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Artificial drought causes a lasting reduction in forest soil respiration

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Since soil respiration is a major flux in the global carbon cycle, potential global warming effects have received great attention. Field soil warming studies focused on the difference in soil respiration under actual and elevated (future) soil temperatures. Accordingly, we warmed the topsoil of a mature spruce forest by 4°C compared to the actual soil temperature during the growing seasons since 2005. We observed a constant 40 - 45 percent increase in total soil respiration on warmed plots. Nitrous oxide emissions were increased by 50 - 60 percent, wheras 10 - 20 percent less methan was taken up. Root and heterotrophic respiration reacted similarly to elevated soil temperature. However, besides rising soil temperature, decreasing precipitation during summer is predicted for our location in the northern limestone Alps (Austria). During July 2008 we simulated a one-month summer drought by building roofs over warmed and control plots. A reduction of soil respiration and N2O emissions was observed on plots where drought was simulated, whereas no change in CH4 uptake could be observed. Until abstract submission, the simulated summer drought offset the positive warming effects.