

Carbon release changes from different organic matter pools in subarctic peatland with permafrost thaw

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Subarctic peatland stores a large amount of organic carbon, and are experiencing permafrost thaw. We addressed three components of subarctic peatland organic matter pool: peat dissolved organic carbon (DOC), peat, and fresh plant litter. We found the release of DOC and CO₂ from fresh litter was initially high, but decrease quickly to smaller, constant rates. Sedges greatly increased with permafrost thaw, which has the highest rates in DOC, CO₂ and CH₄ production, as well as the highest temperature sensitivity compared to shrubs and *Sphagnum*. Permafrost thaw induced higher litter quality and wet anoxic environment had opposite effects on CO₂ production, whereas, they all significantly promoted CH₄ and DOC release. Peat decomposition decreased along peat profile, and deep peat in permafrost zone produced more greenhouse gases than other sites. Dry thawed area peat decomposition was higher than wet thaw area and Palsa in field condition, however, they became similar under the same incubated condition. Similar peat DOC mineralization per volume indicated no significant difference in peat DOC decompostion across permafrost thawing sites. Considering plant composition difference, carbon loss of litter in thaw wet area was significantly higher than Palsa and dry thaw area although carbon loss rate were similar. Our research showed litter decomposition accounted in the total organic matter carbon release were about 14 % in Palsa and dry thaw area, and up to 37.33 % in wet thaw area. In addition, litter decomposition changes accounted for 18.18 % to as high as 115.43 % of the changed peat carbon releases with permafrost thaw, which highlighted the importance of litter contribution to total organic matter decomposition change with permafrost thaw, and the hugest contribution as Palsa thawed into wet area.