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Spatial and temporal variability of soil respiration in an irrigated olive grove in southeastern Spain

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Olive grove management entails environmental and socio-economic repercussions for the Mediterranean region. Maintaining bare soil in alleys is the most common management in this crop, but its implications for soil respiration (R_{soil}) are not well understood. Although previous studies have quantified R_{soil} at specific moments, soil respiration has not yet been continuously measured in olive groves. In this study a complete year of R_{soil} measurements was taken in an irrigated olive grove in southeast of Spain. To avoid spontaneous weed growth a glyphosate-based herbicide was periodically applied. Six automated soil CO_2 efflux chambers with additional sensors of soil temperature (T) and soil water content (SWC) were controled by a multichamber monitoring system (Li-8100A, Li-cor). With the aim of know the spatial variability in R_{soil} and facilitate scaling up to estimate ecosystem soil respiration, 3 chambers were installed under the olive tree canopy and 3 chambers in the alleys.

Preliminary results show that R_{soil} increased in the warmer months and decreased in the colder months as expected. Also, daily R_{soil} values under the trees are normally several times higher than in the alleys but this ratio changed with the seasons. In warm months, daily R_{soil} under the tree was 2-3 times higher than daily R_{soil} in the alley, while in cold months (like January) it was 6 times higher. In the alleys, diurnal variability was detected in R_{soil} except in winter. While R_{soil} under the trees was practically constant throughout the day during the year except in summer when there appears to be a relationship with the decrease in the flux of photosynthates in environments with high VPD. In spring $R_{soil\text{-}alleys}$ was double at midday versus night-time. Additionally, a positive and a negative relationship was established with temperature and SWC respectively. On the other hand, we found no clear relationship for R_{soil} under the tree with respect to T or SWC. These preliminary results suggest a considerable R_{soil} component of total ecosystem respiration influenced by the tree which does not depend on changes in T and SWC and that should be included in the partition models.