

Comparative validation of the PCO₂ rates in Japanese rivers and its controls

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Previous studies showed that total carbon rates are mainly controlled only by chemical weathering and soil respiration, and therefore, PCO₂ within the river water is also characterized by these parameters. This fact is confirmed by numerous studies in a local scale, but when standing on a more macro perspective, study results are still limited. Defining the behaviors of the PCO₂ within the river waters can lead to the understanding of the role of rivers within the global carbon cycle, which, moreover, can be essential in predicting future behaviors. Based on the hydrochemical dataset by Kobayashi (1960) and the further datasets of Kobayashi (Harashima et al., 2006), the PCO₂ of the Japanese river water were mapped. Then, through a comparison with various presumable parameters, we determined the controlling factors of the PCO₂ system.

As a general result, it can be said that (1) Japanese rivers' carbon dioxide are generally supersaturated with respect to the atmosphere, with an average of 3,300% atm as its partial pressure. (2) The Japanese river PCO₂ is mainly controlled by soil respiration, as far as we stand on a short term time scale. (3) Especially, Hokkaido, Kinki area, and the Kyushu area showed high partial pressure rates in average. (4) It is highly possible that alluvial plains, marsh areas, and volcanic areas is related to raising the PCO₂ rates of the river water. Further studies to confirm these results are expected.

Keywords: Carbon cycle, Japanese rivers, Land water, PCO₂