Letter to Science
Word count: 295

More nitrogen limitation in ecosystems due to climate change? Unlikely.

Mason et al (*1*) argue that nitrogen (N) has become more limiting for natural primary productivity worldwide over the past century, and that this is best explained by human-driven elevated temperatures and CO_2. This is in conflict with previous studies showing strong increases in N availability compared to pre-industrial levels (*2*–*4*). They present two observational trends to support this: i) a decline in Europe and the USA since 1990 in various N availability indices; and, ii) a worldwide decline of $\delta^{15}N$ in plant leaves, tree rings, and lake sediments since 1920. We disagree that rising temperatures and CO_2 levels are the best explanation for both trends. The first can also be easily explained by reduced nitrogen emissions from fossil fuels and agriculture since 1990 in Europe and the USA (*5*), but leaving inputs still far above pre-industrial levels, and which continue to cause N-eutrophication and biodiversity loss (*6*). The second trend can be explained by the human-driven shift since 1920 towards a much larger role of gaseous sources of reactive N in the global N cycle relative to direct uptake from soils and recycled residues (*2*, *3*, *6*). Strong increasing livestock numbers have boosted NH_3 emissions through volatilization while artificial nitrogenous fertilizers became widely produced from N_2, which have also strongly promoted NH_3 volatilization (*7*). These gaseous origins of reactive N are typically more depleted in ^{15}N than is N released through organic matter decomposition in soils (*2*, *8*, *9*). Increasing ^{15}N depletion in plants in natural ecosystems over the past century is therefore likely to be reflective of these much increased anthropogenic N inputs (*8*, *10*, *11*) rather than indicating lower N-availability (*1*). Therefore, we caution against the intervention suggested by this paper to fertilize semi-natural ecosystems with N to improve C sequestration, until more compelling evidence is available and other risks (as for biodiversity) can be ruled out.

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