Ecohydrochemical studies in the Achankovil River basin, Western Ghats, South India

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Preliminary studies on the nutrient and water chemistry of the high altitude river basin with relatively homogeneous lithology with pristine ecosystem in Western Ghats region has been carried out. A time series survey has been carried out to understand the natural and anthropogenic hydro geochemical processes controlling the water chemistry in the Achankovil River of the Western Ghats . The water is neutral with pH and EC ranges from 6.32-7.56 and 24 – 54 μS/cm. Chloride and sodium are the dominant anion and cation in the water respectively. Correlation analysis of the chemical parameters of the water shows that some ions have additional sources such as sea spray, soil conditioners and evaporates. This study shows that the majority of carbonate is derived from carbonate weathering followed by silicate weathering. Cation concentrations show decreasing trend from upstream to downstream in contrast to the increasing trend in the major world rivers. Dissolved silica in premonsoon water is low. This is due to the silica uptake by diatoms. The Gibbs plot indicates that the river chemistry is dominated by rock weathering induced by precipitation. The partial pressure of CO_2 in water is high and is in equilibrium with the atmosphere. Thermodynamic plots show that dolomite, kaolinite, albite and chlorite are in equilibrium with the river water. The additional sources which influence the water chemistry are sea spray leaching of evaporates and anthropogenic inputs. Chemical weathering is predominant here compared to physical weathering. The annual discharge of the Achankovil River is 1.48 km^3/yr and transports a significant amount of solute flux (1389 x 10^6 t/yr) and suspended flux (27 x 10^6 t/yr) to the Vemband estuarine lake. The overall material transport seems to be lower compared to the other Indian rivers nevertheless the solute loads are comparable to certain large rivers like Cauvery in the south India. The concentration of PO4, NO3 and Carbon are very high due to the contribution from multiple sources. The solute flux including the nutrient flux is very high among the Western Ghats Rivers in comparison to its size, which will certainly supplement the productivity of the lake/estuary and the coastal waters. Since this study is restricted to limited period. long-term data procurement and analysis along with micro nutrients studies are needed. which are lacking in the present study. to gain insight into the material flux by this river into the Arabian Sea.

Key words: Achankovil River; Nutrient concentrations, seasonal variation; solute acquisition

Export of DOM by rivers: Assessing the relative effects of climate change and human activities using long-term records

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This study presents long-term records of disolved organic matter (DOM) as indicated by oxydability measurements that were constructed for four watersheds in western France as back as 1979. Observations show contrasted evolutions with three watersheds exemplifying large increases in DOM concentrations over the period of study (a doubling of the concentration over a period of 25 years is observed in one case), while the fourth shows DOM concentrations that decrease with time. All watersheds show common inter-annual control on DOM concentration in response to a succession of dry and wet periods with a cyclicity of 5-7 years. The same cyclicity in DOM concentrations is apparent in the long term records of DOM for rivers located in northern England. The evidence support the view that this cyclicity is climatic in origin being likely a consequence of the North Altantic Oscillation that controls the yearly amount of precipitation that falls over Western Europe.

As regards the significance of long-term trends, we note that the onset of DOM increase in those rivers showing positive long-term DOM trends is in phase with an increase in average annual tempretature. This might suggest that the change in temperature is the key mechanism that causes these trends, suggesting that the climate is also the driving force of long-term DOM trends in river. However, such an hypothesis is faced with the problem of explaining why one of the studied watershed shows a divergent evolution, i.e. a long-term DOM decrease. Alternative explanations must thus be found. One such alternative explanation could include changes in land managment and agricultural practices. A survey of agricultural practices in the four studied watersheds reveals that the watershed showing a long-term decrease of DOM is marked by massive spreading of pig manure, a process that does not occur in the other three watersheds. Spreading of pig manure may acidify watershed soils, thereby promoting the adsorption of organic matter on soil minerals which could ultimately limit the export of DOM by rivers. The evidence supports a view that DOM export by rivers is under the control of global, climatic factors mediated by local land-use factors which can cause divergent long-term evolutions in the DOM export capacity of rivers on relatively short spatial scale.