Paper Number: 2089

Chemical weathering in the tropical river catchments of Western Ghats and its implications on climate change- a case study from a tropical river in southwest coast of India

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Several studies have confirmed the role of chemical weathering in sequestering atmospheric carbon dioxide on a million year time scale [1]. The sequestered carbon dioxide during weathering, is transported as bicarbonates into the ocean and deposited as carbonates, which can be locked up in the ocean bottom for several hundred years. Recent studies have indicated that chemical weathering has intensified in the past few decades on account of land-use/ land-cover changes (eg. deforestation) [2], which has doubled the CO_2 uptake by the silicate and carbonate rocks [3]. This can be significant on a decadal to centennial time scale. Hence there is an increasing interest generated to quantify the CO_2 drawdown during weathering in the tropical river catchments, which make up 60% of the total water discharge into the world oceans [4]. Very few studies exist from India, that has reported on tropical silicate rock catchments as a potential CO_2 sequester. We have attempted to estimate the silicate weathering rate and CO_2 sequestration in the Western Ghats through the study of a representative river (Swarna) in the southwestern India that drains a predominantly silicate catchment. We observed very high silicate weathering rate (65.96 tons/km^2/yr) which is higher than all the reported west flowing rivers of India draining Deccan basalts [5] and granitic gneiss [6]. We have attributed the high silicate weathering rate to intense monsoonal rainfall (~5000 mm yr^{-1}) in the upper reaches of Swarna river, dominantly silicate lithology and land-use/ land-cover changes. The carbon-dioxide consumption rate (CCR) in the Swarna river is estimated at 6.72 x 10^5 mol/km^2/yr, which is equal to the Deccan rivers, whereas 2.3 times higher than the adjacent Nethravati river, which is also draining a predominant granite-gneissic lithology. The higher CCR in the Swarna catchment could be from the type of rock assemblages and land-use, land-cover changes. Therefore, detailed studies on chemical weathering and associated CO_2 sequestration from rivers draining Western Ghats is required for drawing an accurate estimation of carbon dioxide sequestration in the tropical Western Ghats.

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