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# Nitrogen availability regulates topsoil carbon dynamics after permafrost thaw by altering microbial metabolic efficiency

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Input of labile carbon may accelerate the decomposition of existing soil organic matter (priming effect), with the priming intensity depending on changes in soil nitrogen availability after permafrost thaw. However, experimental evidence for the linkage between the priming effect and post-thaw nitrogen availability is unavailable. Here we test the hypothesis that elevated nitrogen availability after permafrost collapse inhibits the priming effect by increasing microbial metabolic efficiency based on a combination of thermokarst-induced natural nitrogen gradient and nitrogen addition experiment. We find a negative correlation between the priming intensity and soil total dissolved nitrogen concentration along the thaw sequence. The negative effect is confirmed by the reduced priming effect after nitrogen addition. In contrast to the prevailing view, this nitrogen-regulated priming intensity is independent of extracellular enzyme activities but associated with microbial metabolic efficiency. These findings demonstrate that post-thaw nitrogen availability regulates topsoil carbon dynamics through its modification of microbial metabolic efficiency.