MEDITERRANEAN-TYPE ECOSYSTEM AND INCREASED NITROGEN AVAILABILITY. THE COMPLEXITY OF ITS ECOLOGICAL NETWORKS.

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In general, our knowledge of the structure of ecological networks is still incomplete in important areas that include interactions between the distinct compartments of the biosphere and the reciprocal relationships between biotic and abiotic factors. This is particularly acute for Mediterranean-type ecosystems where biological networks are strongly influenced by the constrains imposed by resource (phosphorus, nitrogen and water) availability and congruence. Several studies have been published about tropical and northern hemisphere ecosystems (Europe and America) but no information is available about the effects of increased localized availability of reactive nitrogen (Nr) on Mediterranean-type ecosystems. The question is complex mainly due to the inter-conversion and distinct effects, often contrary, of the various forms of Nr, whose effects are also dependent on climate, hot and dry summers and cold and humid winters, as it is in Mediterranean climates.

The aim of this work is to understand how species persist in complex webs when increased Nr availability occur quickly and strongly, in order to develop more realistic models that incorporate the relationships between species, abiotic factors and links strength. The approach is multidisciplinary and engages a broad spectrum of parameters integrative of Nr effects on atmosphere, soil and vegetation including lichen communities. The integrative analysis of the results will be used to validate (or not) the models currently used for assessing the impacts of increased Nr availability in northern ecosystems to Mediterranean-type ecosystems. Special attention was given to certain variables along a gradient of atmospheric ammonium concentrations:

1. Atmospheric ammonium concentration along the year in relation to other climate variables (namely, temperature and water availability)
2. Changes in soil characteristics (pH, water holding capacity, C/N ratio, respiration rates, N₂O emission)
3. Composition of soil microbial communities
4. Vegetation and lichen communities composition and diversity.

Altogether the results highlight that: (1) ecological networks, although complex, have well defined patterns that can contribute to clarify ecological mechanisms (such as ammonium toxicity and the relationship between ammonium deposition, soil and vegetation community composition and N₂O emission) promising a better understanding of ecological functionality; (2) abiotic constrains and resource congruence may be essential to explain the persistence of species under conditions of increased Nr availability; and (3) the tolerance of the ecosystem to gains and losses of species as well as its vulnerability to increase Nr availability may be described by some parameters (diversity indexes, critical levels, etc) susceptible to become tools to be used in the interface between science and policy.