THE DISTRIBUTION AND PROVENANCE OF TRACE ELEMENTS IN EASTERN GULF OF MEXICO SEDIMENTS

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ABSTRACT

By knowing the dispersion patterns of river-borne sediments in the marine environment, one can predict the spatial distribution of selected minerals, elements, and particle-bound pollutants. One potentially useful method for determining sediment pathways is by contouring selected trace metals in the sediments seaward of river outflows.

Using the CALCOMP contouring package, the regional distribution of selected metals has been contoured. The package is capable of accepting irregularly spaced data points and offers the user a rather quick and simple method of contouring. All that is required of the user is an x, y, z data set (z being some parameter of interest). The program contains an ordered deck set-up that presents numerous options with regard to the appearance of the final map plot.

Spatially, chromium, copper, iron, nickel and lead concentrations in surficial sediments from the central and eastern shelves off the Gulf of Mexico range from low concentrations in the sediments of the west Florida shelf to highest values on the Mississippi Delta. Iron serves as a useful indicator element for continental detritus. Thus, where high values of iron are found, clays are the dominant sediment type. Iron concentrations in the sediments of the west Florida shelf show a rather uniform increasing gradient offshore (Figure 1). The range of values is from less than 1 mg/g Fe nearshore to greater than 12 mg/g Fe offshore. This progressive increase can be directly attributed to the sediment type. Quartz sands dominate the nearshore area, carbonate sands the middle shelf, and carbonate sands and detrital clays the extreme outer continental shelf and Gulf Basin (Holmes, 1976; Doyle and Sparks, 1980). The other trace metals follow this same trend, as shown for lead in Figure 1.

The primary source areas of continental detritus to the west Florida shelf are the Tampa and Apalachicola Bay areas (Figure 1). The input material from these areas is confined to the immediate vicinity of the bays upon entering the Gulf. Therefore the higher concentrations of metals found offshore are derived from another source, namely the Mississippi River Delta.

Iron concentrations off the Mississippi, Alabama, and northwest Florida shelves also demonstrate a uniform progressive increase in concentrations offshore (Figure 2). The predominant input sources appear to be Apalachicola Bay and the Mississippi River Delta. Iron concentrations in this area range from less than 2 mg/g to greater than 17 mg/g. Again, the concentrations can be explained as a function of sediment type. The nearshore areas are primarily

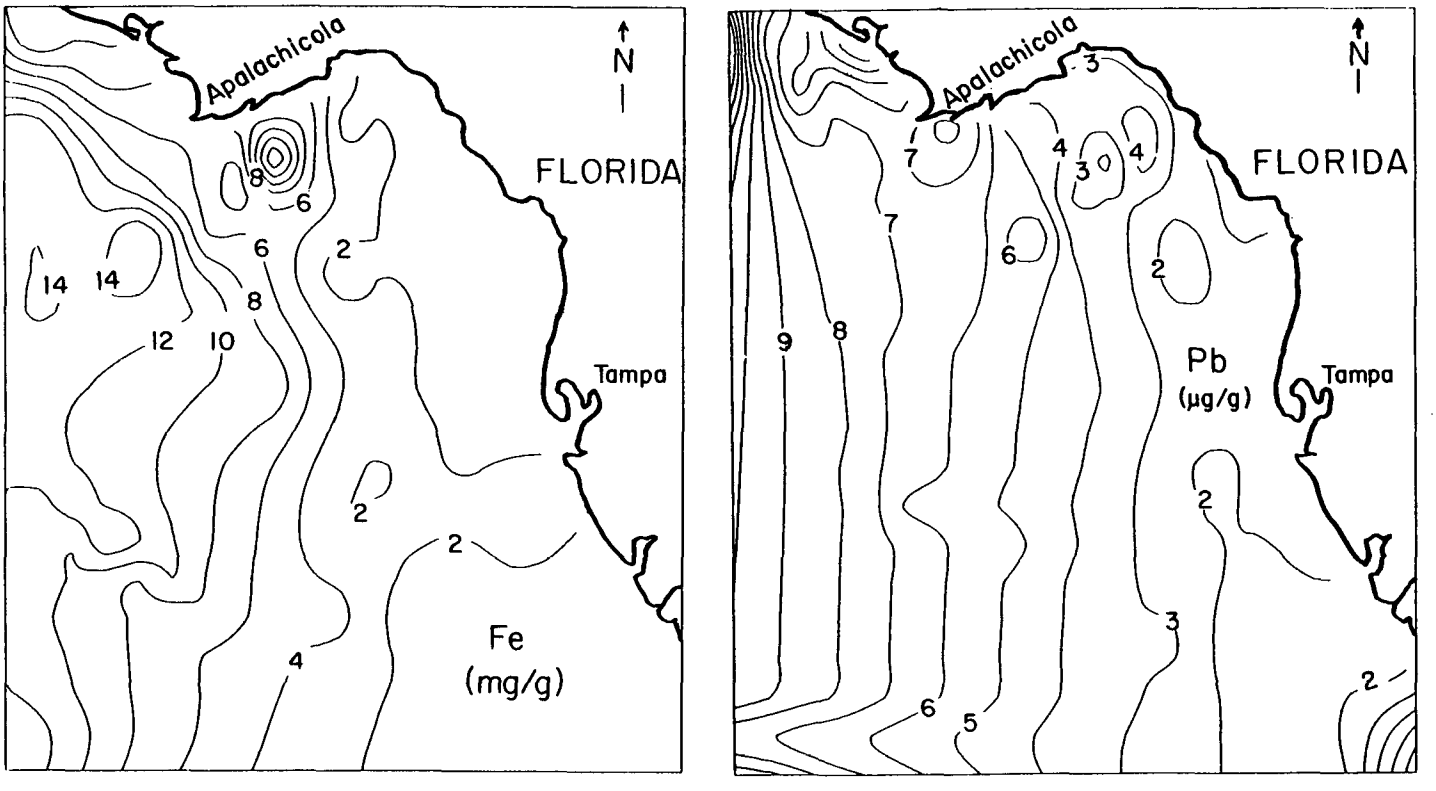

Figure 1 *Sediment iron and lead contour maps for the west Florida shelf.*

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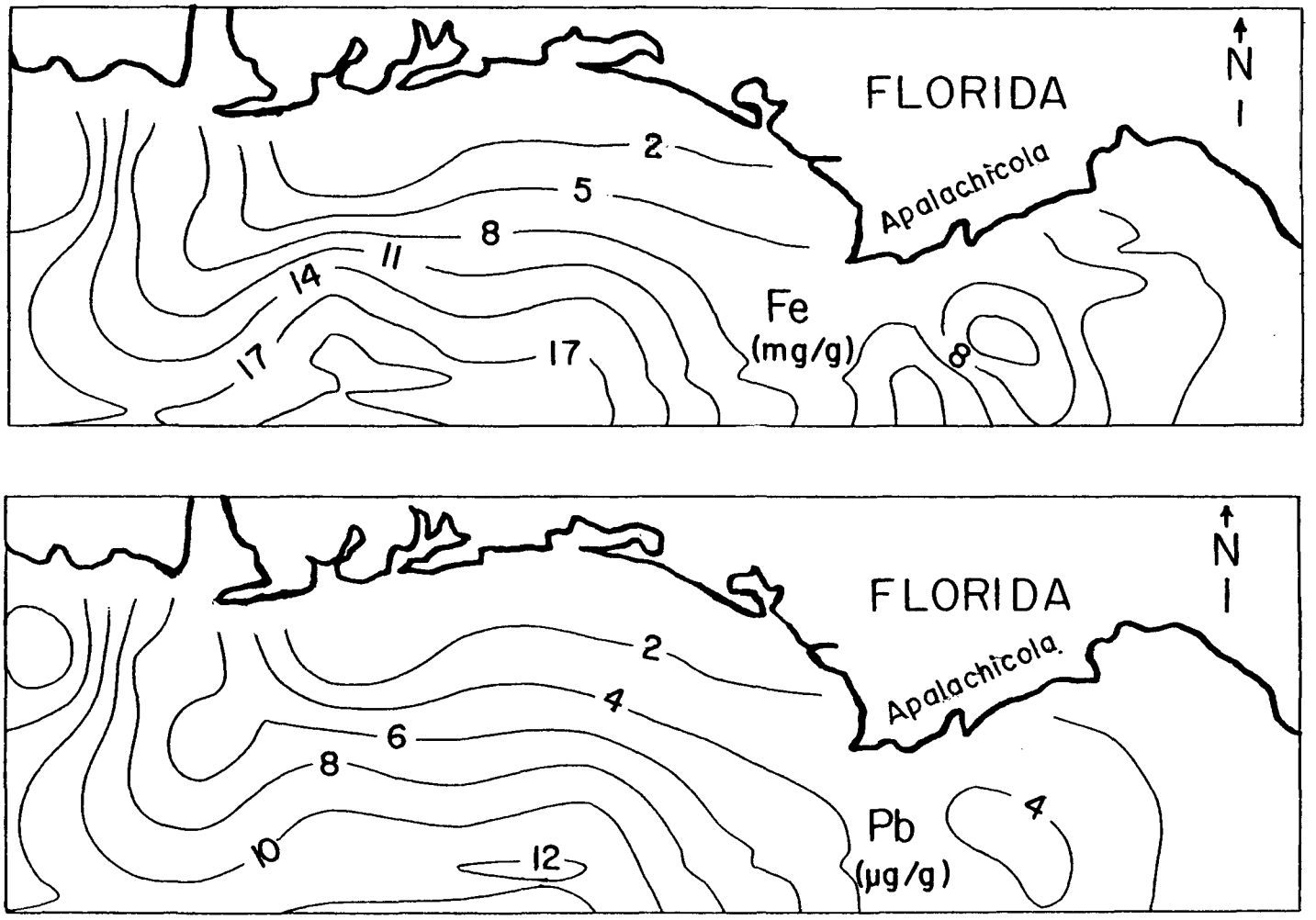

Figure 2 *Sediment iron and lead contour maps for the Mississippi, Alabama, northwest Florida shelves.*

quartz sands; farther offshore clays are abundant. Lead concentrations (Figure 2) also exhibit a similar pattern with concentrations ranging from less than 2 µg/g to greater than 12 µg/g.

Statistical treatment of our trace metal and sediment data was also carried out to identify the important trace metal controlling geochemical variables (grain-size, carbonate content, and total organic carbon). Positive correlations between trace metals and grain-size and between trace metals and total organic carbon were observed. A negative correlation between trace metals and carbonate content was also observed. In addition, a moderate to strong correlation also exists among iron, chromium, copper, nickel, and lead. This correlation can also be viewed with respect to the similarity of their regional distributions via the contour maps.

REFERENCES CITED

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Holmes, C. W., 1976, Distribution, regional variation, and geochemical coherence of selected elements in the sediments of the central Gulf of Mexico: U.S. Geol. Survey Prof. Paper 928, 24 p.