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

Souya Otani1*, KAWAHATA, Hodaka2, USHIE, Hiroyuki2, HIGASHI, Kengo1, MANAKA, Takuya1, SHINOZUKA, Megumi3

1Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo. 2Atmosphere and Ocean Research Institute, The University of Tokyo, 3Graduate School of Frontier Sciences, The University of Tokyo

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