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Photodegradation at day, microbial decomposition at night - decomposition in arid lands

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Our current knowledge of decomposition in dry seasons and its role in carbon turnover is fragmentary. So far, decomposition during dry seasons was mostly attributed to abiotic mechanisms, mainly photochemical and thermal degradation, while the contribution of microorganisms to the decay process was excluded. We asked whether microbial decomposition occurs during the dry season and explored its interaction with photochemical degradation under Mediterranean climate. We conducted a litter bag experiment with local plant litter and manipulated litter exposure to radiation using radiation filters. We found notable rates of CO_2 fluxes from litter which were related to microbial activity mainly during night-time throughout the dry season. This activity was correlated with litter moisture content and high levels of air humidity and dew. Day-time CO_2 fluxes were related to solar radiation, and radiation manipulation suggested photodegradation as the underlying mechanism. In addition, a decline in microbial activity was followed by a reduction in photodegradation-related CO_2 fluxes. The levels of microbial decomposition and photodegradation in the dry season were likely the factors influencing carbon mineralization during the subsequent wet season. This study showed that microbial decomposition can be a dominant contributor to CO_2 emissions and mass loss in the dry season and it suggests a regulating effect of microbial activity on photodegradation. Microbial decomposition is an important contributor to the dry season decomposition and impacts the annual litter turn-over rates in dry regions. Global warming may lead to reduced moisture availability and dew deposition, which may greatly influence not only microbial decomposition of plant litter, but also photodegradation.