



Chemical weathering rates applying riverine total dissolved solid export to estimate in subtropical orogenic arc, Taiwan

Pei-Hao Chen (1), Jr-Chuan Huang (1), Tse-Yang Teng (1), Tsung-Yu Lee (2), Li-Chin Lee (1), and Ying-San Liu (3)

(1) Department of Geography, National Taiwan University, Taipei, Taiwan. (r02228013@ntu.edu.tw), (2) Department of Geography, National Taiwan Normal University, Taipei, Taiwan. (tylee0617@gmail.com), (3) Department of Natural Resources and Environmental Studies, National Dong Hwa University, Hualien, Taiwan. (yingsan@mail.ndhu.edu.tw)

Chemical weathering rate (CWR) plays an important role in the global geochemical cycle. It is one of the major processes to uptake and transfer CO_2 to dissolved bicarbonate in terrestrial waters. However, the CWR in high-standing island marked by quick uplift is rarely documented. The high-lifting orogenic island, such as Taiwan, attracts much attention on extreme sediment discharge and physical denudation rate (PDR) whereas the accompanying chemical weathering is less discussed. In this study, we collected 30 catchments around the island to investigate the comprehensive CWR with regards to the controls of lithology, streamflow and PDR.

Results show that the average silicate and carbonate weathering rate of Taiwan are 74.13 and 287.09 $\text{ton/km}^2/\text{yr}$, which correspond to 22.59 and 73.36 $10^5\text{mol/km}^2/\text{yr}$ of CO_2 consumption. While the world average weathering rate are 5.87 and 12.32 $\text{ton/km}^2/\text{yr}$ in silicate and carbonate, respectively, which uptake 0.86 and 11.61 $10^5\text{mol/km}^2/\text{yr}$ of CO_2 . In general, the CWR is mainly contributed by carbonate weathering and moderately controlled by lithology and uplift rate. The carbonate and silicate weathering dominate the eastern and northern Taiwan, respectively. Specifically, stream flow predominately controls the carbonate weathering except in northern Taiwan, while it plays a secondary role in silicate weathering. The CWR increases with PDR, but the strongly positive correlation gradually diminishes when the PDR exceeds 104 $\text{ton/km}^2/\text{yr}$. Further study is suggested to explore the variation of the strongly positive correlation between PDR and CWR which may affect the estimation of CO_2 consumption.