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**Contrasting effects of nitrogen deposition on soil respiration in two Mediterranean ecosystems**

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Anthropogenic activities are dramatically altering the global carbon (C) and nitrogen (N) cycles. Increased atmospheric N deposition can alter ecosystem C source-sink dynamics, for example via changes in soil CO2 fluxes (the second largest C flux in terrestrial ecosystems), and therefore feedback with climate change. A very limited number of experiments has been conducted to assess the effects of N addition in Mediterranean ecosystems and none of them has explored the effects of N addition on soil respiration (Rs). The main objective of this study was to assess the effects of N deposition on Rs dynamics. We hypothesized that Rs would be negatively influenced by N addition and that this effect would be modulated by the high spatial-temporal variability typical of Mediterranean ecosystems. These hypotheses were tested in two Mediterranean sites: Capo Caccia (Italy) and El Regajal (Spain). Capo Caccia is dominated by *Juniperus phoenicea* L. (53% cover on average) and other shrubs (27% cover), while the remaining 20% is soil covered with a well-developed lichen-dominated biological crust (hereafter biocrust). In this site, 8 plots were randomly established and two microsites were selected within each plot, one under *J. phoenicia* canopy and one in the interspace between shrubs. For three years, four plots were treated with 30 kg N ha-1 y-1 and the other four were treated as controls. El Regajal is dominated by *Rosmarinus officinalis* L. and *Quercus coccifera* L. In this site, 24 plots were established following a 6-block design. Within each block, three plots were randomly selected and treated with 10, 20 or 50 kg N ha-1 y-1 for eight years and another plot was used as control. In both sites, Rs showed clear seasonal patterns, mainly driven by soil water content and soil temperature. In Capo Caccia, Rs was significantly increased by N addition in the bare soil microsite, possibly due to the higher sensitivity of the biocrust to N supply. In contrast, soils under the canopy did not respond to the treatment, which we attributed to the buffering effect of shrubs. In El Regajal, N addition significantly reduced Rs, which can be due to cumulative negative N effects. These contrasting results highlight the urgent need for further field studies to better understand how increased N deposition influences Rs in Mediterranean ecosystems.

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