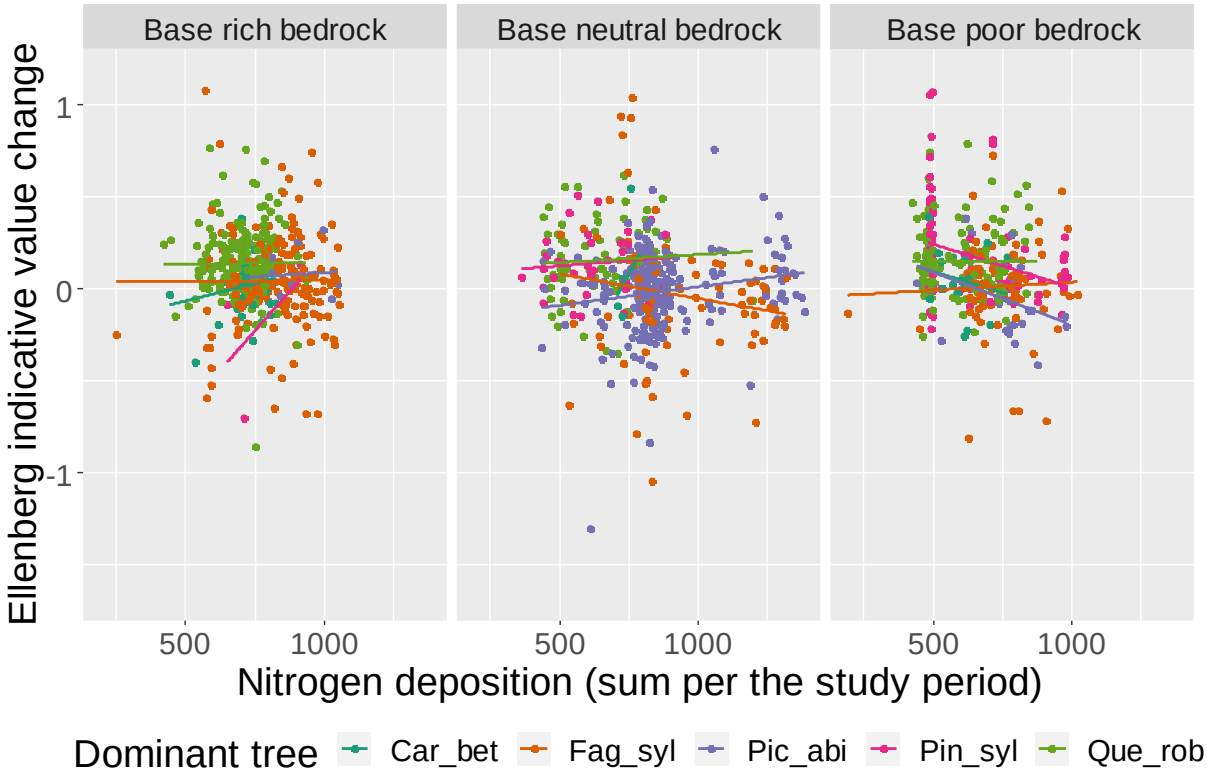
THE BEDROCK AND DOMINANT TREE SPECIES CONTROL THE FOREST RESPONSE TO NITROGEN DEPOSITION

Chuman Tomáš[1,2], Hédl Radim[3], Chudomelová Markéta[3], Oulehle Filip[1]

1 Czech Geological Survey, Klárov 3, 11821 Prague 1, Czech Republic
2 Faculty of Sciences, Charles University, Prague 2, Czech Republic
3 Institute of Botany, Czech Academy of Sciences, Lidická 25/27, 60200 Brno, Czech Republic
tomas.chuman@geology.cz, *radim.hedl@ibot.cas.cz*, *marketa.chudomelova@ibot.cas.cz*, *filip.oulehle@geology.cz*

Many studies show that excessive nitrogen inputs to terrestrial and aquatic ecosystems are one of the environment's most severe problems, leading to a decline in species biodiversity. Species loss through increased nitrogen inputs is a global issue, although it is most prominent in the temperate zone and well documented in Europe and the U.S. In terrestrial ecosystems, nitrogen is often a limiting nutrient for primary producers; however, since the industrial revolution, due to fossil fuel combustion and increased fertilisation, its inputs in the reactive form have increased unprecedentedly. Increased input of nitrogen (eutrophication) results in increased biomass production and a shift from nutrient limitation to light limitation and thus to the dominance of a few species, so-called strong competitors. Most weak competitors are plant species from oligotrophic and mesotrophic habitats adapted to nutrient-poor conditions. The spread of nitrogen-demanding species leads to a decline in plant species of nutrient-poor sites (oligotrophs). However, there are still some gaps in our understanding of the species' response to nitrogen deposition. One such research gap is in understanding the interaction of nitrogen deposition and the bedrock, representing potential nutrient supply other than nitrogen. Other nutrients, such as phosphorus or base cations, may be limited at specific bedrock, modifying the response to nitrogen deposition and not allowing expansion of the strong competitors. Therefore, we analysed the response of temperate forest understory plant species to nitrogen deposition on different bedrock. We used data from resampled forest plots and analysed how the Ellenberg indicative value for nutrients has changed over time. We found a negative relationship between the Ellenberg indicative value for nutrients and nitrogen deposition across all sites, not considering the lithology, indicating that forests have generally experienced slight oligotrophication rather than eutrophication. However, the response to nitrogen deposition further depends on the bedrock and dominant forest tree species. This relationship was the most prominent for the Spruce forest, where we can see oligotrophication on base-poor bedrock and eutrophication on base-rich and base-neutral bedrock.


Base rich bedrock
Base neutral bedrock
Base poor bedrock
Ellenberg indicative value change
1
0
-1
500
1000
Nitrogen deposition (sum per the study period)
Dominant tree
Car_bet
Fag_syl
Pic_abi
Pin_syl
Que_rob