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Title

FoR2N: Italian AnaEE network of nitrogen manipulation experiments in mature deciduous forests

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Abstract:

Fertilizer production and fossil fuel combustion have altered the N cycle, increasing the amount of N atmospheric reactive compounds to double compared to preindustrial levels. In this context, experimental manipulations are crucial to elucidate forest ecosystem responses to increased N deposition, particularly forest N dynamics, ecosystems' C uptake capacity and tree ecophysiological responses. The AnaEE research platform FoR2N consists of long-term manipulative experiments that simulate elevated N atmospheric deposition in Italian forests across various sites and climatic conditions. Three sites are in the northeastern Alps (*Quercus petraea* and *Fagus sylvatica* forests), and one in the Central Apennines (*Fagus sylvatica* forest). In every site there are three control plots and three below-ground fertilizations are provided three times in each vegetative season starting from 2015. In three of the four sites, the role of canopies in intercepting atmospheric N inputs is evaluated by applying N also above the canopies, providing a realistic scenario about future N deposition on forest ecosystems. Recent FoR2N outcomes found no evidence of nutritional and physiological impairments in response to elevated N input [1] and highlight the prominent role of the canopy in intercepting considerable amounts of N from atmospheric deposition [2], revealing underrecognized processes that are essential for a deeper mechanistic understanding of the N cycle in forest ecosystems [2,3,4]. Further, species-specific altered

wood densities of trees subjected to the above canopy fertilization were found [5], with potentially relevant implications for future forest management and timber production.

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