AnaEE Research Infrastructure: Enhancing Understanding and Resilience of Mediterranean Forest Ecosystems in a Changing Climate

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Mediterranean forest ecosystems, characterized by hot, dry summers and mild, wet winters, play a crucial role in regional biodiversity, carbon storage, and climate regulation. These forests are particularly vulnerable to climate change, with increasing drought frequency, rising temperatures, and shifting precipitation patterns threatening their structure and functioning. Experimental frameworks are urgently needed to predict forest responses (acclimation, resistance, resilience, or, instead, forest dieback) under these altered conditions.

The AnaEE ERIC (Analysis and Experimentation on Ecosystems, European Research Infrastructure Consortium) provides a pan-European platform to address these challenges. By integrating highly instrumented open-air experimental sites, controlled environment facilities, and predictive modelling services, AnaEE enables a mechanistic understanding of ecosystem processes. Its network includes Mediterranean forest sites where long-term *in natura* manipulations — such as drought simulations and nutrient additions—generate high-resolution data on ecophysiology (e.g. growth, carbon fixation, carbon allocation), and soil biogeochemistry (Laoué et al., 2023; Rambal et al., 2025).

Several key initiatives, such as the project *Drought ForC* and the program SEE-life (long-term studies in Ecology and Evolution; https://arxiv.org/abs/2507.07472*)* allow us to investigate the effects of prolonged soil moisture deficits on carbon allocation in tree organs, organic matter decomposition, and nutrient cycling across Mediterranean forests. By combining experimental manipulations, long-term observations, and process-based models, these initiatives exemplify how AnaEE links controlled experiments to ecosystem-scale forecasting in water-limited environments.

Through harmonized protocols, standardized measurements, and open-access data, AnaEE promotes cross-site comparisons, reproducibility, and transdisciplinary collaboration. The infrastructure enhances our ability to develop evidence-based strategies for Mediterranean forest management, climate mitigation, and ecosystem conservation under the pressures of a warming, drought-prone future.

Reference

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Rambal, S., Cavender-Bares, J., Limousin, J. M., & Salmon, Y. 2025. A multi-scale analysis of drought

effects on intrinsic water use efficiency in a Mediterranean evergreen oak forest. *Agricultural and Forest Meteorology, 361*, 110283.