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Modelling flooding hydrology and lake water mixture dynamics in an Amazon floodplain lake: the várzea of Lago Grande de Curuaí

MP. Bonnet (1), G. Barroux (1), G. Boaventura (4), F. Seyler (1), P. Moreira-Turcq (2), J.M. Martinez(1), G. Cochonneau (3), P. Seyler (1)

(1)I.R.D. - Institut de Recherche pour le Développement-UR154 LMTG, 14, Av. Edouard Belin, 31400 Toulouse, France, (2) I.R.D. - Institut de Recherche pour le Developpement-UR154 LMTG -Departamento de Geoquímica, Universidade Federal Fluminense, Morro do Valonguinho s/nž 24020-007 Niterói, RJ, Brazil, (3) I.R.D. - Institut de Recherche pour le Développement-UR154 LMTG. Maison de la télédétection 34000 Montpellier, (4) Un.B. Instituto de Geociéncias, Universidade de Brasilia, Campus Universitario Darcy Ribeiro, ICC-Central CEP 70910-900 Brasilia, Brazil

The Amazon floodplain covers about 6.5% of the whole hydrological basin and is expected to have an important influence on the Amazon River dynamics, in terms of hydrology, suspended solids and chemical fluxes. However, up to now, exchanged fluxes between the main stream and its floodplain are poorly known and it is still difficult to precisely quantify to which extend the floodplain may play a significant role. This study, which is part of the Brazilian-French joint research program Hybam (Hydrology and Geochemistry of the Amazonian Basin) focuses on the Amazon floodplain lake area called “várzea of Lago Grande de Curuaí” Pará State, Brazil). This “várzeas” with an area of about 2500 km2, is considered to be representative of the Amazon floodplain, in the lowest part of the river course. Based on the in situ and satellite data acquired since 1997, we developed a model in order to quantify the exchanged fluxes between the floodplain and the river corridor and to describe the temporal dynamics in the lake water mixture derived from river flooding, rainfall, runoff evaporation and exchange with the groundwater system over several annual cycles (1997-2003). During wet or normal years the Amazon River water dominates the lake water mixture all over the year increasing to 67% early in the water year (from December to November). It is progressively diluted while the lake begins filling with the other sources of

water (rainfall, runoff and seepage from the groundwater system) and by the end of the year it accounts for about 52% of the total water input; rainfall and runoff account for about 9% and 4% respectively while seepage from groundwater system accounts for 33%. Great inter-annual variations are observed between water years. In particular, during dry years, the river water dominates the lake mixture only early in the water year increasing to 70% of the total input but is then strongly diluted by seepage from the ground water system which accounts for 64% of the total water input by the end of the year. Over the studied period the water residence time varies between 102 and 229 days depending on the water year. Despite these large variations in the temporal dynamics in the lake water mixture between water years, the floodplain always behaves as a net contribution of water for the river downstream. The exported volume varies between 1.9 and 4.2 km3 depending on water year representing about one third of the maximal storage reached each year.