Silicate Rock Weathering and Atmospheric/Soil Co_2 Uptake in Tropical Lateritic Regions.

J.L. PROBST [1], P. AMIOTTE SUCHET [2], J.L. BOEGLIN [3], J. MORTATTI [4] AND W. LUDWIG [5] [1] LMTG, CNRS/Université Paul Sabatier, 38 rue des 36 Ponts, 31400 Toulouse Cedex, France (jlprobst@cict.fr) [2] GéoSol, Université de Bourgogne, Dijon, France [3] IRD, Centre de Yaoundé, BP 1857, Youndé, Cameroun [4] CENA/USP, CP 96, 13 400 Piracicaba, SP, Brazil [5] CEFREM, CNRS/Université de Perpignan, France

The weathering rate of silicate rocks and the associated atmospheric/soil CO_2 consumption are estimated from river transports of alkalinity, cations, anions and silica using a geochemical modelling (MEGA) in lateritic and non-lateritic areas. The results show that the flux of CO_2 consumed by silicate weathering is directly proportional to the silicate rock weathering rate and that the riverine dissolved silica fluxes are mainly proportional to the runoff intensity, even if a temperature effect could be pointed out (higher silica fluxes in tropical-equatorial areas). There are also good linear relationships between CO_2 fluxes and runoff but it appears clearly that, for similar runoff, the CO_2 flux consumed by silicate weathering is lower for lateritic drainage basins than for non-lateritic ones. It is important to consider such a difference because the lateritic covers occupy 33% of the whole continental areas. To reconstruct the geological fluctuations of CO_2 consumed by silicate weathering, it is interesting to derive directly alkalinity produced by silicate weathering from riverine discharge of dissolved silica. In this study, it has been possible to relate the weathering type to the ratio between alkalinity derived from silicate mineral hydrolysis and silica concentrations : going from allitization processes (genesis of gibbsite) to monosillitization (formation of kaolinite) and to bisiallitization (weathering products are smectites), the molar ratio alkalinity/silica increases respectively from less than 1, to 1-2 and to more than 2.