Spatial and temporal soil responses to carrion decay

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Decaying carrion alter surrounding soil biogeochemical cycling by stimulating heterotrophic microbial communities, perturbing carbon (C) and nitrogen (N) pools and fluxes, and forming ephemeral nutrient hotspots. However, the spatial and temporal boundaries of soil biogeochemical perturbations are not well-defined. By combining field- and lab-based experiments, we provide new insights into carrion-sourced nutrient cycling in East Tennessee soils. Organic C (proteins and amino acids) and N (ammonium) pools are rapidly mineralized within weeks, resulting in CO_2 release and culminating in NO_3^- enrichment for several months. From lab-based experiments, the dominant microbial communities driving changes are sourced from native soil communities rather than communities input from the carrion itself. Soil stable $\delta^{15}N$ composition rapidly changed in response to carrion decay, exhibiting 2‰ enrichment over two days. Isotopic enrichment persisted for over 1 year, contrasting with all other measured soil biogeochemical parameters, which had largely returned to background conditions. In addition, after one year, stable isotopic enrichment extended to 10 cm depth and 40 cm from the visibly altered nutrient hotspot. Carrion decay has the potential to exert long-term changes on soil biogeochemistry, up to several years, and significantly alters soil stable isotopic composition.