

EFFECT OF ARTIFICIAL ALTERATION OF VEGETATION AND SOIL ON THE DYNAMICS OF CARBON DIOXIDE IN SOIL PROFILES

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Dynamics of carbon dioxide in soil profiles were observed under a relatively undisturbed pine forest and an artificially developed grassland adjacent to the forest in the Environmental Research Center, University of Tsukuba, central Japan. The grassland was developed as a meteorological observation field about twenty years ago, and the surface soil and subsoil were exchanged mutually. In the grassland soil, diffusion coefficients of carbon dioxide in soil air are low and the depth of root distribution is shallow compared with those in the forest soil. As a result, concentrations of carbon dioxide in soil air are much higher under the grassland (nearly 10% in vol. at maximum) than under the forest (less than 1.5% in vol.). Such high concentrations in the grassland soil were observed at the depth where the former surface soil was laid. The stable isotope ratios of soil organic carbon around the depth are similar to those in the forest soil, showing C₃-plant origin. In contrast, carbon dioxide in the grassland soil is suggested to be C₄-plant origin, dominant in present vegetation of the grassland. In winter, however, the isotope data indicate substantial contribution of the old soil organic matter to the production of carbon dioxide in the soil. These results of the study suggest the effect of artificial soil disturbance on soil physical condition and soil air environment, and give some insight into the fate of organic matter brought to deep soils.