Geophysical Research Abstracts
Vol. 20, EGU2018-8315-1, 2018
EGU General Assembly 2018

Mediterranean forests under pressure by climate change

Josep Peñuelas and the Global Ecology Unit
CREAF, CSIC, BELLATERRA, Spain (josep.penuelas@uab.cat)

If climate change continues at its current rate, the resilience of many Mediterranean ecosystems will likely be exceeded, altering their structure and function. A consistent understanding of the impacts, however, remains elusive due to the difficulty of obtaining data of field studies at different scales from local to regional. We will present the impacts of climate change on terrestrial ecosystems of the Mediterranean region based mostly on long-term field experiments of climatic manipulation, monitored field sites, and remote sensing data. These studies provide diverse experimental and observational field evidences that rising temperatures, new patterns of precipitation and other climatic changes are already affecting Mediterranean forests. Rapid genetic, epigenetic and metabolomic changes in plants have been described. They have resulted in changes in morphology, physiology, growth, reproduction, and mortality. Some species are more vulnerable to these changes than others are, which has altered their competitive ability and thereby changed microbial, plant and animal community composition. This is what we found in forest studies where natural extremes combined with experimental drought amplified the decreases in stem growth and the increases in stem mortality. Contrasting responses in relative abundance and growth between the tree Quercus ilex and the shrub Phillyrea latifolia were found in the drought treatment reinforcing a vegetation shift favoring the shrub. In another field experiment in a Mediterranean shrubland, those species distributed in cooler regions decreased under the moderate warming treatment, while there was an abrupt decrease in wet-distributed species, followed by a delayed increase in dry-distributed species under the drought treatment. The incorporation of local plant evolutionary strategies and their changing dynamics over time thus leads to more predictable and informative shifts in community structure. Many other impacts have been observed in response to climate change, for example an increase in the emission of biogenic volatile organic compounds or an increased risk of fire and a decrease in the absorption of CO_2 in periods of drought, mostly underestimated by remote sensing data. A reduction of the capacity to retain nutrients and C in vegetation is accompanied, in the short term, by an increase in soil C and nutrient contents due to a decrease in the enzymatic capacity and mineralization of soil. The projected increase of torrential rainfalls introduces a scenario of uncertain changes in nutrient cycles, soil fertility and nutrient fluxes at medium and long terms. All these changes in water and nutrient availability suggest, though, net losses in the capacity of Mediterranean forests and shrublands to act as C sinks. These impacts have also the potential to rapidly alter forest ecosystem services, with important implications on the carbon-water balance, tree population dynamics, and forest communities. Policies of environmental and forestry management should take into account these impacts of the environmental and climatic conditions projected for the coming years and decades. (We may end up focusing on one special issue of these ones or other issues depending on what we have as most exciting those days of the EGU meeting)