Source apportionment of particulate and dissolved carbon in the humid mountainous tropical rivers through stable carbon isotope approach

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Addressing weathering and carbon cycles have been a major challenge with human intervention and perturbation of natural processes. This study investigates the origin, transport and fluxes of particulate organic carbon (POC) present in two humid tropical rivers through stable isotope approach. Samples have been collected on a monthly scale during the summer monsoon (June-September) from the Swarna and Nethravati rivers draining into the Arabian Sea. These mountainous river basins receiving highest rainfall in South India form one of the major zones of weathering and supports higher water-particle interaction (Gurumurthy et al 2017, CG). For the source apportionment, the samples have been collected and measured for stable carbon isotope ratio ($\delta^{13}C_{POC}$) of POC at spatial scale from rivers, and overland flow from the agricultural (dominant paddy) land and forest in the downstream. The $\delta^{13}C_{POC}$ for the Swarna river ranges between -26.95‰ and -26.3‰ with an average of -26.54 ± 0.28‰ whereas the Nethravati river ranges between -27.58‰ and -26.14‰ with an average of -26.71 ± 0.52‰ during the sampling period. The results show that the average $\delta^{13}C_{POC}$ during summer monsoon are similar to that observed during the winter monsoon for these two tropical rivers (Tripti et al. 2013, RCM). However, the $\delta^{13}C_{POC}$ of Swarna river represents less depleted ^{13}C relative to that of the Nethravati river during summer monsoon which is reverse the case reported during the winter monsoon. The observed less depleted ^{13}C during the summer monsoon is mainly due to the higher contribution from the agricultural flow exhibiting higher values of average $\delta^{13}C_{POC}$ of about -26.29 ± 0.41‰. This is also evident from the average $\delta^{13}C_{POC}$ (-27.82 ± 0.37‰) of forest flow which is lower relative to that of the agricultural flow carbon composition. The findings on POC are supported by its relationship with dissolved organic (DOC) and inorganic (DIC) carbon, and major ion composition. Although the agriculture particulate carbon flux is less dominant in the global tropical river basins, the change in the stable carbon isotope ratio is significant while studying the sediment history in the estuaries and nearby ocean.