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# hydrochemistry of the Andeans and sub-andeans Amazon basins - Weathering and CO2 consumption rates.

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Measuring mountain weathering rates, estimating their role on C cycle and identifying the parameters which control them are key to better constrain the knowledge of the continental-ocean-atmosphere interactions over geological timescale.
The Andes, in contrast to the Himalaya, have received poor attention in terms of chemical weathering. Several authors have worked on the Amazon river basin, but it is difficult to assess the role of the Andes (10% of the surface area of the Amazon river basin) by only sampling the Amazon at mouth or sampling its largest tributaries. As shown by earlier works, the Upper-Amazon basins are the main matter source of the Amazon basin. The studied area participates at more than 70% of the Amazon weathering rates while it contributes to the total discharge on 30% for 27% of the total area.
The studied area is comprised between latitude 0º47'N and 20º28'S and between longitude 79º36'W and 58º45'W and can be divided in three major hydrosystems (the Napo river at North, the Maranon-Ucayali rivers on the central part and the upper Madeira at south) which can be separated on Andes and sub-Andes parts.
This work presents the results of the HYBAM research program (present-day hydro-geodynamics of the Amazon Basin) on the upper Amazon basin. The concentration of major elements was analyzed on a monthly basis, sampling at 26 gauging stations which include the Andean basins of the Amazon River and a part of the downstream catchment domain.
The objectives of this work are i) calculate the major elements fluxes and their spatial distribution, ii) estimate the present-day rate of rock weathering, as well as the flux of atmospheric/soil CO2 consumption from total rock and silicate weathering, and iii) constrain the major environmental factor which controls the dissolved matter production using unique high temporal and spatial resolution data sampling.
The main difficulty of studying large river geochemistry is to separate the main sources of the dissolved matter. Studying the temporal dynamic exportation of each element and their main associations helps to better constrain the main matter origin per sub basins and to identify the main processes of production.
Variability of runoff rates and lithology between the 3 hydrosystems mainly explain the intersystem weathering rates variability.
o The convergence of high runoff rates and main volcanic lithology on Napo basin implies a high weathering rate compared to other basins of the studied area and the main world basins.
o Due to the high presence of evaporites and carbonates rocks, the Maranon and Ucayali hydrosystems controls more than 60% of the Amazon hydrochemistry.
o Sandstone lithology and low runoff rates on Upper Madeira basins imply a poor contribution of this basin on Amazon dissolved load.
Sub-andean plains basins can take place a major role on weathering balance. On the carbonates basins of Maranon Ucayali the subandes catchments contributes to more than 40% to the dissolved load of the hydrosystem. It can reflect the importance of the weathering of sediments exported from Andes or/and the importance of the upper plain weathering rate.
The role of environmental parameters, which control those processes, can be partly constrained over the studied area and are compared to other world results. Those results give new keys to better understand the role of major orogenese zones on global weathering processes and its effect on C cycle.