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# The role of plant traits, microbes and soil abiotic properties on ecosystem properties from grassland soils

Nicolas Legay<sup>\*1</sup>, Sandra Lavorel<sup>2</sup>, Catherine Baxendale<sup>3</sup>, Ute Krainer<sup>4</sup>, Michael Bahn<sup>4</sup>, Marie-Noëlle Binet<sup>2</sup>, Amélie Cantarel<sup>5</sup>, Marie-Pascale Colace<sup>2</sup>, Arnaud Foulquier<sup>2</sup>, Eva-Maria Kastl<sup>6</sup>, Karl Grigulis<sup>2</sup>, Bello Mouhamadou<sup>2</sup>, Franck Poly<sup>5</sup>, Thomas Pommier<sup>5</sup>, Michael Schloter<sup>6</sup>, Jean-Christophe Clément<sup>2</sup>, and Richard Bardgett<sup>7</sup>

<sup>1</sup>Laboratoire d'écologie alpine (LECA) – Université Grenoble Alpes – bat. D - Biologie 2233 Rue de la piscine - BP 53 38041 GRENOBLE CEDEX 9, France

<sup>2</sup>Laboratoire d'écologie alpine (LECA) – CNRS : UMR5553, Université Joseph Fourier - Grenoble I, Université de Savoie – bat. D - Biologie 2233 Rue de la piscine - BP 53 38041 GRENOBLE CEDEX 9, France

<sup>3</sup>Lancaster University – Bailrigg, Lancaster. UK LA1 4YW, United Kingdom

<sup>4</sup>University of Innsbruck – University of Innsbruck, Innrain 52, A-6020 Innsbruck, Austria

<sup>5</sup>Ecologie microbienne (EM) – Institut national de la recherche agronomique (INRA) : UR1193, CNRS : UMR5557, Université Claude Bernard - Lyon I (UCBL), Ecole Nationale Vétérinaire de Lyon – BAT GREGOR MENDEL (ex 741)-4 et 43 Bvd du 11 Novembre 1918 69622 VILLEURBANNE CEDEX, France

<sup>6</sup>Helmholtz Zentrum München – Germany

<sup>7</sup>Faculty of Life Sciences [Manchester] – Life Sciences, The University of Manchester, Carys Bannister Building, Dover St, Manchester, M13 9PL, UK, United Kingdom

## Abstract

Although it is known that multiple interactions among soil abiotic properties, plant functional traits and soil microbial properties influence nutrient cycling, the relative contribution of each of these groups of variables is poorly understood. We manipulated grassland plant functional composition and soil nitrogen (N) availability in a multi-site mesocosm experiment to quantify their relative effects on soil N turnover. Overall, root traits, denitrification potential, as well as N and water availability, best explained variation in measured ecosystems properties, especially the trade-off between nutrient sequestration and plant biomass production. Their relative contributions varied with soil inorganic N availability. In relatively N-poor soils, N turnover was mainly controlled by microbial and soil abiotic properties, whereas in the relatively N-richer soils, it was mainly controlled by plant functional traits. This experiment is a strong demonstration of the role of functional characteristics of both plants and soil microbes, and their interplay with soil N availability, as biotic markers of N turnover in grasslands.

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\*Speaker

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