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Forest wildfire increases soil microbial biomass C:N:P stoichiometry in long-term effects

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Boreal forest fire strongly influences carbon (C) stock in permafrost soil by thawing permafrost table which accelerated microbe decomposition process. We studied soil microbial biomass stoichiometry in a gradient of four (3 yr, 25 yr, 46 yr and more than 100 yr) ages since fire in Canada boreal forest. Soil microbial biomass (MB) in long-term after fire is significantly higher than in short-term. MB C and nitrogen (N) were mainly dominated by corresponding soil element concentration and inorganic P, while MB phosphorus (P) changes were fully explained by soil N. Fire ages and soil temperature positively increased MB N and P, indicating the negative impact by fire. Microbial C:N:P gradually increased with fire ages from 15:2:1 to 76:6:1 and then drop down to 17:2:1 in the oldest fire ages. The degree of homeostasis of microbial C, N and P are close to 1 indicates non-homoeostasis within microbial elements, while it of C:N:P is close to 8 shows a strong homeostasis within element ratios and proved microbial stoichiometric ratio is not driven by soil element ratios. In conclusion, i) microbial biomass elements highly depends on soil nutrient supply rather than fire ages; ii) wildfire decreased microbial stoichiometry immediate after fire but increased with years after fire (YF) which at least 3 times higher than > 100 fire ages; iii) microbial biomass C, N and P deviated from strict homeostasis but C:N:P ratio reflects stronger homeostasis.