

The CO₂ system and implications in the Yarlung Tsangpo River on the Tibetan Plateau

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The carbon dioxide (CO₂) emission from rivers are important to regional biogeochemical budgets and global warming effect. This research is one of the first to study CO₂ concentrations and fluxes of the Yarlung Tsangpo (YT) River in the Tibetan Plateau, China. With one-time sampling from 19 sites along the river during the summer of 2017, we found that most of the sampling sites were supersaturated with CO₂ which varied from 258.0-1186.2 μatm with an average of 750.8 μatm . Based on a scaling model of the flux of gas, the calculated fluxes of CO₂ (median value 4805.4 $\text{mg-C m}^{-2} \text{d}^{-1}$) in the YT River was comparable with most other rivers in the world [1]. Concentrations of CO₂ in the river were positively related to the dissolved inorganic carbon (DIC) and nitrogen, indicating that the growing export of riverine nutrients will possibly influence CO₂ concentration and emission. Furthermore, carbonate equilibrium calculation suggested that CO₂ concentration of the YT River was not resulted from the chemical carbon equilibrium motions, but mostly influenced by the carbonate weathering effect and in-stream processes (exchange with atmospheric CO₂ and photosynthesis and respiration) through DIC isotope ($\delta^{13}\text{C}_{\text{DIC}}$) measurement.

It was estimated that CO₂ emissions from global streams contributed about 64% to global warming effects [2]. Rapid climate change has been found to be a major cause of ecosystem degradation in the headwaters area of the Tibetan Plateau. With the global warming, the melting rates of local glacier and permafrost soil will accelerate and the shrinkage of glacier area might reach up to 67% by the year of 2100 [3]. These changes probably contribute to a great harm to soil and water erosions and aggravate nutrition level of the rivers, which in turn would increase riverine nutrient outflows and the greenhouse gases emissions. It might be a vicious circle. Hence, the greenhouse gases emissions and climate change should be especially highlighted in this ecological-fragile area.

**This abstract is too long to be accepted for publication.
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[1] Qu *et al.* (2017) *Sci.Rep-UK* **7**, 165773. [2] Smith *et al.*
(2013) *Proc. Natl. Acad. Sci* **110**, E2865-E2874. [3] Tong *et*
al. (2016) *Sci.Total Environ* **553**, 276-284.