HYDROCHEMICAL ASPECTS OF MAJOR PACIFIC AND CARIBBEAN RIVERS OF COLOMBIA

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Although the South American continent includes three of the largest river basins of the world, the Amazon, the Orinoco, and the Paraná, with some of the highest discharges and sediment loads, a number of comparatively smaller systems in Colombia carry a significant share of sediment and dissolved loads from the continent. Fifteen rivers west of the Cordilleras in South America discharge a combined 254 km$^3$ yr$^{-1}$ or 8020 m$^3$ s$^{-1}$ of water into the Pacific. The San Juan River has the highest water discharge (2550 m$^3$ s$^{-1}$), sediment load (16 x 10$^6$ t yr$^{-1}$), and basin-wide sediment yield (1150 t km$^{-2}$ yr$^{-1}$) on the entire west coast of South America. The best estimate of total sediment load into the Pacific Ocean from both gauged and ungauged rivers is 96 x 106 t yr$^{-1}$. These results in a sediment yield estimate of 1,260 t km$^{-2}$ yr$^{-1}$. Analysis of 22 rivers draining into the Caribbean Sea indicate that the combined water discharge and sediment load are 338 km$^3$ yr$^{-1}$ and 168 x 10$^6$ t yr$^{-1}$, respectively, corresponding to a sediment yield for the Colombia Caribbean drainage basins of 541 t km$^{-2}$ yr$^{-1}$, or approximately half of the yield for the Pacific basins of Colombia. The Magdalena River, the largest river system in Colombia, has an annual discharge of 7,232 m$^3$ s$^{-1}$. Load measurements during the 21 year period yielded an annual sediment load of 144 x 106 t yr$^{-1}$. The Magdalena has the highest sediment yield (559 t km$^{-2}$ yr$^{-1}$) of any medium-sized or large river along the entire east coast of South America and contributes 9% of the total sediment load discharged into the Atlantic Ocean from eastern South America. The concentrations of major dissolved constituents and mass transport rates for major Colombian rivers were based on averages calculated.
from monthly samples from 1990-1993. Ca²⁺ and Mg²⁺ are the dominant ions, indicating that the water corresponds to the rock-dominated type. Dissolved inorganic carbon, present mostly as bicarbonate ions, constitutes almost 50% of the total dissolved solids (TDS) in the Colombian rivers. Values of solute concentrations show that the Sinú and Magdalena have the highest dissolved solute content followed by the El Dique canal and Patía River. The estimates of dissolved materials exported to the Caribbean and Pacific basins are mainly controlled by water discharge. Thus, the Magdalena transports 30 x 10⁶ t yr⁻¹ of dissolved materials into the Caribbean. It is of the same magnitude as the Orinoco (30.5 x 10⁶ t yr⁻¹), ten times lower than that of the Amazon (259 x 10⁶ t yr⁻¹), and similar to the Parana River (38.3 x 10⁶ t yr⁻¹). The specific transport rate is highest in the Sinú basin, 167 t km⁻² yr⁻¹, followed by that of the Magdalena with 117 t km⁻² yr⁻¹. The more diluted rivers on the Pacific basins, Mira and Patía, have values ranging between 31 and 90 t km⁻² yr⁻¹. In Colombia, pristine fluvial systems like those draining the Pacific basins have much less PO₄³⁻ and NO₃⁻ loads when compared to the Caribbean rivers. The Magdalena and Atrato rivers are by far the Colombian systems which contribute the highest P and N fluxes to the sea, with total phosphate and nitrate fluxes up to 186 x 10³ t yr⁻¹ and 47 x 10³ t yr⁻¹, respectively. Many causes are responsible for these high nutrient loads, including massive sewage collection in cities and towns for NH₄⁺ and PO₄³⁻, mainly in the Magdalena basin, and also due to fertilization of banana plantations in the lower course of the Atrato River. Many Colombian rivers, including the larger Magdalena, are affected by deforestation and rapid changes in land use, thus accelerating the transfer of particulate and dissolved organic and inorganic matter, from the river basins to the sea. Due to the magnitude of fluvial fluxes to the oceans from the Colombian rivers, the fluctuations of dissolved and suspended loads need to be monitored for a period of at least 10 years, in order to be able to quantify the influences of man's activities and assess global climate