# Tracing the fate of Mg and Ca originating from liming in Beech forest ecosystems of Northern France over 40 years : ecosystem nutrient budgets and $^{26}Mg/^{24}Mg$ and $^{87}Sr/^{86}Sr$ natural isotope ratio variations

MÉLANIE COURT[1], GREGORY VAN DER HEIJDEN[2], PASCALE LOUVAT[3], EMILE BOLOU-BI[4], CLAUDE NYS[5], LAURENT SAINT-ANDRÉ[6], ARNAUD LEGOUT[7]

[1]melanie.court@inra.fr, [2]gregory.van-der-heijden@inra.fr, [3]louvat@ipgp.fr, [4]emilbolou@yahoo.fr, [5]claude.nys@inra.fr, [6]laurent.saint-andre@inra.fr, [7]arnaud.legout@inra.fr

Most forest ecosystems grow on acid and nutrient poor soils. In many cases, the chemical fertility of forest soils is slowly degrading due to increasing external pressures (*e.g.* decreasing atmospheric inputs, increasing biomass exportations) and is a growing concern in the international forest community. Forest liming with a carbonate product is a solution to restore soil fertility and acidity, globally improve the ecosystem functioning and compensate for nutrient losses caused by biomass harvest and exportation. However, the effects of liming on ecosystem processes and the biogeochemical cycling of nutrients in forest ecosystems are little known.

In this study we studied over 40 years the fate of magnesium and calcium originating from the dissolution of liming products in the soils and trees of five beech plots located in Northern France from ecosystem Mg and Ca budgets combined with the natural variations of magnesium and strontium isotopes ($^{26}Mg/^{24}Mg$ and $^{87}Sr/^{86}Sr$).

Compared to the control plots, soil exchangeable pools of Mg and Ca in the 0-40cm layer increased during the first decade after liming but differences were no longer observable in soil pools after 20 to 30 years. However, the effect of liming on tree nutrition and growth was still observed after 40 years, most probably because the biological cycling of these elements was more dynamic in the limed plots. Liming effects varied between sites depending on the liming product and amount, and the initial chemical fertility level of the soil. The natural variations of Mg and Sr isotopic ratios are an interesting tool which enables to trace the incorporation over time of Mg and Ca liming products into their biogeochemical cycle in forest ecosystems and better understand the changes (biogeochemical processes and cycling) induced by liming operations.