4.5.P19

The vulnerability of the soils in an unpopulated region of Qinghai-Tibet Plateau, China: The geochemical evidences from Kekexili region

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The Qinghai-Tibet Plateau has the highest altitudinal topography in the world, where is also called the third pole besides the South and North Pole. Moreover, it is the headstream area of Yangtze and Yellow Rivers. Therefore, it becomes a hotspot region that scientists from China and all over the world more and more pays attention to. Soil is a greatly important factor for ecologically environmental protection in an ecosystem because of its close relationship with the hydrosphere, atmosphere, lithosphere and biosphere. The objectives of this study were (1) to evaluate quantitatively main pedogenic processes in the region of Kekexili, N. Qinghai-Tibet Plateau in terms of the standpoint of pedogenesis, (2) to discuss the geochemistry and availability of elements in the soils of this region and the effect of the pedogenic processes on them, and (3) to propose the suggestions on the protection and utilization of the soil resources in the Kekexili region.

The soil types in Kekexili region, an unpopulated region of Tibet Plateau, are dominantly the Cambosols and Aridosols, which were developed in alto-cryic and arid surroundings. The soils were characterized by developing meadow or humus surface layer and sandy texture in whole profiles. The abundance of elements in the soils is rich in calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), strontium (Sr), and lead (Pb), while poor in iron (Fe), aluminum (Al), manganese (Mn), titanium (Ti), phosphorus (P), cobalt (Co) and cadmium (Cd). The variation of the elemental abundance was mainly affected by the accumulation of clay and calcium carbonate ($CaCO_3$) in the soils. The variation of bioavailabilities of Fe, zinc (Zn), Mn, Cd, mercury (Hg), and arsenic (As) was mainly dependent on the accumulation of organic matter in the surface soil. These geochemical characteristics of the soils showed that they had such uniqueness as alto-cryic, infantility and primitiveness, which reflected the vulnerability to the environment. Once the organic surface layer in the soils were destroyed, it would not only result in the loss of soil nutrition, the decrease of the bioavailability of the soil elements and the plant growth, but also result in the exposure of sandy soil and further desertification. Therefore, it is greatly important to protect these particular soil resources for the protection of the headstream of the Yangtze River and the change of global environment.

4.5.P21

ΔG_r dependence of weathering rates under natural conditions

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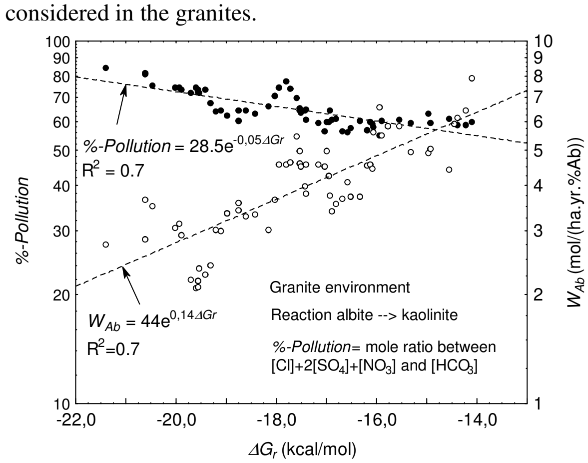
In the laboratory Burch et al. (1993)[1] observed that dissolution rates of albite are ruled out by a nonlinear function that in a plot W_{Ab} *vs.* ΔG_r is S-shaped; W_{Ab} is the dissolution rate of albite and ΔG_r the Gibbs free energy of the reaction. In agreement with this function, the W_{Ab} values are high but constant for $\Delta G_r < -9$ (dissolution plateau far from equilibrium), decrease rapidly for $-9 < \Delta G_r < -6$ and decrease more slowly for $-6 < \Delta G_r < 0$ kcal/mol. In our study of estimation of field weathering rates from spring data of the Vouga river basin (central Portugal), we report that rates of plagioclase weathering into kaolinite calculated in granite and schist environments using mole balances (Pacheco and Van der Weijden, 1996)[2] are not constant far from equilibrium. A plot W_{Ab} *vs.* final ΔG_r (figure) shows an increase of W_{Ab} with ΔG_r in the granites, but a careful analysis of the figure is due. The smaller rates occur when water has initially been polluted by fertilizers (high %-Pollution) and the larger rates when initial water is cleaner. According to this, W_{Ab} would decrease with an increasing initial ΔG_r of the water with respect to the plagioclase → kaolinite reaction, which is in agreement with Burch et. al. (1993) results. The most important thing, however, is that $W_{Pl} \neq$ constant in the range $-22 < \Delta G_r < -14$ kcal/mol. Results for plagioclase reaction in the schists are identical to those in the figure. The observed trends are not as obvious when the biotite → kaolinite reaction is considered in the granites.



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