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Recovery from acidification as predicted by the MAGIC model for 14 forest catchments in the Czech Republic.

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Czech Republic is well known as country with severe acidification caused by high SO_2 emissions during second half of 20^{th} century. Peak of sulfur emission occurred in 1980´s (2.4 million tons of SO_2) and decreased dramatically during 1990´s to 0.22 mil. tons at the present.

As a result sulfur deposition decreased significantly and forest ecosystems started to regenerate.

The biogeochemical model MAGIC (Model of Acidification of Groundwater in Catchments) was applied to estimate soils and surface waters chemistry for the period 1850-2030 in 14 forest catchments (GEOMON network) located in the Czech Republic. All catchments are monitored since 1994 (many of them longer). Hydrology as well as chemistry of precipitation, throughfall and runoff was measured. Catchments cover large span of natural resistance to acidification, altitude gradient as well as deposition gradient. The most polluted catchments received at the beginning of 1990´s 50-80 kg S/ha/year and 30-40 kg N/ha/year. At present typical S deposition is between 10-20 kg ha/year for both S and N.

As a result sulfate, base cations and aluminum in stream waters decreased and pH increased. The most pronounced pH increase was observed (and also modeled) for steams with lowest pH about 5,5 in 1980´s. In respect of pH these streams will very close to pre-industrial estimate within 20 years. But future recovery in most damaged catchments (pH close to 4,0 in 1980´s) is quite small in comparison with historically

estimated conditions. These streams will recover to pH around 5.0 in 2030.

The reason for limited recovery is long-term depletion of base cations (Ca, Mg, Na, K) from soil-exchange complex. At most acidified catchments base saturation decreased from ca. 20-30% (1850) to 5-10% at present. Present level of acidic deposition will not allow significant soil recovery in the near future. MAGIC predictions estimates even further decrease of base saturation in the next two decades.

The lost of base cations was caused predominantly by atmospheric deposition, but intensive forestry is also responsible for approximately one third of the base cations loss via accumulation in harvested biomass.