Silicon retention in cascade reservoirs in Karst area, southwest China

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As a macronutrients required by certain groups of plants, e.g. diatom, DSi plays an important role in sustaining river, coastal and oceanic ecosystems. In diatoms, DSi is taken up and incorporated into an amorphous form known as biogenic silica (BSi) to construct their cell walls (frustules). The decrease in the supply of DSi has a result in the changes in the ratios of nutrient elements (e.g. Si:N:P), which may cause the shifts in phytoplankton populations in water bodies, allowing the non-siliceous phytoplankton species to bloom. Obviously, due to its indispensability for diatom growth, silicon cycling in hydrosphere is of global significance.

However, in the last few decades, human activities have caused enormous changes of nutrients fluxes to oceans, of which the rapid increases of phosphate and nitrate inputs was well documented, but the fluvial flux of DSi was found continuously decreasing in rivers world wide. As the source, transport and sink characteristics of silicate are distinct from those of nitrogen and phosphorus, scientists gradually relate the 'silicate retention' to the extensive river impounding.

In this study, based on the investigations on cascade reservoirs located in karst area in Wujiang Basin, southwest China, silicon retention in these gorge type reservoirs were reported. The results showed that DSi concentrations have significant variations seasonally. In January, DSi had less fluctuation along the mainstream, with an average of 62μM. However, from April to October, great discrepancies of DSi concentrations were observed in the outflow of reservoirs, summer in particular. Generally, DSi concentrations of the releasing water from the dam would have an abrupt increase, compared with that of the epilimnion of the reservoirs, even that of the inflow water. In the water column, for each season DSi in water below 20m in depth had obviously higher concentrations than that in epilimnion, and DSi concentrations were obviously higher in deep water. Despite that DSi was obviously absorbed in the upper layer of reservoirs, the deep layer discharging for hydropower could compensate the retained silicon. As a result, the total silicon retention by these reservoirs was estimated very limited.

Formation age, setting of Ordovician Honghuapu intrusion in the west segment of north Qinling Mountains, China

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The Honghuapu Intrusion are located in the western segment of northern Qinling Mts.,China, which intrude into Ordovician Caotangou volcano-sedimentary rocks and were intruded by mafic dykes. Petrogeography studies suggest the major rock type of the intrusions is medium to fine grained trondhjemite. The intrusions belong to weak per- aluminous calc-alkaline with SiO_2=71.62%~77.33%, Al_2O_3=12.21%~14.91%, TiO_2=0.16%~0.47%, Na_2O=3.75%~4.59%, K_2O=0.51%~2.58%, K_2O/Na_2O=0.12~0.69, CaO=1.41%~2.60%, σ=0.85~1.19.

They are enriched in LILE(Ba, Rb, Th etc.) and depleted in HFS(Nb、Ta etc.),and can be classified as I type granite. Chordrite -normalized REE diagrams are right-clined LREE enriched patterns with relatively low LREE/HREE ratios ,as well as low $\Sigma REE=29.53\times10^{-6}$~$87.10\times10^{-6}$, δEu=0.67~1.67, $(La/Yb)_N$=2.63~7.97. The REE, major and trace element tectonic setting discrimination are all comparable with that of typical volcanic-arc granites. Growed with island-arc volcanic rocks (Caotangou Group) of the area, the Honghuapu Intrusions were formed in island arcs settings on the subduction zone. Combined with the age of volcanic rocks in Caotangou Group (456.4±1.8Ma) and mafic dykes (425~433Ma), the formation age of Honghuapu Intrusions had been determined as late Ordovician based on isotopic dating from the Honghuapu trondhjemite (450.5±1.8Ma) by LA-ICPMS zircon U-Pb method. The formation age and tectonic setting of the Honghuapu intrusions reveal that in the Caledonian epoch plate subduction event was existed in the west segment of Northern Qinling Mts., and provide new information for the deep studies of the Early Paleozoic tectonic framework, tectonic evolution and geodynamic mechanism of Qinling Orogens.

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