



Evidence for the control of river-water chemical stratification on the geochemistry of Amazonian floodplain sediments

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Holocene and historical Amazonian floodplain deposits collected from two cores of the Varzea Curuai flooded area (Brazil) were analysed for major and trace element geochemistry as well as Nd-Sr isotopic compositions (21 samples). The TA11 and TA14 cores (110 cm and 270 cm in depth, respectively) were collected at different locations in the varzea, near a channel inlet connecting the Amazon River to the varzea and at the centre of the varzea, respectively. The two cores represent records of sedimentation on different time-scales, with TA11 covering the last 100 years and TA14 extending back to 5600 years cal BP. Although the sediments are generally coarser in TA11 than in TA14, the major and trace element concentrations, Cr/Th and Th/Sc and Eu anomalies and Nd-Sr isotopic compositions in both cores fail to show any clear variations with depth. However, there are some chemical differences between the two analysed cores. The TA14 sediments have higher Al/Si and CIA values than those of TA11. The TA14 sediments are enriched in Th, U, Y, Nb, REE, Cs, Rb, V and Ni but show slightly depleted MgO, CaO and Sr and more strongly depleted Na₂O, Zr and Hf compared with TA11. In addition, the Nd-Sr isotopic compositions of the TA11 sediment core are on the whole similar to the Solimões suspended particulate matter (SPM), whereas TA14 has a similar Nd-Sr isotopic composition compared with the SPM of the Amazon River at Obidos. These differences are best explained by chemical stratification of the Amazon River. During flooding of the Amazon River, coarser grained particulates supplied by the Solimões River are deposited in the deepest environments near the channel inlet, as recorded in the TA11 sediment core. By contrast, finer grained suspended sediments derived from the Madeira River are transported into the shallower environments of the varzea system and deposited as a result of flow expansion and loss of carrying power, as recorded in the TA14 sediment core. We calculate that between ~43 and ~85% of the sediment input to the TA14 core site are derived from the Madeira River, while all the sediment in the TA11 core sample is supplied by the Solimões River. Finally, our findings lead us to question whether major rivers are chemically stratified and to what extent the Amazon River is representative of major rivers both at the present-day and in the geological past.