



Relation between fire temperatures and solute release in Mediterranean forests. A multivariate analysis approach

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In order to evaluate the degree of solutes release according to temperature and the relations between these it is applied a clusters analysis. It was exposed to different temperatures (150ž, 200ž, 250ž, 300ž, 350ž, 400ž, 450ž, 500ž and 550žC) in laboratory environment leaf litter samples of three mediterranean species (*Quercus suber*, *Quercus robur* and *Pinus pinea*) during 2 hours and posteriorly mixed with destiled water to create an ash slurry. The paramethers analysed are pH, electrical conductivity(EC), major ions (Ca^{2+} , Mg^{2+} and N^{+}), minor ions (Al^{3+} , Fe^{2+} , Mn^{2+} and Zn^{2+}), other compounds (P_2O_5 and SiO_4) and the Calicite (CaCO_3) of the ashes because is an important component who determine the solubility of the compounds. With the aim of identify the proximity between temperatures - taking in consideration the parameters in analysis - it is applied a clusters model (Joining - tree clustering), the single linkage method as amalgamation rule and r-pearson as distance of measure with the objective of identify the correlations between temperatures. The cut line for group formation is at the distance of 0.15. The results show that in *Quercus suber* leaf litter, the formation of three groups, the first composed by the temperatures 150ž, 200ž, 250ž, 300ž, 350ž and 400žC, the second by 450žC and the third by 500ž and 550žC. In relation to *Quercus robur*, it's identified three groups too, first (150ž, 200ž, 250ž, 300ž and 350ž C), second (400žC) and third (450ž, 500ž and 550žC). The same number of clusters are finded in *Pinus pinea*, first (150ž, 200ž, 250ž, 300ž and 350ž C), second (400 and

450°C) and third (500°C and 550°C). It can be noted that for the three species, the composition is different and it's related to different impacts with the temperature. Of all species, the more reduced impacts are found in *Quercus suber* litter (low variation until 400°C, first group), and higher in the others, mainly in *Pinus pinea*. The model shows that with the increasing of the fire temperatures, the homogeneity is lower and the impacts on solutes release rising exponentially but in different degrees depending on the specie in analysis. This rising is abrupter in *Pinus pinea* leaf litter, and lower in *Quercus suber*. This analysis indicates that fire temperatures have heterogeneous impacts on solute release in mediterranean forests and that, as much higher is the fire temperature, higher the heterogeneity between effects of the temperature.