Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11847, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11847
EGU General Assembly 2008

Simulating soil chemical responses to high atmospheric S, N and Ca deposition in a Masson pine forest ecosystem in south China using the nutrient cycling model, NuCM

P. Yu (1), Y. Wang (1), T. Sogn (2), J. Mulder (2), J. Zhu(1)

(1) The Research Institute of Forest Ecology, Environment and Protection, the Chinese Academy of Forestry, China, (2) Department of Plant and Environmental sciences, the University of Life Sciences, Norway

In order to increase the quantitative understanding of nutrient cycling in a Masson Pine (*Pinus massoniana*) forest ecosystem in southwest China and perform prediction of long-term effects of atmospheric deposition of S, N and Ca, the Nutrient Cycling Model (NuCM) was applied. By contrast to Europe, the atmospheric deposition of S and N in China is accompanied by high Ca deposition, partly neutralizing acid inputs. NuCM was calibrated and validated using monitoring data from the Tie Shan Ping forest catchment (Chongqing). Using NuCM was adequate in simulating nutrient cycling under influence of acidic deposition, although some discrepancies between observed and simulated soil solution Ca concentration were found in deeper soil layers. The calibrated model was used to predict the soil chemical response of different scenarios of S, Ca and N input during a 60-year forecast period. A scenario with continuation of current deposition rates, "business of usual"-ban, did not result in a strong soil acidification, but revealed that the forest system today seemed to be out of steady state at the present deposition load. The model simulations suggested that the system reached a new steady state condition after about 10 years, adapted to the higher concentration of SO_4^{2-} in soil solution. Ca^{2+} and Al^{3+} were the major cations neutralizing the higher SO_4^{2-} concentration. As the high Al concentration was accompanied with a high Ca concentration the Ca/Al molar ratio was not predicted to particularly low. However,

soil solution Mg^{2+} concentration declined and may be a limiting nutrient for forest growth in the future. In the scenario with 50 % reduction in S load, but without any change in Ca deposition, NuCM predicted increased soil base saturation. Simultaneously the concentration of Al in soil solution declined. A 50 % reduction in both the S and Ca load, caused a modest recovery. A 50% increase in N load combined with the 50 % decrease in S deposition, weakened the positive effects of the reduced S load. As the vegetative uptake did not accumulate all the extra N input, increased NO_3^- concentration in soil solution was simulated and NO_3^- replaced the role of SO_4^{2-} as the major mobile anion. This result emphasises the additional role of N in the acidic precipitation pollution. Aiding that reduction of atmospheric N content should be stressed in the same way as S load reduction.