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The content of major elements in the dissolved and particulate load of rivers

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INTRODUCTION

Rivers are by far the most important supply of material to the ocean system. The total flux of dissolved and particulate matter is estimated at 2.0×10^6 g yr^{-1} (1.55×10^{10} g yr^{-1} for the solid load and 4.0×10^{15} g yr^{-1} for the dissolved load) which is 6 times the glacial scour - Antarctica included - and roughly 200 times the atmospheric fall-out (Livingston, 1963; Holemna, 1968; Meybeck, 1977; Goldberg, 1971). Many studies have been devoted to the determination of river load since the pioneering work of Forel on the Rhône river and the Lake of Geneva in the late 1800's. If the major dissolved element composition is now well documented (Alekin and Brazhnikova, 1960; Livingstone, 1963; Meybeck, 1977), the chemical composition of suspended sediment is still poorly known except for some elements (Clarke, 1924; Moore, 1967; Konovalov and Ivanova, 1970; Martin, et al., 1976) in a few rivers (Gould and Howard, 1960; Turekian and Scott, 1967; Georgescu et al., 1973; Brunskill et al., 1975). Chemical speciation of elements in rivers is of major concern to chemists and hydrologists (Gibbs, 1973; Förstner and Müller, 1975); however there is still no comprehensive data on the average composition of suspended sediments nor on the overall relationship between dissolved and solid transport of elements, except for some local studies in the U.S.S.R. (Strakhov, 1967; Morozov, 1969).

This type of information is needed for a better understanding of weathering processes, geochemical mass balance and characterization of the upstream boundary conditions of estuaries.

SAMPLING AND ANALYTICAL PROCEDURES

The data presented in this paper are partly derived from literature for the Mississippi and Nile (Clarke, 1924), Colorado (Gould and Howard, 1960), Mac Kenzie (Brunskill et al., 1975), Danube (Georgescu et al., 1973 , sample B 15), while new analyses have been performed on the rivers listed in Table 1. These new analyses include some of the major world rivers (Amazon, Congo, Ganges, Orinoco and Parana) and various European rivers.

Whenever possible, large river water samples up to 300 litres have been collected. The Ems and Ganges samples reflect newly-deposited and fine-grained sediment taken on the river bank. Suspended sediment has been usually recovered by filtration with 0.45µ Millipore filters except for the Congo and Rhône river samples for which continuous centrifugation and settling respectively have been used.

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