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Soil respiration and its components respond asymmetrically to throughfall reduction and nitrogen additions in a subtropical Moso bamboo forest in the Southwest China

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The roles of multiple global change are expected for many terrestrial ecosystems in future. As two main global change factors, the impact of drought and nitrogen deposition and their interaction on soil respiration and its components (R) remains unclear. To explore the responses of soil respiration (R_s), autotrophic respiration (R_a) and heterotrophic respiration (R_h) to multiple global change factors, we established a field experiment of throughfall reduction and nitrogen additions in a subtropical Moso bamboo (*Phyllostachys heterocycla*) forest in the Southwest China, using a 4 × 4 completely randomized design. Results showed that bivariate exponential equation with soil temperature (T) and soil moisture (SWC) ($R=a.e^{bT}.SWC^{c}$) was fitted to predict R_s, R_a and R_h. Throughfall reduction, nitrogen additions and their interaction had no effect on annual mean R_s and R_a, but nitrogen additions significantly depressed annual mean R_h. Nitrogen additions significantly decreased contribution of R_h to R_s and increased contribution of R_a to R_s, however, the contributions were non-responsive under throughfall reduction. The more positive effect of nitrogen additions on the contribution of R_a to R_s was appeared compared with that of throughfall reduction, thereby more negative effect on the contribution of R_h to R_s. The fine root biomass, fine root carbon and nitrogen storage regulated R_s, while fine root phosphorus storage determined R_a. The R_h was negatively correlated with vector lengths, thus suggesting that microbial carbon limitation caused the decline of R_h. Our findings demonstrate that the nitrogen additions played overriding role than throughfall reduction in affecting the contribution of R_a and R_h to R_s. Moreover, the negative response of temperature sensitivity of R_s and R_h to nitrogen additions, suggesting that that the nitrogen additions may weaken the positive response of soil CO_2 emission to global climate warming. Our study highlights asymmetrical responses of R_s, R_a and R_h to throughfall reduction and nitrogen additions and could enhance accurate predictions of soil carbon dynamics in response to multiple global climate change in future.