

ABSTRACT

Decomposition of plant litter is a key ecological process in streams, whose contribution to the global carbon cycle is large relative to their extent on Earth. We examined the mechanisms underlying the temperature sensitivity (TS) of instream decomposition and forecast effects of climate warming on this process. Comparing data from 41 globally distributed sites, we assessed the TS of microbial and total decomposition using litter of nine plant species combined in six mixtures. Microbial decomposition conformed to the metabolic theory of ecology and its TS was consistently higher than that of total decomposition, which was higher than found previously. Litter quality influenced the difference between microbial and total decomposition, with total decomposition of more recalcitrant litter being more sensitive to temperature. Our projections suggest that (i) warming will enhance the microbial contribution to decomposition, increasing CO₂ outgassing and intensifying the warming trend, especially in colder regions; and (ii) riparian species composition will have a major influence on this process.