COASTAL DUNE FORESTS UNDER SCENARIOS OF GROUNDWATER LIMITATION: FROM TROPICS TO MEDITERRANEAN - GWTROPIMED PROJECT

Cristina Antunes [1], Sylwia Gorka [2], Margarida Ramos[3], Otilia Correia[3], Rolf Siegwolf [4], Simone Vieira [5], Luiz Martinelli [6], Christiane Werner [7], Maria Cruz Barradas [8], Maria João Pereira[9], Cristina Máguas [3]

[1] Centro de Biologia Ambiental, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal. Participant in the COST-**STSM**: ES0806-010474: Stable isotopes as tracers of long-term groundwater stress.
[2] Engineering Department, Wroclaw University, Poland. Participant in the COST-**STSM**: ES0806-023165: Plant functional groups water use in a groundwater limitation situation.
[3] Departmento de Biologia Vegetal, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal.
[4] Laboratory of Atmospheric Chemistry (LAC), Paul Scherrer Institute, Villigen, Switzerland.
[5] Departamento de Biologia, Universidade Estadual de Campinas (UNICAMP), São Paulo, Brasil.
[6] Departamento de Universidade de São Paulo, São Paulo, Brasil.
[7] Dept. of AgroEcosystem Research, University Bayreuth, Bayreuth, Germany.
[8] Departamento de Biología Vegetal y Ecología, Universidad de Sevilla, Sevilla, Spain.
[9] Centro de Recursos Naturais e Ambiente, Instituto Superior Tecnico, Universidade Tecnica de Lisboa, Lisboa, Portugal.

Groundwater (GW) drawdown is important to vegetation as can produce dramatic changes in plant communities, on physiological performance or survival of plant species. GW lowering and surface water diversions will affect vulnerable coastal dune forests, ecosystems particularly sensitive to GW limitation and inevitably affect GW-dependent species. Sand dune plant communities encompass a diverse number of species that differ widely in root depth, tolerance to drought and fluctuations of the water table, and capacity to shift between seasonal varying water sources. The high ecological diversity of sand dune forests, characterized by sandy soils, well or poorly drained, poor in nutrients and with different levels of salinity and GW, can occur in different climatic regions of the globe. Such is the case of Tropical, Meso-mediterranen and Mediterranean areas, where future climate change is predicted to change water availability. Accordingly, the core idea of this project is to evaluate, along a climatic gradient, the capacity of different plant communities to adapt to future scenarios of changing GW by an integrative spatial approach of GW stress indicators.

This large-climatic-scale study, covering Brazil, Portugal and Spain, will provide an excellent experimental condition to study the GW dynamics and community functioning in natural ecosystems of high ecological value. To fulfill the main objective, suitable short- and long-term GW limitation stress indicators will be integrated in spatio-temporal water dynamics. In a global consortium partnership, 4 main tasks will be developed in this project: (i) Characterize and understand plant functional groups water use in a GW limitation situation in a climatic gradient (Task 1); (ii) Understand ecophysiological responses of functional groups in a GW gradient and define suitable short-term stress indicators in GW limitation scenarios, using stable isotopes (leaf ^{13}C and xylem ^{18}O) as the main approach (Task 2); (iii) Estimate important factors that could function as GW long-term stress tracers and evaluate long-term stress sensitivity of the functional groups to temporal/seasonal changes in water availability, through the use of tree-rings isotopic signal (^{13}C and ^{18}O) as an archive tool (Task 3); (iv) Develop a model to evaluate community water use and response under future groundwater change scenarios through ecophysiological parameters (Task 4).

Ultimately, this approach will contribute to trace GW stress in vegetation in an early stage and help to manage vulnerable communities.