

Sulphur dynamics in forest ecosystems following the reduction of sulphur deposition

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Due to the reduction in sulphur (S) emissions, atmospheric sulphur dioxide (SO₂) concentrations and sulphur deposition in Europe decreased significantly in the last decades. As a result, in forest ecosystems, the risk of soil and water acidification decreased, but some forests became at risk to get deficient in S. Only few studies have examined changes in sulphur dynamics in forest ecosystems as a response to reduction of S deposition. Within the monitoring framework of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests), sulphur compounds in soil solution, biomass and deposition have been monitored for many years across Europe, allowing the evaluation of sulphur dynamics in forest ecosystems. Here, we quantified the change in sulphur pools (soil solution, foliar and litterfall content) in the study period 2000 to 2020 across Europe. Our results show how the magnitude of decline in atmospheric SO₂ concentration and S deposition as well as climate and tree species moderate sulphur dynamics in forest ecosystems, while the absolute effect can differ due to site-specific factors. This study increases our understanding regarding the long-term effects of elevated S deposition and helps to evaluate the time scales and magnitude at which forest ecosystems react to changes in sulphur inputs. Eventually, consequences for forest ecosystems in countries with ongoing high atmospheric sulphur emissions and deposition may be predicted.