B. Red Clay	Skeletal remains of organisms <30%	Clay
II. Terrigenous deposits, called muds	Distinguished by a bluish, green, gray or black color, or presence of appreciable neritic organic remains or allogenic minerals	
A. Organic muds	Skeletal remains of organisms >30%	
Calcareous mud and sand	CaCO ₃ >30%; calcareous organisms or neritic type	Calcareous ooze
Globigerina } pteropod } mud	CaCO ₃ >30%; calcareous organisms of pelagic type	Calcareous ooze
Siliceous } Diatom } Radiolarian } mud	CaCO ₃ <30%; remains of siliceous organisms >30%	Siliceous ooze

Pelagic Sediments

Pelagic clay	<30% CaCO ₃ , <30% siliceous skeletons; slow sedimentation indicators (zeolites, Fe and Mn micronodules, fish bones, etc.) >10%.	Clay
Zeolite clay	Zeolites are dominant constituent	Zeolitite
Siliceous Radiolarian } ooze Diatomaceous }	Soft; >30% siliceous skeletons <30% CaCO ₃ , <30% silt and clay	Siliceous ooze
Radiolarite } Diatomite } Chert } Porcelanite }	Same as siliceous ooze but hard	Rock or gravel
Calcareous ooze	Soft; >30% CaCO ₃ , <30% silt and clay	Calcareous ooze
Chalk } Indurated chalk } Limestone }	Same as calcareous ooze but firm or hard	Rock or gravel

Transitional sediments

Muddy diatom ooze	Soft; >50% diatoms; >30% silt and clay; <30% CaCO ₃ .	Siliceous ooze
Muddy diatomite	Same as above but hard	Rock and gravel
Diatomaceous } mud Siliceous }	Soft; 10-50% diatoms; >30% silt and clay; <30% CaCO ₃ .	Siliceous ooze if diatoms >30%; otherwise, mud
Marly calcareous ooze	Soft, >30% CaCO ₃ , >30% silt and clay.	Calcareous ooze
Marly chalk } Marly limestone }	Same as above but hard	Rock and gravel

Terrigenous and volcanic detrital sediments

Clay } Mud } Silt } Sand }	Soft; <80% volcanic particles; <10% diatoms; <30% CaCO ₃ ; slow sediment indicators <10%. Sediments subdivided into textural groups according to the diagram in Fig. 1, page 22.	Clay, mud or sand and silt
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Radiolarian (diatom) chalk	5-30% siliceous microfossils; remainder is chalk	Calcareous ooze or siliceous-calcareous ooze depending on detailed description
Radiolarian (diatom) marl	5-30% siliceous microfossils, remainder is clay and silt	Clay
Coarse fraction 30-80%:		
Foraminiferal (pteropod) chalk ooze	30-80% coarse calcareous microfossils; remainder is chalk	Calcareous ooze
Foraminiferal (pteropod) marl ooze	30-80% coarse calcareous microfossils; remainder is marl	Calcareous ooze
Foraminiferal (pteropod) clay ooze	30-80% calcareous microfossils; remainder is clay and silt	Calcareous ooze
Radiolarian (diatom) chalk ooze	30-80% coarse siliceous microfossils; remainder is chalk	Siliceous or siliceous-calcareous ooze depending on detailed description
Radiolarian (diatom) marl ooze	30-80% coarse siliceous microfossils; remainder is marl	Siliceous or siliceous-calcareous ooze
Radiolarian (diatom) clay ooze	30-80% coarse siliceous microfossils; remainder is clay and silt	Siliceous ooze
Coarse fraction >80%:		
Foraminiferal (pteropod) ooze	>80% coarse microfossils, predominantly foraminifera or pteropods	Calcareous ooze
Radiolarian (diatom) ooze	>80% coarse microfossils, predominantly radiolaria or diatoms	Siliceous ooze

The Kaneps report does not mention the classification of terrigenous sediments, but Lamont-Doherty uses the usual terms sand, silt and mud; we presume they have the same meaning here as in other systems.

- 2 = definitely present. This code is used only for incomplete descriptions in which the actual quantity of microfossils is either not supplied or cannot be understood.
- 3 = rare or trace amounts, probably <10%. Includes such categories as "few" (usually 5-15%) and "negligible" and DSDP categories "trace" (<2%) and "bearing" (2-10%).
- 4 = low, probably 10-30%. Usually the abundances of the constituents have been estimated and listed in the description. Includes samples described as "Foraminiferal" or "Radiolarian" clay.

DSDP core describers may add the prefix "rich" to the sediment name if constituents are present in amounts of 10-25%.⁸ Although DSDP descriptions always list the estimated percentages or abundance, the coder may encounter descriptions from other sources where the sediment was described as, for example, a foram-rich clay, which would be included in this category. At SIO a sediment name is prefixed by the term "bearing" for a comparable range of 5-25% (personal communication, Carolyn Glockhoff).

For DSDP and SIO, major constituents present in quantities greater than 25% provide the sediment name. Constituents are listed in order of increasing abundance from left to right. The coder can use the number of sediment names to estimate abundances. For example, a sample may have the assigned lithology "Foram, clayey, nanno ooze." The first item of three is probably less abundant than 30%; thus Forams would be in the 10-30% range. The second constituent would be likely to fall in the 30-50% range, but probably toward the lower boundary of this category. The nannofossils could also be assumed to be present in the 30-50% range, though being present in the greatest abundance they could be assumed to be in the higher end of the range.

Occasionally specimen abundances are given in terms of individuals per gram of sediment. In order to determine the percentage equivalent one must have specific knowledge of both the specimens and the region. An example would be diatoms in the Bering Sea, where 100,000 to 200,000 diatoms per gram sediment would constitute between 10 and 30%, but this cannot necessarily be applied to other regions because of variance in specimen size (personal communication, Edith Vincent, SIO).

- 5 = moderate, probably 30-60%. This category would include those samples described as foraminiferal or pteropod marl ooze in the Olausson or Kaneps classification systems. SIO observers require that more than 50% of the sediment consist of biogenous remains before the sediment is called an "ooze" (personal communication, Carolyn Glockhoff). A "biogenous ooze" may be dominated by one skeletal type, or it may be a composite. In the latter case, the abundance of any one organism is likely to be in the low or moderate range.
- 6 = probably >30% and possibly >60%. This category is used when the sample is classified as "ooze" according to a system where ooze is defined as a sediment containing >30% microfossils and no further information is available.

- 25 Consolidation Code as follows:
- 0 or blank = soft or not specified, unconsolidated
 - 1 = soupy, semi-liquid
 - 2 = firm, stiff, or partially indurated
 - 3 = hard, indurated

The presence of minerals and other features in the sample is indicated by the numeral "1" and their absence by a blank or "0" in the appropriate column:

- 26 Turbidite
- 27 Bedded Laminated, stratified, varved, evidence of cross-bedding
- 28 Graded
- 29 Worm Burrows
- 30 Mottling Cannot be specifically identified as burrows
- 31 Volcanic Ash Layer Ash layer within the layer of core being described
- 32 Dispersed Volcanic Ash Accumulations of glass shards constitute volcanic ash.
- 33 H₂S Hydrogen sulfide gas
- 34 Manganese Pavement or Crusts
- 35 Manganese Nodules Includes samples described as concretions
- 36 Manganese Micronodules Generally silt or sand-sized. Do not place a "1" in this column if the description reports merely "manganese test positive."
- 37 Quartz
- 38 Feldspar Includes plagioclase and orthoclase
- 39 Pyroxene Includes hypersthene and augite
- 40 Chlorite
- 41 Mica Includes muscovite and biotite. Mica is usually a terrigenous sediment component; however, muscovite can be authigenic.
- 42 Glass
- 43 Palagonite
- 44 Glauconite A component of "green mud" or "green sand." It is an indicator of very slow sedimentation.

4 = mud. See classification schemes in Section C-1 for various definitions of this term. It is always a terrigenous sediment, generally of mixed grain size. Data bank coders should follow DSDP definition (Fig. 1) if possible.

5 = calcareous ooze

6 = siliceous ooze

7 = clay. May be pelagic or terrigenous. Pelagic clay is fine-grained with indicators of slow sedimentation $\geq 10\%$, $< 20\%$ terrigenous detrital material in the coarse fraction or $< 30\%$ in the total sample, CaCO_3 or siliceous microfossils $< 30\%$; includes sediments described as lutite. Terrigenous clay is a terrigenous sediment with $\geq 90\%$ clay-sized fraction.

8 = volcanic ash

9 = siliceous-calcareous ooze. Includes samples with $> 30\%$ CaCO_3 and "appreciable" amounts of radiolaria or diatoms.

10 = zeolitite

Part 2 of the Description Record is identified by the numeral "2" in Column 1 and is coded as follows:

<u>Columns</u>	<u>Item</u>	<u>Explanation</u>
1	2	Card number; identifies second part of Description Record
2-10	Square Number Sequence Number Layer Number } }	Same as for Card 1
11-16	Top of Layer	The depth below the sediment-water interface, in centimeters, at which the layer being described begins. The top layer may or may not begin at zero.
17-21	Layer Length	The depth of the top of the layer, in centimeters, subtracted from the depth of the bottom of the layer
22-24 25-27	Predominant Color } Secondary Color } }	Colors are expressed by a 3-character code condensed from the Munsell system. The first character of each color code represents the <u>hue</u> :

R = red (R in Munsell code)
 O = orange or yellow-red (YR 1/ to YR 5/)
 Y = yellow (2.5Y)
 G = green, yellow-green or olive (7.5Y, 10Y, GY, B, BG)
 B = blue or purple (B, PB, P, RP)
 N = neutral (black, white or gray: N)
 T = tan or light yellow-brown (2.5Y6/ to 9/ or YR6/ to 9/)

TABLE 3: MODIFIERS FOR ROCK AND PEBBLES

Code	Modifier
IGN	Igneous, unspecified
BAS	Basalt, pillow basalt, basalt glass
GAB	Gabbro, diabase
PUM	Pumice
BRE	Breccia, volcanic
VOL	Volcanic, unspecified
TUF	Tuff
AND	Andesite
GRA	Granite
PER	Periodotite
MET	Schist, or unspecified metamorphic
GRE	Greenstone
SER	Serpentine
SED	Sedimentary, unspecified
SAN	Sandstone, graywacke
MUD	Mudstone, siltstone, claystone, shale
CON	Conglomerate
LIM	Limestone
CHA	Chalk
CHE	Chert, porcelanite
EVA	Evaporite -- gypsum, salt
MNN	Mn nodules
MNP	Mn pavement or crust
MNC	Mn-coated
COR	Coral
PHO	Phosphorite nodules
ZEO	Zeolite nodules
GLA	Glacial transport material
SHE	Macrofauna shells
ALT	Altered
FER	Ferruginous
SIL	Siliceous