Sources and transformation of carbon in spring-pond system under different land cover at Puding karst-analog test site

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Riverine export of DIC (dissolved inorganic carbon) and OC (organic carbon) to the sea is regulated by a variety of natural and anthropogenic factors. Understanding the influence of these factors on the age, source, and transformation of DIC and OC can help to constrain global carbon budgets and improve assessments of current and future, natural and anthropogenic impacts on both riverine and global carbon cycles. Here we present the hydrochemistry and dual carbon isotope compositions ($\delta^{13}C$-$\Delta^{14}C$) from the effect of different land cover (karst rocky desert, bare land, cultivated land, grass land, shrub land) and aquatic biological processes on the carbon cycle at Puding karst-analog test site.We found that$\delta^{13}C$ and $\Delta^{14}C$ have different behaviors. The $\delta^{13}C_{DIC}$ of S1, S2 and S3 were similar to each other, with a range from −5.4‰ to −2.2‰. $\delta^{13}C_{DIC}$ in S4 has the most negative value, followed by S5. The $\Delta^{14}C_{DIC}$ values of Spring water are more depleted than pond-$\Delta^{14}C_{DIC}$ values, indicating CO_2 exchange between DIC and the atm. In the pond. The $\Delta^{14}C_{POC}$ is lower than the $\Delta^{14}C_{DIC}$ in both spring and pond, indicating POC has an older carbon source. The $\Delta^{14}C_{POC}$ in spring is lower than that in pond, reflecting newly produced POC via photosynthetic uptake of DIC. Soil CO_2 input, CO_2 degassing and exchange with atmospheric CO_2, photosynthesis and mixing of old carbon are the influencing factors of variations in $\delta^{13}C$ and $\Delta^{14}C$ values of DIC, POC and plants.The POC and submerged plant will uptake carbon from DIC by aquatic phototroph in karst system, which may be a large C sink in global carbon budget.This study also benefits the explanation of apparent ages of TOC and stalagmite in karst areas.