Geophysical Research Abstracts
Vol. 21, EGU2019-7395-3, 2019
EGU General Assembly 2019


# Plasticity in leaf hydraulic traits and water relations in Mediterranean evergreen Quercus ilex subjected to long-term rainfall exclusion

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Increasing temperature and drought conditions in the Mediterranean can result in leaf dehydration and summer defoliation even in drought-adapted tree species such as the widespread evergreen oak Quercus ilex. The stomatal regulation of leaf water potential plays a central role in avoiding this phenomenon as it balances the need to maintain transpiration for photosynthesis and leaf cooling with the risk of hydraulic failure. This regulation is constrained by a suite of traits that includes leaf hydraulic conductance, leaf hydraulic capacitance, minimum conductance to water vapor, cell osmotic potential and wall elasticity, and xylem vulnerability to embolism, all of which having a different plasticity in response to drought. We investigated the plasticity of these traits in response to long-term experimentally increased drought in two partial throughfall exclusion experiments located in pure and mixed holm oak forests in southern France. Osmotic adjustment was observed to increase the cell osmotic potential at full turgor and to decrease the water potential at turgor loss in the dry treatments of the two experiments, thus suggesting a stomatal closure at more negative water potentials in drier conditions. However, leaf hydraulic conductance and vulnerability to embolism did not exhibit any plasticity in response to increased drought to match the one in osmotic potential and maintain the hydraulic safety margin. The sequence of leaf responses to drought and dehydration was conserved and common to all treatments and sites. Long-term measurements of leaf water potential at the two sites show that, although partial defoliation was observed in some trees during the extreme droughts of 2016 and 2017, leaf cavitation and drying remains an exceptional phenomenon in Quercus ilex.