

研究论文

川西亚高山林区三种土地利用方式下土壤呼吸动态及组分区分

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摘要 采用动态密闭气室法(IRGA)对川西亚高山林区云杉(*Picea likiangensis* var. *balfouriana*)人工林、农地和冷杉(*Abies faxoniana*)原始林的土壤呼吸日变化及季节变化进行了测定,计算了土壤呼吸3个组分的值。结果表明, (1)云杉人工林中根系呼吸占林地总呼吸的22%, 冷杉原始林为29%; (2)土壤呼吸速率的日变化和季节变化均与10cm地温的变化相一致; (3)由于本地区土壤水分不是限制因子,因此温度成为影响土壤释放CO₂的最关键因素 云杉人工林矿质土壤呼吸随温度变化的Q10值为2.44, 农地为1.82, 冷杉原始林为2.73; (4)云杉人工林年呼吸CO₂总量为43.93t·hm⁻²·a⁻¹, 其中72%来自于矿质土壤排放, 6%来自于枯落物分解; 农地年呼吸CO₂总量为26.07 t·hm⁻²·a⁻¹, 主要来自矿质土壤; 冷杉原始林年呼吸CO₂总量为33.95t·hm⁻²·a⁻¹, 其中61%来自于矿质土壤排放, 10%来自于枯落物分解。

关键词 [亚高山林区](#); [土地利用/覆盖](#); [土壤呼吸](#)

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Dynamic and fractionalization of soil respiration under three different land use/covers in the subalpine region of western Sichuan Province, China

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Abstract Carbon cycling is one of the most important processes in forest ecosystem and it is closely related to the energy flux. With recognizing the environmental effects caused by atmospheric carbon dioxide, there has been a surge of renewed interest in the carbon cycling in soil. Soil respiration is the loss of carbon from soils as a result of both microbial activities and root respiration. Soil temperature plays an important part in determining soil respiration rates.

The study focused on the responses of soil respiration rate to soil temperature in 3 land use/covers in the subalpine region of western Sichuan, China. Soil respiration and its daily and seasonal changes in *Abies faxoniana* primary forest, and *Picea likiangensis* var *balfouriana* plantation and cropland were measured by means of closed-chamber IRGA technique. The spruce plantation and cropland were established or transferred from the primary forests in 1960s. Each type has five permanent plots. Within each plot, three sub-plots have been set up, one with litter being removed away and one with root being cut by trench method. The different treatment of the sub-plots allows us to estimate the respiration respectively from root, litter and mineral soil. Results show that CO₂ emission from root system accounted for 22% of the total emission from land surface of the spruce plantation and 29% in the primary fir forest. The respiration rate from the spruce plantation and primary fir stand reach the peak in August, while it comes forth early in July in cropland because of the farming works. Since soil moisture is not a limiting factor, CO₂ emission was mainly co

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ntrolled by temperature. There were significant correlations between soil respiration rate and soil temperature at 10cm depth. Q10 for respiration of mineral soil was 2.44, 1.82 and 2.73 respectively for spruce plantation, cropland and primary fir stand. The annual CO₂ emission rate from spruce plantation was 43.93 t•hm⁻²•a⁻¹, of which 72% was from mineral soil and 6% from litters. An efflux of 26.07 t•hm⁻²•a⁻¹ from cropland was observed, most of which was released from mineral soil. The annual CO₂ emission from primary fir stand was around 33.95 t•hm⁻²•a⁻¹, of which 61% was from mineral soil and 10% from litter.

Key words subalpine; land use/cover; soil respiration

DOI

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