Geophysical Research Abstracts
Vol. 12, EGU2010-4543-1, 2010
EGU General Assembly 2010

Fundamental tree growth processes severely suffer from water stress. The example of Pinus halepensis Mill. in South-eastern France

Francois Girard (1), Michel Vennetier (1), Samira Ouarmim (1), Yves Caraglio (2), and Laurent Misson (3)
(1) CEMAGREF Aix en Provence, France, (2) CIRAD AMAP Lab Montpellier, France, (3) CEFE/CNRS Montpellier, France

Plant architecture processes are commonly neglected in the studies about climate change impact. In terms of biomass, primary growth (i.e. lateral and principal twig growth) and leaf production are far more important than secondary growth (i.e. radial growth). Polycyclism, or the ability for a plant to produce several flushes in the same growth season, is a key process of plant development. Aleppo pine is a good model to study polycyclism: it is known to produce up to four annual flushes in one growth season: one to three in spring and sometimes one after summer drought. Architectural development i.e. ranching rate, annual branch length growth and number of needles and fruiting are positively correlated with the production of multiple flushes per year. These tree growth processes are likely to be impacted by the anticipated climate trend over the next century, particularly repeated and more severe water stresses, However, Aleppo pine architecture is not well-described in the literature and an important lack of knowledge prevents any possible prediction for the 21st century. Thus, the objectives of this study were (i) to describe architectural processes on Aleppo pine in the Mediterranean region for the last 15 years, (ii) to untangle interrelationship between climate and twig status in the evolution of tree architecture and (iii) to look for a possible impact of climate change. Since 1998, climate was far hotter and drier than normal in South-eastern France: each process of tree architecture was significantly affected, particularly after 2003 heat-wave, which delayed effect remains till 2008, exacerbated by repeated droughts. Morphologically, polycyclism is primarily influenced by twig vigour, hierarchy and position (low, middle or top crown). Climatically, tree architectural development for a given year depends mainly on water availability in preceding growth season and to a less extent on rainfall during winter and summer temperatures of current and preceding year, both contributing to water balance.