Geochemistry of the fine size fraction of bottom sediments from the southern Argentine shelf

FREDERIC R. SIEGEL *and* FRANK T. DULONG

Department of Geology
George Washington University
Washington, D.C. 20052

ANTHONY DORRZAPF *and* PAUL P. HEARN

U.S. Geological Survey
Reston, Virginia 22092

JACK W. PIERCE

Division of Sedimentology
U.S. National Museum
Smithsonian Institution
Washington, D.C. 20560

Major element data and trace element data on bottom sediments from the Argentine continental platform are generally lacking. It is important to generate such data in order to establish geochemical baseline concentrations from which "anomalous" concentrations can be identified. These "anomalies" may be the result of natural processes such as drainage from a mineralized zone (Siegel and Pierce, in press), or may represent environmental intrusion by man because of population growth and subsequent problems related to urbanization, industrialization, and increasing demands on mineral and energy resources (Siegel *et al.*, 1978). Environmentally secure development can proceed only when available data provide a basis for proper planning that will least intrude on the environment.

Siegel and others (1968) and Lunking and others (1973) reported on trace element concentrations in bottom sediments and cores from the Golfo San Matias (41°-42°S.) and were able to demonstrate the influence of size fraction, biogenic component, and heavy mineral suite on trace element distribution. In 1973, Boosman studied a suite of bottom sediments taken on the continental shelf (38°-42°30'S.) sedimentologically and mineralogically and provided C_{org} data as well on the less than 62-micron fraction of the sediments.

During R/V *Hero* cruise 75-3, which was designed to study the amount of suspensate on the southern Argentine shelf (between about 55° and 47°S.), suspensate mineralogy, and suspensate contribution to the Argentine Basin lutite sequence (Pierce and Siegel, in press; Siegel *et al.*, 1976), bottom sediments were collected in order to study their relations to the suspensates above them. Although Siegel and his colleagues believe that the suspensate represents a "purer" sample for geochemistry since the degree of diagenetic alteration it undergoes is probably far less than that of the fine fraction in bottom sediments, bottom sediments are also good for geochemical studies because the data generated from them provide reference bases for future evaluations of environmental contamination.

Table 1. Summary of emission spectrographic analyses of bottom sediment combined silt and clay size fractions, southern Argentine continental shelf. The standard deviation on any single answer was taken as +50%, -33%.

	X		Range
	IN PERCENT		
Si	23.5	7.0	9.0-34.0
Al	4.8	1.7	1.4- 7.0
Fe	3.7	1.4	1.4- 8.5
Mg	1.2	0.2	0.7- 1.7
Ca	3.8	3.9	1.1-19.0
Na	1.8	0.4	0.9- 2.9
K	1.7	0.4	0.7- 2.4
Ti	0.2	0.1	0.1- 0.4
P	0.3	0.3	0.1- 0.6
	IN PPM		
	X		Range
B	61.3	18.0	24.0- 94.0
Ba	318.0	69.9	180.0- 470.0
Be	1.3	0.6	< 1.0- 2.0
Co	8.1	3.3	2.8- 17.0
Cr	36.7	12.9	16.0- 68.0
Cu	113.0	147.0	25.0- 580.0
Ga	14.8	4.1	4.6- 21.0
La	27.2	5.0	19.0- 41.0
Mn	1345.0	750.0	330.0-4100.0
Nb	5.1	2.4	< 2.2- 9.4
Ni	23.6	9.4	13.0- 61.0
Pb	86.6	70.3	18.0- 310.0
Sc	12.0	3.1	5.0- 17.0
Sn	37.9	99.6	< 1.5- 640.0
Sr	518.0	315.0	190.0-1600.0
V	88.8	29.4	30.0- 150.0
Y	20.0	4.5	9.9- 29.0
Yb	2.7	0.7	1.3- 3.8
Zn	187.0	112.0	51.0- 560.0
Zr	111.0	39.6	57.0- 250.0

Table 2. Correlation coefficient estimates for selected element couples, significant at the 99% confidence level. N= 33.

Fe-Co	=	+0.73	Cu-Zn	=	+0.76
Fe-Ni	=	+0.61	Pb-Zn	=	+0.67
Fe-Cr	=	+0.55	Cu-Pb	=	+0.41
Co-Cr	=	+0.75			
Co-Ni	=	+0.80			
Ni-Cr	=	+0.72			

The bottom sediments taken on the southern Argentine shelf (Siegel and others, 1976) are being studied by one of us (FTD) sedimentologically and mineralogically as part of an M.S. thesis. Geochemically, emission spectrographic analyses have been made on the combined silt and clay fractions. Of the 55 trace elements analysed for, 20 were present in greater than detection level concentrations. A summary of these data plus data for major element concentrations is given in table 1. Thus, for the area studied, concentration levels have been established (for the time of sampling) against which future geochemical studies may be compared taking into account the accuracy, precision, and detection limits of the analytical technique and instrumentation used. Isogeochemical plots of element distribution are similar for those elements, which, because of the number and arrangement of electrons around their nuclei, respond similarly to geochemical processes and environments. For example, one grouping of Fe, Cr, Ni and Co, and another grouping of Cu, Zn and Pb, have been identified. This is reflected in the significant correlation coefficient estimates (at the 99 percent confidence level) between the elements in each group (table 2).

To highlight some of the subtle distributional trends, trend surface analyses will be prepared, and subsequent comparisons will be made to the sedimentological and mineralogical trends.

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