



## **Spatial and temporal variation in the soil CO<sub>2</sub> efflux in a subtropical broadleaved forest in Okinawa, Japan**

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Soil CO<sub>2</sub> efflux ( $R_s$ ) is a major component of the carbon emissions from terrestrial ecosystems. The spatiotemporal variation in  $R_s$  and its dependency on biotic and abiotic factors have been clarified in various ecosystems. It is thought that subtropical ecosystem  $R_s$  values are slightly higher than those of temperate ecosystems, but much smaller than those of tropical ecosystems (Bond-Lamberty & Thomson, 2010), but compared with temperate and tropical ecosystems there are limited relevant data. This study examined spatial (within stand-scale) and temporal (hourly to seasonal) variation in  $R_s$  in a subtropical evergreen broad-leaved forest on Okinawa Island, Japan. We measured  $R_s$  using a closed dynamic chamber at 60 locations within a 0.15-ha plot once a month in 2013 and 2014. In addition,  $R_s$  was measured continuously using automated chambers at two locations within the same plot in 2015. The annual average  $R_s$  value ( $5.5 \mu\text{mol m}^{-2} \text{s}^{-1}$ ) obtained from the monthly manual measurements was comparable with values reported for tropical rainforests and larger than those for temperate forests. At our site,  $R_s$  showed clear seasonal variation depending on soil temperature, unlike in tropical rainforests, which lack seasonality. The spatial variation in  $R_s$  was positively correlated with the ratio of litter cover area per unit soil area, which was larger on the ridge and smaller on the slope. We propose that the amount of litter, as a material for heterotrophic respiration, largely characterises the spatial variation in  $R_s$  at this site, with a relatively small contribution from autotrophic respiration by plant roots. The results clarify that  $R_s$  values in subtropical forests in Okinawa have characteristics between those of temperate forests (seasonality) and tropical rainforests (large  $R_s$ ).