

Silicate weathering rate and controlling factors: study from the small granitic watershed in the Jiuhua Mountains

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It's important to understand quantitatively the feedback between climate and chemical weathering. Although silicate weathering is significant to regulate long-term climate change, the factors and mechanism controlling the intensity and rate of silicate weathering are still not very clear. study on small "mono-lithology" watershed is a main pathway to discuss the weathering mechanism.

River water samples were collected 1–2 times/month from small granitic watersheds in the Jiuhua Mountains during one hydrological year from July 2014 to June 2015, with a purpose of discussing on the silicate weathering rate and its controlling factors in subtropical region. Moreover, rainwater, farmland water, and groundwater were also collected to evaluate respective contribution. The pH value of rain water is 3.81–5.72 with an average of 4.78, which shows that even the precipitation in mountain region is affected by the anthropogenic activities in nearby densely populated industrial cities. The total dissolved solid (TDS) of stream samples ranges from 34.3 to 324 mg/l, with an average of 56.9 mg/l, more than twice the average value (22.7 mg/l) of the global about 40 granitic watersheds (Oliva et.al, 2003).

By using mass balance method, calculated contribution of agricultural activities, atmospheric input, silicate weathering and carbonate weathering are 6.7%, 18.9%, 44.6% and 27.5%, respectively. The average silicate weathering and CO₂ consumption rates of ten small granitic watersheds are 5.95 t/(km² y) and 0.88×10⁵mol/(km² y). There is strong correlation between the average weathering rate of ten watersheds in every month and the precipitation and temperature of corresponding month. Therefore, climate factors (temperature and runoff) play important role in silicate weathering. This is also demonstrated from the global perspective. The chemical weathering rate of small granitic watersheds in subtropical region is obviously lower than those in tropical zone with higher temperature and rainfall, but higher than those in high latitude regions, such as, Siberia, Norway and Canada.